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ORIGINAL

Educational intervention for the reduction of intestinal parasitism in children under 5 years of age. Belize City, 2021

Intervención educativa para la reducción del parasitismo intestinal en niños menores de 5 años. Ciudad de Belice, 2021

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ABSTRACT

Introduction: intestinal parasitism represents a serious health problem worldwide, affecting both developed and underdeveloped countries, with more than one billion people infected by various types of parasites.
Method: the study focused on improving knowledge of parasitic diseases in mothers of children under five years of age through an educational program in a public clinic in Belize. A baseline survey was conducted, education was implemented, knowledge was reassessed, and participants' confidentiality and informed consent were guaranteed.
Results and discussion: the educational intervention significantly improved their knowledge of intestinal parasitosis, increasing from 77,5 % to 95 % in key areas. This highlights the effectiveness of educational interventions in health promotion.
Conclusions: most of the mothers in the sample were between 20 and 29 years old with high school education, and initially had limited knowledge about intestinal parasites, but after the educational intervention, their understanding in all topics assessed improved significantly, demonstrating the effectiveness of the program.

Keywords: Early Educational Intervention; Parasitic Diseases; Adolescent Mothers.

RESUMEN

Introducción: el parasitismo intestinal representa un grave problema de salud a nivel mundial, afectando tanto a países desarrollados como subdesarrollados, con más de mil millones de personas infectadas por varios tipos de parásitos.
Método: el estudio se centró en mejorar el conocimiento sobre enfermedades parasitarias en madres de niños menores de cinco años mediante un programa educativo en una clínica pública de Belice. Se realizó una encuesta inicial, se implementó la educación, se evaluaron los conocimientos nuevamente y se garantizó la confidencialidad y el consentimiento informado de los participantes.
Resultados y discusión: la intervención educativa mejoró significativamente su conocimiento sobre parasitosis intestinales, aumentando del 77,5 % al 95 % en áreas clave. Esto resalta la eficacia de las intervenciones educativas en la promoción de la salud.
Conclusiones: la mayoría de las madres en la muestra tenían entre 20 y 29 años con educación secundaria, y al principio tenían un conocimiento limitado sobre parásitos intestinales, pero después de la intervención educativa, su comprensión en todos los temas evaluados mejoró significativamente, demostrando la eficacia del programa.

Palabras clave: Intervención Educativa Precoz; Enfermedades Parasitarias; Madres Adolescentes.

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INTRODUCTION

Intestinal parasitism is currently a serious medical and social problem, affecting not only underdeveloped countries, but also the most developed ones. The World Health Organization (WHO) estimated that 750 million episodes of intestinal parasitism occur annually in underdeveloped countries, mainly affecting the child population worldwide; it is estimated that it contributes the largest number of infected people among the more than 1 billion people who are infected by helminths every year.[1]

Parasitism has been known since such remote times that thousands of years before our era there were already real notions of tapeworms, filariae and intestinal worms, which was precisely the reason why the worm was chosen as a symbol of disease; a concept that spread widely throughout the world.[2] A parasite is considered to be any living being, animal or plant, that spends part or all of its existence inside another living being, at the expense of which it nourishes itself, and causes apparent or inapparent damage. Parasitic diseases are responsible for considerable morbidity worldwide; they often present with non-specific symptoms and high prevalence rates. Ascariasis, trichocephalosis, giardiasis, and amebiasis are among the ten most common infections observed worldwide.[3]

Currently, authors prefer to replace the terminology of intestinal parasitism with that of diseases caused by protozoa and helminths. In general, these diseases have low mortality, but they also cause important health and social problems due to their symptoms and complications.[4]

In general terms, it is considered that today there are 1110 million people in the world population infected by cestodes, 240 million by trematodes and 3240 million by nematodes; infections by protozoa are not far behind, with an estimated 480 million people suffering from amebiasis and around 280 million from giardiasis, the latter being considered the most frequent intestinal disease caused by protozoa in underdeveloped countries, causing significant morbidity, mainly affecting children between the ages of one and five years.[5] The high prevalence worldwide and its effects on the nutritional status and immunity of populations, particularly those living in tropical and subtropical areas, make intestinal parasite infections a major health problem.[6]

In Latin America, multiple investigations related to intestinal parasitism have been carried out, mainly in rural areas. In countries such as Colombia, Venezuela, Guatemala, Brazil and Haiti, the relationship between intestinal parasitism and the poor socioeconomic conditions in which rural populations live has been observed, with a higher incidence of protozoa followed by helminths. Nutritional complications appeared to be closely linked to the presence of intestinal parasites.[7,8]

WHO has led to the establishment of control programs for intestinal parasitosis, as most infections are endemic to poor countries, permanent control will only be feasible where improvements in water supplies and sanitary conditions are supplemented by health education. It is a long term concept, this type of permanent control of transmission can only be achieved with the improvement of living conditions that can be achieved with economic development.[9]

In the 21st century, intestinal parasitosis continues to be a major health problem in the world. Intestinal parasitism is one of the most widespread health problems due to the number of people affected (three quarters of the world's population according to WHO).[10]

Intestinal parasitism is one of the most difficult communicable diseases to control, not only because of its widespread dissemination, but also because of the various factors involved in its chain of propagation. The socioeconomic conditions of many areas of the planet contribute to this great dissemination; the lack of sanitary measures, the level of poverty, the abandonment in which great masses of the population find themselves, the air and maritime communications that in spite of the technological advances facilitate contamination to countries in which there is development and adequate hygienic-sanitary measures, which have seen parasitism appear in an increasing form in their population.[11,12]

Parasitic infections and diseases are a major health problem in most Latin American countries, due to their frequency, the diagnostic and therapeutic problems they pose and, sometimes, their severity. Polyparasitism is frequent and from the second year of life of the child, infections with three and four species of protozoa abound. The intensity of the infection aggravates this situation. Studies carried out in rural regions of Central America, using egg counting techniques, show high percentages of children with severe infections by Ascaris, Trichocephalus and Uncinaria, in terms of concentration of eggs per gram of feces.[13]

In Belize, it is estimated that 45 % of children in urban areas and 90 % of children in rural areas are infected by intestinal parasites, favored by factors such as overcrowding, poor hygienic-sanitary and socioeconomic conditions, and poor eating habits. There are experiences that indicate that educational intervention at the population level, aimed at modifying knowledge, attitudes and habits, tends to reduce risk factors and diseases or negative consequences due to lack of knowledge.[14]

In these communities, health education becomes the best tool for health personnel, since, in order to change risk behaviors, it is first necessary to improve the level of information. When applied in the form of an educational program, it also achieves greater involvement of local leaders and the affected population, and can be adapted to the characteristics and needs of the personnel on whom it is necessary to act, taking into account their culture and limitations. There are experiences that indicate that educational intervention at the population level, aimed at modifying knowledge, attitudes and habits, tends to reduce risk factors and diseases or negative consequences due to lack of knowledge.[13,15]

The objective of this study is to evaluate the effectiveness of an educational intervention on intestinal parasitism in mothers of children under five years of age in a public clinic in suburban Belmopan, Belize.

METHOD

An educational intervention study was conducted with the objective of evaluating the effectiveness of this method in increasing knowledge of parasitic diseases in mothers of children under 5 years of age in a public clinic in the suburban area of Belmopan, Belize between the months of January to June 2021.

The universe consisted of 72 mothers or guardians of children under 5 years of age who visited the outpatient clinic for diarrhea

or abdominal pain; a sample of 40 were selected by simple random sampling using the lottery method. Two groups of 20 members each were formed, which made it possible to work on the basis of the focus group technique.

Inclusion criteria: all mothers or guardians who gave their consent to participate in the project.

Exclusion criteria: mothers or guardians with mental disabilities, illiteracy and/or language barriers.

Study exit criteria: absence from more than one of the scheduled meetings.

The research was subdivided into three stages: Diagnosis, Intervention and Final Evaluation.

Diagnostic Stage

For the first stage of the study, the mothers were informed of the characteristics of the study and their participation was requested and validated by means of a signed document (annex 1).

Subsequently, a questionnaire (annex # 2) was applied in the first meeting to characterize the study group and identify the level of knowledge and attitudes they had on the subject, which allowed to define the topics to be taught taking into account the

The knowledge variable is defined as follows:

Risk Factors

- Adequate: those who select 3 or more items correctly.
- Inadequate: those who select less than 3 items correctly.

Clinical manifestations (symptoms and signs of the disease).

Transmission routes:

- Adequate: those who select 3 or more items correctly.
- Inadequate: those who select less than 3 items correctly.

Prevention:

- Adequate: those who select 4 or more items correctly.
- Inadequate: those who select less than 4 items correctly.

Actions to take in case of intestinal parasitism episode:

- Adequate: when both items are correctly selected.
- Inadequate: any other possibility.

Complications of the disease:

- Adequate: those who select 2 or more items correctly.
- Inadequate: those who select less than 2 items correctly.

The survey consists of a total of 7 questions. The qualitative evaluation of each question determines the final result of the survey, which is detailed below:

- Adequate: 4 or more questions answered adequately.
- Inadequate: Less than 4 questions answered adequately.

Intervention stage

An educational program on the subject, designed according to the needs found after the application of the survey, was given. For the application of the educational program, different schedules were considered on the same day for the two groups of participants, which allowed working on the basis of the focus group technique. Each group received a total of 6 activities not exceeding 45 minutes each, on a weekly basis, using different techniques to achieve the proposed objectives, including: motivational expectation, video debate, dramatization, group discussion, demonstration and educational talks.

Evaluation stage

The same survey was applied after the educational program, which was evaluated in the same way and allowed to determine the variation in the level of knowledge on the subject after the intervention and finally a last meeting was held to evacuate the doubts.

To collect information on knowledge before and after the training, the questionnaire was applied, which also served as an evaluation to check the quality of its preparation. In addition, information on interests and motivations was obtained through the focus group technique. The questionnaire was evaluated by themes, where two possibilities were always established: correct or incorrect. Two initial questions were asked to obtain general data.

The information was processed manually using a calculator and a PC. The texts were processed with Microsoft Word and the tables and graphs were made with Microsoft Excel. During the statistical analysis, the percentage was used as a summary measure for the qualitative variables. The results were presented in double-entry tables; for their better interpretation and use, the Microsoft Office 2016 Excel program was used.

The results were analyzed and discussed by means of comparisons and analysis of statistical techniques that allowed the proposed objectives to be achieved and conclusions and recommendations to be drawn.

The survey carried out as part of this study was conducted with a rigorous ethical approach at all stages. The confidentiality of

the information collected was guaranteed, ensuring that participants had the option of providing their responses anonymously. In addition, informed consent was obtained from all participants prior to data collection, clearly explaining the purpose of the survey and ensuring that their participation was voluntary. During the data analysis process, confidentiality of personal information was maintained and techniques were used in a responsible and respectful manner. Ethics was a fundamental pillar in conducting this survey, thus guaranteeing the integrity of academic research.

RESULTS AND DISCUSSION

Adequate characterization of the universe with which we work is indispensable in good research; in the case of educational interventions we must always comply with this principle, since it is not possible to influence a group of people if we do not have a thorough knowledge of their characteristics.

There is a predominance of mothers between 20 and 29 years of age, representing 57,5 % of the sample. This is followed by the group under 20 years of age with 27,5 % and the group over 30 years of age with 15 %. The under 20s account for 11 mothers; pregnancy during the adolescent stage is frequent. In the developing countries of Central America and the Caribbean, the possibilities for women to study and improve their education are limited, which is why the average age of first birth is lower than in those countries where young women have better educational and work prospects.[16,17]

The predominant level of schooling among the cases under study is Primary school not completed with 37,5 %, followed in order of frequency by Primary school completed with 35 %. Then we have the groups Secondary or Basic with 15 %, Pre-university or Baccalaureate with 140 % and University with 2,5 %. The capacity to assimilate knowledge is closely related to the educational preparation of individuals, hence the application of any pedagogical tool must be preceded by an analysis of these characteristics to facilitate that the information reaches everyone equally.[18,19,20]

The composition of the selected sample allowed the application of a questionnaire with the most important aspects of each of the topics. In the following, we show how our research influenced the mothers' knowledge about intestinal parasitosis.

Table 1. Area of knowledge evaluated in the survey

Area of knowledge evaluated		Formerly		Then	
		N	%	N	%
Knowledge of risk factors	Correct	2	5	31	77,5
	Incorrect	38	95	9	22,5
Clinical knowledge	Correct	8	2	34	85
	Incorrect	32	80	6	15
Knowledge of transmission routes	Correct	4	10	37	92,5
	Incorrect	36	80	3	7,5
Knowledge of prevention measures	Correct	6	15	38	95
	Incorrect	34	85	2	5
Knowledge of actions to be taken	Correct	1	2,5	34	85
	Incorrect	39	97,5	6	15
Knowledge of complications	Correct	5	12	32	80
	Incorrect	35	87,5	8	10
Overall evaluation	Correct	4	10	38	95
	Incorrect	36	90	2	5

Source: survey.

For mothers, knowing what aspects can favor the appearance of intestinal parasitism is of vital importance in the management of their children. The lack of adequate programs determines the ignorance of the elementary rules of personal and collective hygiene. It is considered that poor information about this aspect influences the high prevalence of the disease in this area, since only 5 % of the respondents were able to correctly identify the risk factors. With the application of this educational intervention, it became evident that there is a need for more information about this important topic, since at the end of the intervention, 77,5 % of the mothers were able to adequately determine the risk factors for intestinal parasitism. Only 4 of the respondents had unsatisfactory final results, related to the level of schooling, since 3 of them did not finish elementary school.

The least recognized risk factors when applying the initial survey were contamination of water with residual waste (12,5 %) and introduction of formula milk before 4 months of age (10 %). At the end of the study, 72,5 % and 70 %, respectively, were able to identify them. Another aspect that varied considerably was the identification of non-use of footwear as a risk factor. Chin in an investigation found that there are problems in the identification of risk factors for intestinal parasitism.[21]

Avila Labrada eta al, in a study conducted in a similar group, found that such important factors as hand washing after defecation and the non-use of footwear were unknown to the vast majority of respondents.[22]

The clinical manifestations of intestinal parasitism are very varied, ranging from inapparent forms to polysymptomatic pictures where abdominal pain and diarrhea stand out as the most frequent symptoms.[23,24] At the beginning of the study it was found that only 20 % of the mothers were able to recognize them. At a second stage, when the final questionnaire was applied, 85 % were able

to point them out correctly.

Despite the fact that probably none of their children have been exempt from having suffered from intestinal parasitism at least once, the vast majority of the mothers did not know how to adequately identify the main symptoms of this disease. After the intervention, a significantly high number were able to identify the fundamental clinical manifestations, such as diarrhea and abdominal pain, which demonstrates the educational need present in this group and the assimilation of the knowledge imparted on the subject.

Conti, in a study conducted in Palmares de Quebracho, Uruguay, found difficulty in recognizing the basic clinical manifestations of intestinal parasitism before carrying out an educational intervention, which raised the level of knowledge of the population studied on the subject.[25]

Similar studies achieved a significant increase in the level of knowledge about the topic after the intervention, which shows the effectiveness of these investigations.[26,27,28]

In order to reduce the incidence of intestinal parasitism, knowledge of the routes of transmission is very important. At the beginning of the survey, only 10 % of the respondents knew how to identify them correctly, coinciding with other studies carried out in Latin America where the authors found that many women did not adequately recognize the way in which their children could acquire parasitosis, which had a negative impact on the health of the infants as they were exposed to risk situations; this changed after applying the educational program to 92,5 %.[29]

Specifically, at the beginning, 7,5 % were able to point to contaminated water and food as a source of infection, while more than half considered the sexual route to be fundamental in transmission. Likewise, only two mothers considered the possibility of infection through the skin of the hands and feet to be correct; after the intervention it was found that 92,5 % eradicated this difficulty and none considered the sexual route to be fundamental in transmission.

The main routes of transmission of intestinal parasitism are fecal-oral, direct and telluric, which should be known by the entire population.

The hygienic quality of drinking water is a determining factor in the transmission of parasitic diseases; therefore, it is necessary to monitor its sanitary quality, origin, storage conditions, treatment method and handling. In the population under study, approximately 72 % of the population consumes tap or non-drinking water.

It is necessary to educate parents about the routes of transmission of intestinal parasitism, and doctors and nurses at health posts play an important role in this regard.

Notwithstanding the numerous efforts aimed at raising this knowledge in the population, we were able to confirm in our survey that only 4 mothers were aware of these pathways; at the end of the intervention, only 3 were unable to recognize them. This shows that this type of educational intervention contributes to raising the level of knowledge of the population in diseases as frequent as intestinal parasitism in which the patients themselves play an active role in the health-disease process.

The mastery and correct application of preventive measures is one of the fundamental pillars that determine a decrease in the frequency of the appearance of parasitic diseases, which is why this aspect is included in the research. Initially, only 15 % of the women managed these measures adequately, and at the end of the intervention this figure rose to 95 %, which positively demonstrated the knowledge acquired. Only 2 of them maintained inadequate knowledge before and after the intervention. At the beginning, only 4 mothers considered washing raw food to be important in the prevention of intestinal parasitism, an aspect that varied to 97,5 % once the program was concluded. Similarly, maintaining exclusive breastfeeding until the sixth month and avoiding open fecalism were considered at the beginning by only 12,5 % and 15 %, respectively, while in the second application of the survey these values rose to 97,5 % and 100 %, respectively.

Despite receiving the program provided, six of the respondents answered the final survey incorrectly. It should be noted that more than three quarters of the respondents considered at the beginning that self-medication and infusions without prescription were adequate measures in the case of suspected intestinal parasitism in their children. This situation varied considerably, as only 2,5 % and 5 %, respectively, continued with the same criteria at the end of the intervention.

In his research, Quedena Zapata found that there is a high tendency to indiscriminate and unprescribed use of antiparasitic drugs, which, far from being an appropriate behavior, leads to the appearance of complications such as chronic diarrhea and malnutrition.[30]

The high frequency of intestinal parasitism and its late diagnosis determine that many patients present complications typical of these entities. Therefore, it was necessary to determine the mothers' knowledge about them. Only 12,5 % knew about it, a figure that improved to 80 % after the program was given.

When analyzing the results of the qualitative evaluation of the survey at the beginning and at the end of the educational program, it was observed that initially only 10 % were evaluated as adequate, a figure that rose to 95 % at the end of the study. These results show the effectiveness of this type of program and the need for its implementation in order to increase the level of knowledge of the population about intestinal parasitism and thus reduce its incidence.

The above results coincide with those obtained by other authors on the usefulness of educational methods for groups in the prevention of parasitic diseases.[26,27,28]

The topics related to intestinal parasitosis are generally simple and practical, so they could be adequately handled by most of the mothers. The good results obtained with the application of the intervention encourage us to think that this acquired knowledge will lay the foundations to create favorable behaviors and habits, with the possibility of incorporating them to their daily life style and the consequent decrease of those behaviors of risk for health in order to obtain a better quality of life for the individual, the family and the community.

CONCLUSIONS

- The sample consisted predominantly of mothers between 20 and 29 years of age with secondary schooling.
- There was a marked lack of knowledge among the respondents about the routes of transmission of parasites, risk factors, clinical manifestations, main complications, prevention and actions to be taken in case of suspicion of parasitic disease in their children.
- A significant improvement in the level of knowledge was achieved in all the topics evaluated after the educational program was applied, which evidences the effectiveness of the program in the group studied.

RECOMMENDATIONS

- Continue to develop educational programs with mothers, aimed at modifying knowledge and attitudes about intestinal parasitism and other communicable diseases.
- Encourage promotion and prevention efforts that involve the family, the community and society in the fight against communicable diseases.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORSHIP CONTRIBUTION

Conceptualization: Yolanda Price, Sharon Gillett, Gloria Lennen.
Research: Yolanda Price, Sharon Gillett, Gloria Lennen.
Methodology: Yolanda Price, Sharon Gillett, Gloria Lennen.
Project management: Yolanda Price, Sharon Gillett, Gloria Lennen.
Original draft-writer: Yolanda Price, Sharon Gillett, Gloria Lennen.
Writing, proofreading and editing: Yolanda Price, Sharon Gillett, Gloria Lennen.

BIBLIOGRAPHIC REFERENCES

1. Frigerio S, Bert F, Clari M, Di Fine G, Riva S, Bergese I, et al. Knowledge, Attitudes, and Practices Related to Schistosomiasis Among Children in Northern Senegal. Ann Glob Health 2016;82:840-7. https://doi.org/10.1016/j.aogh.2016.10.002.

2. Jung EM, Kim EM, Kang M, Goldizen F, Gore F, Drisse MNB, et al. Children's Environmental Health Indicators for Low- and Middle-Income Countries in Asia. Ann Glob Health 2017;83:530-40. https://doi.org/10.1016/j.aogh.2017.10.013.

3. Berahmat R, Spotin A, Ahmadpour E, Mahami-Oskouei M, Rezamand A, Aminisani N, et al. Human cryptosporidiosis in Iran: a systematic review and meta-analysis. Parasitol Res 2017;116:1111-28. https://doi.org/10.1007/s00436-017-5376-3.

4. Fatungase KO, Amoran OE, Alausa KO. The effect of health education intervention on the home management of malaria among the caregivers of children aged under 5 years in Ogun State, Nigeria. Eur J Med Res 2012;17:11. https://doi.org/10.1186/2047-783X-17-11.

5. Esu EB, Effa EE, Opie ON, Meremikwu MM. Artemether for severe malaria. Cochrane Database Syst Rev 2019;6:CD010678. https://doi.org/10.1002/14651858.CD010678.pub3.

6. Haghi MM, Etemadifar F, Fakhar M, Teshnizi SH, Soosaraei M, Shokri A, et al. Status of babesiosis among domestic herbivores in Iran: a systematic review and meta-analysis. Parasitol Res 2017;116:1101-9. https://doi.org/10.1007/s00436-016-5368-8.

7. Ramos-Sesma V, Navarro M, Llenas-García J, Gil-Anguita C, Torrus-Tendero D, Wikman-Jorgensen P, et al. Community-based screening of Chagas disease among Latin American migrants in a non-endemic country: an observational study. Infect Dis Poverty 2021;10:117. https://doi.org/10.1186/s40249-021-00897-2.

8. Conterno LO, Turchi MD, Corrêa I, Monteiro de Barros Almeida RA. Anthelmintic drugs for treating ascariasis. Cochrane Database Syst Rev 2020;4:CD010599. https://doi.org/10.1002/14651858.CD010599.pub2.

9. Hill J, Kayentao K, Achieng F, Diarra S, Dellicour S, Diawara SI, et al. Access and use of interventions to prevent and treat malaria among pregnant women in Kenya and Mali: a qualitative study. PloS One 2015;10:e0119848. https://doi.org/10.1371/journal.pone.0119848.

10. Calvopina M, Ortiz-Prado E, Castañeda B, Cueva I, Rodriguez-Hidalgo R, Cooper PJ. Human myiasis in Ecuador. PLoS

Negl Trop Dis 2020;14:e0007858. https://doi.org/10.1371/journal.pntd.0007858.

11. Lu G, Nagbanshi M, Goldau N, Mendes Jorge M, Meissner P, Jahn A, et al. Efficacy and safety of methylene blue in the treatment of malaria: a systematic review. BMC Med 2018;16:59. https://doi.org/10.1186/s12916-018-1045-3.

12. Navel V, Mulliez A, Benoist d'Azy C, Baker JS, Malecaze J, Chiambaretta F, et al. Efficacy of treatments for Demodex blepharitis: A systematic review and meta-analysis. Ocul Surf 2019;17:655-69. https://doi.org/10.1016/j.jtos.2019.06.004.

13. Moshki M, Zamani-Alavijeh F, Mojadam M. Efficacy of Peer Education for Adopting Preventive Behaviors against Head Lice Infestation in Female Elementary School Students: A Randomised Controlled Trial. PloS One 2017;12:e0169361. https://doi.org/10.1371/journal.pone.0169361.

14. Gutman J, Kovacs S, Dorsey G, Stergachis A, Ter Kuile FO. Safety, tolerability, and efficacy of repeated doses of dihydroartemisinin-piperaquine for prevention and treatment of malaria: a systematic review and meta-analysis. Lancet Infect Dis 2017;17:184-93. https://doi.org/10.1016/S1473-3099(16)30378-4.

15. Firestone R, Rowe CJ, Modi SN, Sievers D. The effectiveness of social marketing in global health: a systematic review. Health Policy Plan 2017;32:110-24. https://doi.org/10.1093/heapol/czw088.

16. Luttges C, Leal I, Huepe G, González D, González E, Molina T. Pregnant again? Perspectives of adolescent and young mothers who and do not experience a repeat pregnancy in adolescence. Int J Qual Stud Health Well-Being 2021;16:1898317. https://doi.org/10.1080/17482631.2021.1898317.

17. Corder RM, de Lima ACP, Khoury DS, Docken SS, Davenport MP, Ferreira MU. Quantifying and preventing Plasmodium vivax recurrences in primaquine-untreated pregnant women: An observational and modeling study in Brazil. PLoS Negl Trop Dis 2020;14:e0008526. https://doi.org/10.1371/journal.pntd.0008526.

18. Sim V, Galbraith K. Effectiveness of multimedia interventions in the provision of patient education on anticoagulation therapy: A review. Patient Educ Couns 2020;103:2009-17. https://doi.org/10.1016/j.pec.2020.05.003.

19. Carbone ET, Zoellner JM. Nutrition and health literacy: a systematic review to inform nutrition research and practice. J Acad Nutr Diet 2012;112:254-65. https://doi.org/10.1016/j.jada.2011.08.042.

20. Ibarra EM. Conocimiento, práctica y percepción sobre tele-enfermería en Argentina. Salud Cienc Tecnol 2021;1:33. https://doi.org/10.56294/saludcyt202133.

21. Chin YT, Lim YAL, Chong CW, Teh CSJ, Yap IKS, Lee SC, et al. Prevalence and risk factors of intestinal parasitism among two indigenous sub-ethnic groups in Peninsular Malaysia. Infect Dis Poverty 2016;5:77. https://doi.org/10.1186/s40249-016-0168-z.

22. Ávila Labrada M, Usiña Pozo M, Guerra Pompa O, Pulgar Rodríguez R. Intervención educativa para prevenir el parasitismo intestinal en niños de 0 a 9 años. Rev Electrónica Dr Zoilo E Mar Vidaurreta 2015;40.

23. Zuilkowski SS, Jukes MCH. Early childhood malaria prevention and children's patterns of school leaving in the Gambia. Br J Educ Psychol 2014;84:483-501. https://doi.org/10.1111/bjep.12033.

24. Celestino AO, Vieira SCF, Lima PAS, Rodrigues LMCL, Lopes IRS, França CM, et al. Prevalence of intestinal parasitic infections in Brazil: a systematic review. Rev Soc Bras Med Trop 2021;54:e00332021. https://doi.org/10.1590/0037-8682-0033-2021.

25. Conti Diaz IA. Experiencia de Docencia-Investigación sobre enfermedades parasitarias en una población rural: Palmares de Quebracho, Paysandú, 1988-1989. Rev Méd Urug 1982:103-9.

26. Noriega Macareno R, Tuiran Méndez A. Intervención educativa para el control y prevención de parasitosis en niños escolares de los municipios de Sincelejo y San Juan de Betulia, zona urbana y rural 2018. Tesis para obtener el título profesional de Magister en Salud Pública. Universidad de Sucre, 2019.

27. Contreras Franco N, Viteri Paredes J. Intervención de enfermería en la prevención de factores de riesgo de la parasitosis intestinal en niños escolares del recinto "Las Marías", cantón Puebloviejo, Provincia de Los Ríos, mayo- septiembre 2019. Tesis para obtener el título profesional de Licenciatura en Enfermería. Universidad Técnica de Babahoyo, 2019.

28. Torres Campoverde F. Programa para la prevención de parasitosis intestinal en escolares en Centinela del Cóndor, Ecuador.

Tesis para obtener el título profesional de Magister en Salud Pública. Universidad de Navarra, 2018.

29. Vidal-Anzardo M, Yagui Moscoso M, Beltrán Fabian M. Parasitosis intestinal: Helmintos. An Fac Med 2020;81. https://doi.org/10.15381/anales.v81i1.17784.

30. Quedena Zapata MJ. Factores asociados a automedicación con antiparasitarios en niños del C.S. «Comunidad Saludable», Sullana-2017. Tesis para obtener el título profesional de Químico Farmacéutico. Universidad San Pedro, 2020.

ANNEXES

Supplementary Material 1
Informed Consent

Intestinal parasitism is one of the diseases that most affect the population in rural areas, causing the most damage in the pediatric age group. By means of this study we intend to provide an educational program to increase the knowledge that you have on the subject, with which you will not only increase your knowledge, but you will also be able to educate your family members in a more integral environmental health. Hoping that you will cooperate with this research, I ask you to do so by filling out the following form for the legal assurance of your consent.

I hereby acknowledge that I wish to participate in the research proposed by the author: _____ acknowledge that I wish to participate in the research proposed by the author, once I have been explained the objectives of this, and the benefits it will bring, both for my child(ren) and for the community in general. I have also been informed that the nature of the information I provide will be completely confidential, using it only for scientific purposes. I will have the possibility of withdrawing from the research when I deem it convenient without any reprisal.

Once my participation in the study has been accepted, I commit myself to cooperate with my efforts to ensure that the research is adequately developed, I will try to help the author, collaborating with my punctuality and attendance to the activities that are planned here for the sake of the research. And for the record of the above, I sign below:

_____ _____

Participant Researcher

Supplementary Material 2
Questionnaire

1- Mark with an x as appropriate.

1.1 Mother's age:

a) __Under 20 years of age
b) __Between 20 and 29 years old
c) __30 years and over

1.2 Schooling:

a) __Unfinished elementary school
b) __Completed elementary school
c) __Secondary or elementary school
d) __Pre-university or High School
e) __University

2- There are different risk factors for parasitic diseases. Mark with an x the correct ones.

a) __Not washing hands after the act of defecation.
b) __Water and food contamination with residual waste (urine and feces).
c) __The failure to carry out analyses looking for parasites with a certain periodicity.
d) __The introduction of artificial (non-maternal) milk before 4 months of age.
e) __Eating and drinking from domestic utensils (glasses, plates, cutlery) used by parasitized persons.
f) __No use of footwear.
g) __Do not boil drinking water.

3- The clinical manifestations of parasitic diseases are multiple, as well as numerous are the parasites that exist, recognize within these groups of symptoms which can be produced by parasites frequently. Mark with an x as appropriate.

a) __Diarrhea
b) __Absence of symptoms
c) __Sed
d) __Anal squawk
e) __Headache
f) __Irritability
g) __Abdominal pain

4- Given the following statements, say which ones you consider correct, marking the appropriate ones with an x as appropriate:

a) __The most frequent form of transmission of parasites is through contaminated water and food.
b) __Parasites are mainly transmitted sexually.
c) __Parasites are transmitted through venous routes (blood transfusions, serum).
d) __Parasites enter the body through the skin of the hands and feet.
e) __Parasites are transmitted by sleeping with parasitized people.
f) __Parasites are transmitted by mosquito bites.

5- Among the measures used to prevent diseases caused by parasites are some of the following, identify with an x as appropriate.

a) __Boil drinking water.
b) __Correctly wash foods to be consumed raw.
c) __Construct latrines near water reservoirs.

d) __Fumigation of the living area.
e) __Avoid open defecation.
f) __Eliminate micro dumps and landfills.
g) __Maintain exclusive breastfeeding until the sixth month of life.
6- Upon suspicion of a parasitic disease you should:
a) __Take tablets that in other occasions have been prescribed by your doctor for the cure of intestinal parasites.
b) __See a doctor.
c) __Go to the laboratory for analysis.
d) __Take infusions recommended for parasites.
e) __Start taking measures to prevent other family members from becoming infected.
7- There are multiple complications caused by parasitic diseases. Recognize which of the following are a consequence of intestinal parasites:
a) __Diarrhea that can lead to dehydration of the patient.
b) __Nutrition.
c) __Fever without apparent cause.
d) __Learning difficulty.
e) __Loss of balance and visual disturbances.
f) __Intestinal Obstruction and Perforations.

Supplementary Material 3
Educational Program
Intestinal Parasitism
General Objective
To increase knowledge about intestinal parasitism.
Specific Objectives
1. To specify the different types of risk factors for intestinal parasitism.
2. To provide guidance on the main signs and symptoms of intestinal parasitism.
3. Achieve an understanding of the transmission pathways of intestinal parasitism.
4. To provide an appropriate conduct to follow in case of intestinal parasitism.
5. To provide information on the main complications of intestinal parasitism.
The execution of the meetings was carried out as follows:

Encounter #1
Topic: Introduction of the Educational Program.
Time: 60 minutes
Objectives
Presentation of the course and its objectives.
2. Introduction of participants using participatory presentation techniques.
3. Initial diagnosis (Application of the questionnaire).
Activities
Introduction: In order to establish relationships among the research participants, a participatory technique was applied in pairs, which consists of forming duos with the research participants who converse for a few minutes and then introduce their partners in an organized manner.
Main Activity: In order to make known the objectives of the course as well as its fundamental characteristics in terms of duration, frequency and importance, banners were made on these aspects. Likewise, definitions, terms and key words that were used on a regular basis during the research were made known, given their importance, so they were placed in a place in the premises to be used for the meetings where they could be seen by the participants.
Closing: In conclusion, a discussion guided by the researcher was held on the fundamental aspects discussed.
Presentation technique: Presentation in pairs. Closing technique: Debate Teaching method: Lecture Means: Cardboard folds. Office material: Chalk.

Encounter #2
Topic: Intestinal Parasitism: Risk factors.
Time: 60 minutes
Objectives
1. To raise awareness of the main risk factors of the disease.
Activities
Introduction: To begin the third meeting, the participatory technique “Follow the rhyme” was applied, which consists of placing the participants in a circle, who consecutively name a fruit so that each one mentions a different one each time and also includes those already mentioned. The loser is the one who takes more than 30 seconds to answer correctly or who forgets a fruit already

mentioned.
Main activity: A dramatization was developed, which consisted of assigning a role to a number of participants based on a problem situation in relation to the topic to be dealt with without a script, which allowed them to act spontaneously. This was followed by discussion of the topic and group debate.
Closing: To conclude, the participants discussed the importance of breastfeeding, its advantages and techniques.
Participatory techniques: Animation technique: Follow the rhyme. Technique with performance: Dramatization. Teaching method: Workshop. Media: Mimeographed support material.

Encounter #3
Topic: Intestinal Parasitism: Basic clinical manifestations.
Time: 60 minutes
Objectives
1. Identification of the fundamental symptoms of the disease.
Activities
Introduction: To begin this meeting, the "Box of Surprises" technique was applied, which consists of participants standing in a circle and passing around a box containing questions related to the topic discussed in the previous class while listening to music that, when stopped by the author, determines that the person holding the box will answer a question.
Key activity: The researcher gave a brief lecture on the subject supported by teaching aids and demonstration techniques.
Closure: The "Fears and Hopes" technique was applied, which consists of each of the participants presenting their fears and hopes about the topic discussed, followed by a summary of those considered to be the main ones.
Participatory techniques: Animation technique: Box of surprises. Closing technique: Fears and hopes. Teaching method: Lecture. Media: Mimeographed support material.

Encounter #4
Subject: Transmission routes
Time: 60 minutes
Objectives
1. Explain concept of transmission pathway.
2. To make known the fundamental routes of transmission.
Activities
Introduction: To begin the fifth meeting, the participatory technique "Follow the rhyme" was applied, which consists of placing the participants in a circle, who consecutively name an animal so that each one mentions a different one each time and also includes those already mentioned. The loser is the one who takes more than 30 seconds to answer correctly or who forgets an animal already mentioned.
Fundamental activity: The technique of questions by teams was applied, which consists of dividing the group into 2 subgroups which will be given 2 cards with the words true and false respectively. Subsequently, the author read statements related to the topic to be addressed, which should be answered by each team showing one of the cards, with the first one to answer correctly winning. Next, the details contained in the objectives of the meeting were specified.
Closing: This meeting culminated with the technique "Giving and receiving affection" which consists of placing the participants in a circle and saying nice words or phrases to the right and left, which are then expressed aloud for all to hear.
Participatory techniques: Animation technique: Follow the rhyme. Analysis technique: Questions by teams. Closing technique: Giving and receiving affection. Teaching method: Lecture. Means: Mimeographed support material, cardboard, office material.

Meeting #5
Topic: Prevention of parasitic diseases.
Time: 60 minutes
Target
1. To inform about the measures to prevent parasitic disease.
Activities.
Introduction: The "Secret Friend" technique was applied, which consists of forming pairs at random and in an incognito manner where each one asks a question related to the topic taught in the previous session and so on, everyone will have to ask and answer.
Key activity: In order to provide the information considered in this meeting, a video was shown on the topics to be discussed, detailing each of the aspects. Subsequently, the topic was discussed.
Closing: The "Lottery" technique was applied, which consists of placing several cards in a box, some blank and others referring to questions to be answered in relation to the topic taught at that meeting.
Participatory techniques: Animation technique: Secret friend. Audiovisual technique: Video-debate. Closing technique: The lottery. Teaching method: Workshop. Media: Television, videotape, VCR. Mimeographed support material.

Encounter #6

Subject: Conduct to be followed in the face of a parasitic disease.
Time: 60 minutes
Target
1. Explain the hygienic-dietary treatment.
2. Emphasize the importance of going to the doctor when a parasitic disease is suspected.
Activities
Introduction: To begin this meeting, the researcher made a brief reminder of the previous topic; then, in order to evaluate the knowledge received, questions were asked at random on these topics.
Fundamental activity: A dramatization of the different measures to be taken in the event of an episode of intestinal parasitism was performed, which were later discussed, allowing for a deeper understanding of each aspect.
Closing: The meeting ended with an exchange of experiences among the participants moderated by the author.
Participatory techniques: Technique with performance: Dramatization. Closing technique: Debate. Practical class. Teaching method: Workshop. Media: Mimeographed support material.

Meeting #7
Topic: Complications of intestinal parasitism.
Time: 60 Minutes
Objectives
1. To raise awareness of the complications of intestinal parasitism.
Activities.
Introduction: To begin this meeting, the technique of "The affective raffle" was applied, which consists of gathering a bag with small numbered papers that coincide with the number of participants and that are taken, which determines that the author offers an affective prize that contains in a list: a poem, an invigorating phrase, a flower, a song, an applause or a kiss. Afterwards, aspects of the theme of the previous meeting were recalled together.
Main activity: The author proceeded to apply the "Brainstorming" technique, which consists of asking the participants to state the complications of intestinal parasitism, which are written down on a blackboard, thus allowing the topic to be discussed as a whole later on.
Closing: At the end of the meeting, different problematic situations were discussed individually and in a directed way.
Participatory techniques: Animation technique: The affective raffle. Organization and planning technique: Brainstorming. Teaching method: Workshop. Media: Mimeographed support material.

Meeting # 8
Topic: Conclusions of the educational program.
Time: 60 minutes.
Objectives
1.To answer any doubts that may exist in relation to the topics taught during the educational program.
Final diagnosis.
Activities
Introduction: To begin this last meeting, the "box of surprises" technique was applied; on this occasion the participants were placed in a circle and a box containing the questions that offered the greatest difficulties in the final evaluation was passed around while music was played, which, when stopped by the author, determined that whoever had the box should answer the question selected at random from inside the box.
Key activity: The researcher gave a brief clarification of the most difficult topics using teaching aids.
Closing: The researcher offered the results of the final survey anonymously and the meeting ended with an exchange of experiences among the participants moderated by the author.
Participatory techniques: Technique with animation: box of surprises. Closing technique: Debate. Teaching method: Workshop. Media: Mimeographed support material, chalk.