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Effect of a participatory educational program on primary school teachers' knowledge of malaria

ABSTRACT

OBJECTIVE: To describe a participatory educational program for building up knowledge on malaria among primary school teachers in a highly endemic city.

METHODS: An observational study was conducted. A 40-hour course with a multidisciplinary and problematizing approach was held in 2008, including 46 teachers mainly from rural areas of the city of Barcelos, Northern Brazil. The participatory educational process was comprised of workshops and practical classes. A previously validated questionnaire was applied before and after the course to assess teachers' knowledge and subsequently analyzed using qualitative and quantitative approaches and open-response thematic analysis.

RESULTS: Prior to the course, teachers had little information about the transmission mechanisms, means of prevention, and the association between malaria and its vectors, and their health concepts were limited. After the course, teachers' knowledge of malaria increased and they reflected on their role in society.

CONCLUSIONS: The effect of the educational program on the construction of contextualized knowledge of malaria and health indicates the potential of the strategy developed. Continuing education processes are required for the maintenance of new knowledge and practices directed towards health promotion.

DESCRIPTORS: Faculty. Teaching, manpower. Problem-Based Learning. Health Education. Malaria, prevention & control.

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INTRODUCTION

Despite the efforts made to control malaria, this disease continues to be highly endemic in several areas of the legal Amazon region.¹⁸ The majority of studies refer to basic biological aspects of the parasite and its vector, and others to clinical, epidemiological and therapeutic efficacy studies. Since the 1990s, there has been an emphasis on the importance of studies on sociocultural aspects that enable greater awareness of the communities' behavior towards this disease, so that new control strategies with a community approach can be planned.^{7,8,12}

As the elimination of malaria is associated with changes in risk behaviors, health education is a key instrument.¹⁰ The inclusion of educational practices in the routine of students living in malaria-endemic cities is a way to raise knowledge that promotes prevention practices and attitudes in the communities.^{20,a,b}

The present study aimed to describe a participatory educational strategy on knowledge of malaria among primary school teachers.

METHODS

The municipality of Barcelos is located in the state of Amazonas, in northern Brazil, and it is this country's second largest municipality in area. It has 24,567 inhabitants, 55.6% of whom live in rural areas. The municipal seat is situated on the right bank of the Negro River, which is 390 km away from the capital of Amazonas in a straight line and 496 km away by river. It is a highly malaria-endemic area with an annual mean of 5,033 cases in the last five years and a mean annual parasite incidence of 156.4 cases per 1,000 inhabitants.²²

The educational action developed was based on Paulo Freire's ideas, seeking to "problematize" reality.⁹ Actions included group dynamics as a psychosocial intervention resource, according to recommendations by Afonso.¹ The results obtained with the health education process included a project for the development and assessment of an integrated strategy for endemic disease control in this area.

The course had a multidisciplinary and problematizing emphasis and lasted 40 hours. A total of 46 primary and secondary school teachers of the municipal and state school network participated in this course. Simple language and a variety of images were used, including biomedical and social aspects involved in disease transmission and maintenance. The process included workshops and practical classes, where teachers were

instructed about the educational possibilities to include this theme in the school curriculum, with approaches that are adequate for students' different age groups and contextualized in the local reality. Basic aspects of malaria were approached, such as the biology of the parasite and its vectors; identification using magnifying glasses and microscopes; clinical, diagnostic and therapeutic aspects; risk factors; and transmission dynamics. In addition, the following aspects were also approached: methods for the planning of educational and control actions and the role of the *Sistema Único de Saúde* (SUS – Brazilian Unified Health System), the importance of information in schools and communities, health and environmental measures, practices to develop activities with students and the population in the communities, and the preparation of local educational materials and of integrated project models for each participant, which fit the location itself. A (pre-course) questionnaire was applied on the first school day and another (post-course) questionnaire was applied on the last school day, each comprised of 27 open and closed questions. Questionnaires included questions about general health and specific questions about malaria, considering basic disease aspects (clinical symptoms, risk of death, treatment), previous contact with the disease and knowledge of transmission. This instrument enabled the assessment of teachers' previous knowledge of malaria, knowledge of malaria acquired during the course and mastery of the educational practices to work with this theme in the classroom after the educational process. The questionnaires, developed from the assumptions described by Günther,¹¹ were previously validated with a group of local teachers, who had the same profile. These questionnaires were characterized by their simple language, adapted to the local reality and including words used colloquially in the area.

In the statistical analysis, data were stored using EpiInfo software, version 6.0. Student's t-test was used to compare the measures of continuous variables between two series of data with GraphPad Prism, version 4.0 for Windows. χ^2 statistical test was used for the association tests. Yates correction was applied when the expected values were lower than five. In all analyses, a 5% significance level was adopted. Open responses were analyzed with a qualitative approach.⁴ Teachers' responses to open questions were categorized into units (words or sentences) that repeated themselves, seeking to interpret the meanings included in the materials collected to obtain the true meaning.^{5,6,20} Thematic analysis was used in this study. This is one of the content analysis categories, comprised of the

^a Jotta, LACV, Carneiro MHS. Malária: as imagens utilizadas em livros didáticos de biologia. In: Atas do 7 Encontro Nacional de Pesquisa em Educação em Ciências (ENPEC); 2009 [cited 2010 Nov 20] Available from: <http://www.fae.ufmg.br/abrapec/viempec/7enpec/pdfs/303.pdf>

^b Schall VT, Massara CL. Esquistossomose como tema gerador: uma experiência de educação em saúde no município de Jaboticatubas - Minas Gerais. In: Ministério da Saúde; Organização Pan-Americana da Saúde. Escolas promotoras de saúde: experiências do Brasil. Brasília (DF); 2006. v. 6, p. 205-16. (Série Promoção da Saúde, 6).

following stages: pre-analysis, material exploration and treatment of results and interpretation.^{4,15} After reading the responses, analytical categories were identified.

The study was approved by the Human Research Ethics Committee of the *Fundação de Medicina Tropical do Amazonas* (State of Amazonas Tropical Medicine Foundation – process 2939/2008). On the first course day, all teachers were adequately informed about the research objectives and they signed an informed consent form for participation, recording and dissemination of images.

RESULTS

Of the 46 teachers who participated in the course, 14 (30.4%) were women and 32 (69.6%) were men. Participants were aged between 18 and 52 years, with a mean age of 29 years. The median of time working as a teacher was three years; four (8.7%) participants reported not having experience, because they had just been hired; five individuals (10.8%) had more than 20 years of experience in teaching.

Of all teachers, 39 (84.8%) worked in the rural area and seven in the urban area (15.2%); 45.7% of them (21/46) worked in multi-grade classes of primary education (from the first to the fourth grades); 19.6% (9/46) in the first grade of primary education; 6.5% (3/46) in preschool; 4.3% (2/46) in the second grade, third and fifth grades of primary education; and 10.9% (5/46) did not know this information, because they were in the process of being hired at the moment of the course.

A total of 18 (31%) teachers had previously received training in health education, of which seven (7/18, 38.9%) participated in courses on sexually transmitted diseases and AIDS, and five (5/18, 29.4%) on malaria.

With regard to general knowledge of health and school performance in disease prevention, teachers were asked an open-ended question about the definition of health; before the course, there were seven answers in blank; after the course, five. The most frequent responses before the course were more general and associated with a concept of lack of disease or well-being, reproducing the concepts promoted by the World Health Organization (WHO) in a limited way: health as the absence of disease – “Health is not to be infected by diseases”; health as a possibility/willingness to act – “Health is willingness to do all activities: work, leisure, friends”; and health as an expression of feelings – “Health is to be happy and to have no concerns”.

By comparing pre-course and post-course responses, a change in the statements of certain teachers can be observed, showing that prevention was more valued: “Health is to be at peace with life and to have good information about disease prevention”; “Health is to

care for yourself physically and mentally, to have love and to prevent diseases”. In addition, after the course, ideas associating health and social, intellectual and spiritual well-being were more frequent, referring to the importance of a healthy environment, higher value of knowledge and information, and responsibility for the well-being of all: “Health is to have access to society, being aware of health problems to help oneself and others”; “Health is to care for your body and to care for the health of the population, fighting for the well-being of all”. In addition, participants reported hygiene and food care practices: “To be healthy is to be clean, that is, to be hygienic”. It means to care for aspects such as cooking food well, washing fruits, and not walking barefoot”. Although general concepts of well-being remained, some responses suggested that the reflections made during the course could have contributed to the broadening of the concept of health and, especially, to ideas about prevention, humanization and exercise of citizenship rights, as observed in the following report: “Health is to care for the environment where we live, it is to demand that the government provide basic sanitation, employment and housing, among other things”.

The 52 responses to the question “how can the school contribute to health?” also showed changes before and after the course, thus suggesting the effect of reflection promoted in the classes. This reflection was based on texts and activities present in the course, with an emphasis on Health Promoting Schools. Before the course, seven blank responses and one “I don’t know” response were recorded, whereas there were only two blank responses after the course. The greater emphasis observed in eight responses given before the course was on the recommendation for lectures as a means of health information in the school, some of which would be given by health professionals, thus delegating this role to participants from outside of the school: “By having lectures with people who understand about diseases”; “In the countryside, teachers have to bring primary health agents to give information about diseases”. In addition, “to transmit” and “to pass on” (knowledge) were verbs present in the pre-course responses: “By passing on the content to the students, who take this to their families”; “By transmitting knowledge of this disease to other people who don’t have such knowledge”. Some responses referred to preventing diseases and valuing community actions: “Schools have a key role so that, in the future, students learn about certain diseases and the ways to prevent them”.

After the course, although lectures continued to be mentioned, other alternatives were reported, such as: organizing theater plays, telling stories, forming mutual-aid groups, handing out pamphlets, using booklets and posters, holding meetings, and developing health education projects. These actions were present in the workshops of the course and included in the

Table 1. Assessment of knowledge of malaria before and after the course of primary and secondary school teachers. Municipality of Barcelos, Northern Brazil, 2008.

Question	Before the course (%)	After the course (%)	p-value
Have you ever heard of malaria?			
Yes	100	100	
No	0	0	
Where did you find information about malaria?			
FUNASA	31,0	17,4	0,1425
Doctor	0,0	2,2	na
Health agent	10,3	4,3	0,4316*
School	1,7	2,2	0,4846*
Relative/friend	3,4	0	0,4746*
Manual/booklet	1,7	8,7	0,3577*
Means of communication	1,7	0	na
Several of the above	48,3	65,2	0,0046
Symptoms associated with malaria (chills, fever, sweating)			
Correct response	48,3	82,6	0,00046
Incomplete response	36,2	17,4	0,0349
Incorrect response	13,8	0	0,0347*
Did not respond	1,7	0	na
Ways of transmission			
Correct response	50,0	73,3	0,0181
Incomplete response	25,9	15,6	0,1978
Incorrect response	24,1	11,1	0,0988
Ways to prevent malaria			
Correct response	19,0	69,6	0,000001
Incomplete response	24,1	15,2	0,2931
Incorrect response	44,8	15,2	0,0015
Did not respond	12,1	0	0,0347*
Is there a cure for malaria?			
Yes	84,5	100	0,0183*
No	6,9	0	0,2403*
Does not know	8,6	0	0,1251*
Can someone die from malaria?			
Yes	91,4	97,8	0,3576*
No	1,7	2,2	0,4746*
Does not know	6,9	0	0,2403*
Do you know the <i>Anopheles</i> mosquito?			
Yes	94,3	97,7	0,6091*
No	5,7	2,3	0,6091*
Does the <i>Anopheles</i> mosquito cause any problems?			
Yes	61,4	94,6	0,000005
No	5,3	5,4	0,6091*
Did not respond	33,3	0	0,00023
What problems can the <i>Anopheles</i> mosquito cause?			
Malaria	29,8	76,5	0,00011
Other complications	17,7	23,4	0,4397

* χ^2 with Yates correction.

na: does not apply

FUNASA: *Fundação Nacional de Saúde* (National Health Foundation)

responses: “People in schools can and should organize themselves and be united so that, as a group, they can create projects to fight this disease”; “Schools can contribute with lectures, theater plays, and story-telling inside their facilities and in the community”. In addition, after the course, the words “information”, “awareness”, “sensitization” and “partnerships” also appeared: “By sensitizing the community with lectures, booklets and posters to prevent these diseases, apart from health education”. The question about the contribution of the teacher’s role to health showed changes. Before the course, there were short responses such as “To guide”, “To be the mediator”, and “To encourage”. After the course, short responses were as follows: “To raise people’s awareness in the community”; “To contribute by playing your role as an educator”. Broader ideas that emphasize the educator’s social role appear after the course, such as: “To contribute to my students’ critical and participatory education, so they can take advantage of modern society and perform in it in a critical and responsible way”. Furthermore, after the course, prevention was frequently mentioned: “To inform and to prepare important prevention partners”; “To make students acquire knowledge and put it into practice in their daily lives”; “To sensitize the population at risk to how they can prevent such diseases”.

Before the course, teachers expressed short concepts such as teaching, explaining, acting, guiding, clarifying and promoting lectures, restricting themselves to the classroom and transmission of contents about hygiene, health, diseases and prevention. After the course, however, there was greater empowerment of the function of the teacher not only in the classroom, but also as part of society, with new attributions such as: “To be someone who transmits knowledge”; “To prepare individuals for society”; “To pass on the knowledge received in courses to the community in which one works”; “To take themes seriously and work with an interdisciplinary approach”. One response showed a more elaborate position, reflecting the emphasis discussed throughout the course: “To prepare critical citizens who are capable of performing in modern society. To collaborate with other institutions so that the school education is also directed towards key current points, to know the local reality from the beginning, and participates in it”.

With regard to knowledge of malaria, all teachers had previously heard of this disease, although only 48.3% of them correctly identified its three typical symptoms (chills, fever and sweating) before the course; 82.6% ($p=0.00046$) could give correct responses after the course (Table 1). When assessing transmission mechanisms, 50% and 73.3% gave correct responses before and after the course respectively ($p=0.0181$). Among previous concepts, incorrect ideas were mainly associated with dengue virus transmission mechanisms (Table 2).

Table 2. Previous concepts about the ways of transmission/prevention of malaria among primary and secondary school teachers. Municipality of Barcelos, Northern Brazil, 2008.

Transmission	Prevention
Still water	Eliminating still water from flower pots, tires and sewage
“Bacteria” from the <i>carapanã</i> mosquito	Caring for the environment where one lives
Staying near still-water streams	Not leaving containers that hold water with the top side up
Water and foods that are not fit for human consumption	Spraying rivers with insecticides
Dengue mosquito bite	Preventing garbage accumulation
<i>Carapanã</i> mosquito bites and transmits the virus	Keeping the home clean
	Taking malaria medicine
	Seeking a health clinic
	Taking medicine to do the thick-smear
	There is no way to avoid it

In terms of malaria prevention measures, 19% and 69.6% gave correct responses before and after the course respectively ($p=0.000001$) (Table 1). The main incorrect concepts found before the course were those about dengue fever prevention (how to prevent water from accumulating in flower pots, tires and sewage, and how to prevent garbage accumulation near houses) and patient diagnostic and treatment actions (Table 2). However, after the course, there were more complete ideas of prevention, revealing the construction of new knowledge: “Cleaning the areas that promote the spread of malaria focus, putting mosquito nets in the houses, avoiding exposure during the times when mosquitoes transmit the disease”; “Using mosquito nets and avoiding exposure during the times that mosquitoes bite”; “Not staying close to streams and rivers between 6.00 and 7.00pm”; “Sleeping under a mosquito net”.

With regard to knowledge of the vector mosquito, the majority of teachers (94.3% and 97.7% before and after the course, respectively) answered that they knew the *muriçoca* or *carapanã* (local names to describe the *Anopheles* mosquito); however, before the course, 61.4% mentioned that this mosquito caused a disease, a figure that rose to 94.6% after the course ($p=0.000005$). Before the course, only 29.8% of teachers associated the vector with malaria transmission, while knowledge of this fact increased to 76.5% after the course ($p=0.00011$) (Table 1). After the course, some teachers showed that they had learned the scientific name of the mosquito, used the word vector and associated the female mosquito bite with transmission.

DISCUSSION

Although the municipality of Barcelos is a highly endemic area for malaria, teachers had little information about transmission mechanisms, vectors and means of prevention. This is a concerning fact, because teachers can disseminate incorrect or inadequate information to their students, thus having repercussions for the development of an educational strategy with actions aimed at schools.¹⁶ Our research group has shown that the school, despite its being an important space – and at times the only one – of knowledge construction in endemic rural areas, is not fulfilling this key role.^c New educational practices are required, with the production of educational materials that are adequate for the physical, social and cultural environment of these populations.^b A study on images^a found in school biology books that are associated with malaria reveals language complexity and errors that could promote memorization, rather than learning. In the present study, authors suggest that books should mention that “mosquitoes” are also locally known as “*pernilongo*”, “*muriçoca*” and “*carapanã*”, a fact which is not included in the majority of texts analyzed, emphasizing the need for teacher training and continuing education processes. Researchers in this study believe in intersectoral partnerships (health, education and environment) to produce materials adapted to each reality.

Results of this study are similar to those found in the general population of Colombia¹³ and Mexico.²¹ Studies conducted by Lipowsky et al¹³ (1992) and Rodriguez et al²¹ (2003) also refer to inadequate educational processes, because knowledge is not contextualized in the local reality. This type of knowledge does not lead to prevention practices and these authors emphasize the need for more studies that can result in the understanding of behavioral factors of the populations exposed to malaria, aiming at greater adequacy of control interventions. A study conducted in the Colombian Amazon revealed that individuals may even know about the etiology, symptoms and treatment of malaria, but they do not put control actions into practice.¹⁹ Similar results were found in highly endemic areas in Africa^{8,12} and Asia.¹⁷

In the specific case of malaria, among hundreds of articles available in the SciELO online database, there were two including educational intervention results. One of them assessed the promising strategy known as “*El mundo de la malaria*” (The malaria world), which combined environmental and educational interventions to improve knowledge and promote disease prevention behavior changes, resulting in social mobilization and community participation in

health promotion, especially in rural areas.² Results were encouraging, with an increase in knowledge and adherence to the use of mosquito nets impregnated with pyrethroids and adequate treatment. In another study, authors observed that there was not only an increase in knowledge and prevention practices, but also a 25% reduction in the number of new malaria cases in the group that participated in the educational process, as opposed to 17% in the control group, six years after the intervention.³

In the present study, the increase in knowledge and reflections on the role of teachers in the dissemination of knowledge reveals the importance of their qualification improvement processes. This requires continuing education actions^{2,3,17} in the sense of prevention practice dissemination and mobilization of students and their families in the disease control process. As observed in the post-course results, although there has been an increase in the scope of more interactive and participatory practices and concepts, the responses of some teachers reveal the persistence of a type of education based on knowledge transmission, rather than the joint construction of this knowledge using activities such as workshops, meetings, interactive projects and field visits with the students. These activities were emphasized and practiced throughout the course as relevant for a type of education which is contextualized and committed to health promotion. There is the need to replace the prescriptive approach of lectures for more participatory practices, such as workshops performed with the school community, thus gathering scientific and folk knowledge. Such observation indicates the need for greater investment in educational processes for teachers, so that their role in health education is increased, with a closer relationship between knowledge and practice and greater critical understanding of reality.

Continuous work is key for teachers to disseminate the knowledge they have acquired in the educational interventions and, thus, to promote their commitment and that of their students and their students' families to health promotion and endemic disease prevention practices and attitudes.¹⁴ In highly endemic areas for malaria, the inclusion of malaria studies in the school curriculum is recommended, with practices and contents adapted to the local reality. An integrated strategy to control malaria must take into consideration the importance of the educational sector as a source of knowledge to bring about attitudes and practices that are adequate for malaria prevention and control. The *Estratégia de Escolas Promotoras de Saúde* (Health-Promoting School Strategy), which appeared in the late 1980s,

^c Cardozo-Trujillo KY. Conhecimentos sobre malária entre moradores de uma zona altamente endêmica do município de Barcelos, estado de Amazonas, Brasil [monografia para obter o título de especialista em Ensino em Biociências e Saúde]. Rio de Janeiro: Fiocruz, Instituto Oswaldo Cruz; 2010.

can provide important resources for more dialogical practices. The reason for this is that health promotion is viewed as a comprehensive approach, comprised of the following three interrelated components: health education, including the development of abilities for life; creation and maintenance of healthy environments; and the offer of healthcare services, food and a healthy life.^d

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^d Ministério da Saúde; Organização Pan-Americana da Saúde. Escolas promotoras de saúde: experiências no Brasil. Brasília (DF); 2007. (Série Promoção da Saúde, 6).

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