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Intestinal parasitosis in malnourished children and adolescents

Parasitoses intestinais em crianças e adolescentes desnutridos

Parasitosis intestinal en niños y adolescentes con malnutrición

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This article discussed the need for integrated public health interventions addressing both intestinal parasitosis and malnutrition, emphasizing the importance of sanitation, education, and healthcare infrastructure to combat these conditions.
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The findings contributes into the discussion about the complex relationship between intestinal parasitosis and malnutrition, challenging assumptions about their interdependence and offering evidence to guide future epidemiological and intervention-based studies in similar settings.

ABSTRACT

Introduction: Intestinal parasitosis represents a public health problem since they are infections that occur by ingesting protozoan cysts, eggs, or worm larvae. These are transmitted by the consumption of water or food contaminated with fecal matter, from person to person or from animal to human; the social factors that influence are poverty, geographic condition, infrastructure of health services, education, and lifestyle. **Objective:** To determine intestinal parasitosis in children and adolescents with malnutrition. **Methods:** Quantitative research approach, non-experimental design, cross-sectional and descriptive scope, with a population of 46 children and adolescents from the Salcedo Canton of the *Jardín del Edén Foundation*, Ecuador. Information was collected by taking anthropometric measurements and coproparasitic examination. **Results:** Of the total of 46 children and adolescents it was evident that according to the BMI/Age 67.4% were normal and 32.5% with malnutrition (due to deficit and excess), also 82.6% were found with parasitosis, with protozoa predominating 96.5% over helminths 3.5%, of which the greatest predominance was in the female sex 43.5%, the main species found were: Amoeba coli cyst 30.6%, amoeba histolytica 28.3% and giardia lamblia 15.3%. **Conclusion:** Intestinal parasitosis in children and adolescents in this research has nothing to do with malnutrition because some of them had a normal nutritional status, and despite that, they had parasitosis.

Keywords: Intestinal parasitosis; prevalence; child; adolescent; malnutrition.

RESUMO

Introdução: As parasitoses intestinais representam um problema de saúde pública, pois são infecções que são produzidas pela ingestão de cistos de protozoários, ovos ou larvas de vermes, estas são transmitidas pelo consumo de água ou alimentos contaminados com matéria fecal, de pessoa para pessoa ou de animais para o homem, os factores sociais que influenciam são a pobreza, a condição geográfica, a infra-estrutura dos serviços de saúde, a educação e o estilo de vida. **Objetivo**: Determinar parasitoses intestinais em crianças e adolescentes desnutridos. Métodos: Pesquisa com abordagem quantitativa, desenho não experimental, transversal e de abrangência descritiva, com população de 46 crianças e adolescentes do Cantão Salcedo da Fundação Jardín del Edén. A coleta de informações foi realizada por meio de medidas antropométricas e exame coproparasitário. **Resultados:** Do total de 46 crianças e adolescentes, ficou evidente que segundo o IMC/Idade, 67,4% eram normais e 32,5% estavam desnutridos (por deficiência e excesso), 82,6% também foram obtidos com parasitoses, predominando protozoários 96,5%. sobre os helmintos 3,5%, dos quais o maior predomínio é do sexo feminino 43,5%, as principais espécies encontradas foram: cisto de ameba Coli 30,6%, ameba histolítica 28,3% e giardia lamblia 15,3%. **Conclusão:** A parasitose intestinal nas crianças e adolescentes da presente investigação nada tem a ver com desnutrição, pois alguns deles apresentavam estado nutricional normal e apesar disso apresentavam parasitose.

Palavras-chave: parasitose intestinal; prevalência; criança; adolescente; desnutrição.

RESUMEN

Introducción: La parasitosis intestinal representa un problema de salud pública, ya que, son infecciones que se producen por la ingesta de quistes de protozoos, huevos o larvas de gusanos, estos son transmitidos por el consumo de agua o alimentos contaminados con materia fecal, de persona a persona o de animales al hombre, los factores sociales que influyen son la pobreza, condición geográfica, infraestructura de los servicios sanitarios, educación y estilo de vida. **Objetivo:** Determinar la parasitosis intestinal en niños y adolescentes con malnutrición. **Métodos:** Investigación de enfoque cuantitativo, de diseño no experimental, de corte transversal y de alcance descriptivo, con una población de 46 niños y adolescentes del Cantón Salcedo de la Fundación Jardín del Edén. La recolección de información se realizó mediante la toma de medidas antropométricas y el examen coproparasitario. **Resultados:** Del total de los 46 niños y adolescentes se evidencio que de acuerdo al IMC/Edad el 67,4% se encuentra normal y 32,5% con malnutrición (por déficit y exceso), también se obtuvo un 82,6% con parasitosis, predominando los protozoarios 96,5% sobre los helmintos 3,5%, del cual el mayor predominio tiene el sexo femenino 43,5%, las principales especies encontradas fueron: Quiste de ameba coli 30,6%, ameba histolítica 28,3% y giardia lamblia 15,3%. **Conclusión:** La parasitosis intestinal en los niños y adolescentes de la presente investigación no tiene nada que ver con la malnutrición, debido a que, algunos de ellos tenían un estado nutricional normal y pese a eso tenían parasitosis.

Palabras clave: Parasitosis intestinal; prevalencia; niño; adolescente; malnutrición.

INTRODUCTION

Intestinal parasitosis is an infection caused by the ingestion of protozoan cysts, eggs or worm larvae through the transcutaneous penetration of larvae from the soil (Gómez & Jaramillo, 2022). The increase in parasites is due to several social, socioeconomic, hygienic and risk factors such as poverty, geographical condition, infrastructure of sanitary services, inadequate disposal of excrement and garbage, insufficient supply of drinking water, poor personal hygiene, lack of knowledge of infection mechanisms and malnutrition, consumption of water or food contaminated with fecal matter, from person to person or from animals to humans, education and lifestyle (Cedeño et al., 2021; Cociancic et al., 2020).

On the other hand, intestinal parasitosis and malnutrition are related to socioeconomic and hygienic-sanitary conditions, since they influence the high transmission of parasites. Malnutrition is characterized by the lack, excess or imbalance in the intake of energy and essential nutrients in the diet, including overweight, obesity and different forms of malnutrition in the child population. Due to nutrient deficiency, this population does not have normal physical and intellectual development. On the other hand, malnutrition includes global malnutrition, chronic malnutrition, acute malnutrition, overweight and obesity and can be determined by the Body Mass Index (BMI) (Longhi et al., 2022; Murillo et al., 2022; Baltazar et al., 2023).

At a global level, the World Health Organization (WHO) has estimated that there are 3.5 billion parasitized inhabitants in the world and approximately 450 million suffer from parasitic diseases, mainly affecting the child population as opposed to other populations. Also at a global level, 1.5 billion people are infected by helminths compared to protozoa, about 46 million between 1 and 14 years of age are at risk of infection and 3 million children die in the world each year due to intestinal parasitosis (Murillo et al., 2022; Pan American Health Organization PAHO, 2022).

In South American countries such as Ecuador, according to reports from the Ministry of Public Health (MSP), intestinal parasitosis ranks second among the causes of outpatient morbidity with 84.6% frequency in the child population. According to the latest surveys carried out in 2010 by the National Institute of Statistics and Censuses (INEC), approximately 62.7% of children under 12 years of age live in poverty, with intestinal diseases being a public health problem in the Ecuadorian population and one of the 10 main causes of consultations in health centers with parasite percentages between 0 and 40% in urban areas (Durán et al., 2023; Castro et al., 2020).

At the national level in Ambato, according to the statistics of the Ambato Health District, cases of consultation for parasitosis increased, in 2020 there were 4,283 and in 2021, 9,124 cases were registered due to poor hygiene habits where children are the most vulnerable (De la Torre et al., 2023). On the other hand, after carrying out an investigation in the Totoras Parish of the Ambato Canton in a population of 153 children, it was determined that there are 77.1% of parasitized children, with polyparasitism predominating 77% over monoparasitism 23% and protozoa 91.7% over helminths 8.3%, where the main species found were: Blastocystis spp. (47.6%), Entamoeba coli (32.03%) and Endolimax nana (28.1%) (Torre et al., 2023).

Based on the above, it is important to treat intestinal parasitosis in children and adolescents with malnutrition to improve their physical and intellectual development and prevent infections and diseases caused by this. It is also important to know what type of parasite species exists in each of them so that they have a specific treatment according to the parasite they have and thus avoid further complications in the future. Therefore, the objective of this research is to determine intestinal parasitosis in children and adolescents with malnutrition.

METHODS

The research was developed under a quantitative approach, since the data obtained were analyzed and quantified statistically in order to explain the results numerically (Flores & Anselmo, 2019; Sanchez, 2019). The research design was based on a non-experimental approach, since it was fundamentally based on the observation of what occurs naturally in the research and then analyzing it, without being able to manipulate the variable, intervene or control the conditions of the study in any way (Sousa et al., 2007). In addition, the study has a cross-sectional section, since it collects data from participants in a limited time only once (Manterola et al., 2023). Finally, it was descriptive in scope, since it describes characteristics of intestinal parasitosis in children and adolescents with malnutrition (Ramos, 2020).

The study population according to (Mucha et al., 2021) refers to the set of elements that contain certain characteristics that are intended to be studied, that is why, the choice of the population for this research was based on the *Modelo de Atención Integral de Salud* (MAIS) [Integrated Health Care Model] according to life cycles (Ministerio de Salud Publica, 2012), in which they mention that childhood goes from 0 to 9 years, so according to the age groups, children from 5 to 9 years old and adolescents from 10 to 19 years old were selected. Therefore, the study population was made up of a total

of 46 children and adolescents, that is, 9 children and 37 adolescents living in the Salcedo canton of the Jardín del Edén Foundation, whose sample were those who presented malnutrition.

Inclusion criteria

- Children from 5 to 9 years old and adolescents from 10 to 19 years old.

- Children and adolescents who belong to the Jardín del Edén Foundation.

- Legal representative of the children and adolescents of the Jardín del Edén Foundation who signs the informed consent.

Exclusion criteria

- Children and adolescents who do not belong to the group mentioned above.

- Children and adolescents who do not belong to the Jardín del Edén Foundation.

Information collection technique: The technique used to collect the information was the anthropometric evaluation and the coproparasitic examination. The first helped to delimit the children and adolescents with malnutrition by measuring weight and height (Štrkolcová et al., 2024) and the second to determine the intestinal parasites in each one of them. This information was collected using alphanumeric coding, meaning that each participant had a code consisting of the initials of their first and last names and their date of birth, thereby ensuring that the information collected was confidential.

To identify malnutrition (deficit and excess), the Body Mass Index (BMI) was calculated as the indicator of choice in children and adolescents from 5 to 19 years of age by dividing the weight of the child or adolescent by their height in meters (kg/m2), the reference values were taken according to the WHO BMI classification (Borja et al., 2023). The BMI/Age was also determined by means of the growth pattern percentile tables for nutritional assessment and the z-score or standard deviation, which was expressed in units of SD and defined as malnutrition (≤ -2SD), risk of malnutrition (≤ -1SD and > -2SD), normal (> -1SD and < +1SD), overweight (≥ + 1SD and < +2SD), obesity (≥ + 2 SD and < +3SD) and severe obesity (≥ +3SD) (Kaufer & Toussaint, 2008; Rodríguez et al., 2018).

On the other hand, to carry out the coproparasitic examination, all children and adolescents were explained that they must take the sample by spontaneous defecation in the morning hours of the assigned day, then they should deposit a small part of the feces in the container to avoid contamination with any element from the outside or urine. Once the stool samples were collected in the morning hours in clean, plastic containers with lids, properly labeled with names and surnames, age and date of collection, the samples were quickly transferred to the San Juan clinical laboratory in the Canton of Salcedo and delivered to the laboratory staff to be processed and analyzed. The coproparasitic analysis was direct, a macroscopic examination where was observed the color, appearance, consistency, food remains and mucus, also a microscopic examination where the presence of parasites was analyzed. The materials used were the stool samples, toothpicks, physiological serum, slide plate and coverslip.

Once the results were obtained, they were recorded in Excel format and then in the IBM SPSS 25 statistical program, which allowed the data obtained to be entered and statistical analysis to be performed, facilitating the preparation of frequency and percentage tables. From this data, the results were prepared to proceed to the analysis and interpretation of the frequency tables to give rise to the development of the discussion and conclusions.

Since this was a research with children and adolescents, an informed consent was applied in which the information on the research topic was disclosed, they were also informed that the data collected will be used for research purposes and if they refused to participate or did not want to continue, they could withdraw without any problem. It should be noted that this research complied with all the ethical requirements established in the Declaration of Helsinki (Manzini, 2022) complying with the ethical principles of confidentiality, autonomy and respect, in addition, it was endorsed by the research ethics committee of the Technical University of Ambato with the assigned code 048-CEISH-UTA-2024.

RESULTS AND DISCUSSION

The research consisted of a total of 46 children and adolescents 9 children from 5 to 9 years old and 37 adolescents from 10 to 19 years old from the Jardín del Edén Foundation of the Canton Salcedo, inclusion and exclusion criteria were applied prior to authorization in the consent and assent format that was authorized by the representative of the foundation and to all children and adolescents who decided to participate in this research. In the same way, the presence of parasitosis in children and adolescents with malnutrition (due to deficit and excess) was determined, in addition, the standard deviation and the BMI were established with the anthropometric measurements of weight and height of each child and adolescent using the growth pattern percentile tables for nutritional evaluation.

Table 1. Population categorization by life cycle

Life cycles	Sex	Frequency	%
Childhood 5-9 years	Female	4	8.7%
	Male	5	10.9%
	Total	9	19.6%
Adolescence 10-19 years	Female	20	43.5%
	Male	17	37.0%
	Total	37	80.4%
Total	Female	24	52.2%
	Male	22	47.8%
	Total	46	100 %

Source: Prepared by the author

Of the total of 46 children and adolescents (Table 1) 19.6% belong to the 5 to 9 year-old age group, of which the female sex had a higher prevalence (8.7%) compared to the male sex (10.9%). 80.4% belong to the adolescent stage (10 to 19 years), and likewise the female sex (43.5%) predominated over the male sex (37.0%). In the research there was a higher participation of the female sex with 52.2% and a lower participation of the male sex with 47.8%.

When assessing nutritional status according to WHO BMI and standard deviation indicators (Table 2), it was found that 15.2% of children were normal and 4.3% overweight; among adolescents, 2.2% were malnourished, 4.3% were at risk of malnutrition, 52.2% were normal, 17.4% were overweight, and 4.3% were obese. In the total survey, 2.2% were malnourished, 4.3% were at risk of malnutrition, 67.4% were normal, 21.7% were overweight, and 4.3% were obese.

Table 2. Body Mass Index/Age (BMI/Age) in children and adolescents

Life cycles	IMC/E	Frequency	%
Childhood 5-9 years	Malnutrition	0	0.0%
	Risk of malnutrition	0	0.0%
	Normal	7	15.2%
	Overweight	2	4.3%
	Obesity	0	0.0%
	Total	9	19.6%
Adolescence 10-19 years	Malnutrition	1	2.2%
	Risk of malnutrition	2	4.3%
	Normal	24	52.2%
	Overweight	8	17.4%
	Obesity	2	4.3%
	Total	37	80.4%
Total	Malnutrition	1	2.2%
	Risk of malnutrition	2	4.3%
	Normal	31	67.4%
	Overweight	10	21.7%
	Obesity	2	4.3%
	Total	46	100%

Source: Prepared by the author

Of all children and adolescents with parasitosis, it was found that only 2.2% are malnourished, 4.3% are at risk of malnutrition, 52.2% are normal, 19.6% are overweight and 4.3% are obese, that is, 82.6% of the entire population studied has parasitosis (Table 3). After the results of the coproparasitic examination (Table 4), it was observed that of the total of 46 samples analyzed, 82.6% correspond to children and adolescents who have parasitosis, as opposed to those who do not have parasitosis (17.4%). According to sex, the highest prevalence of parasitosis is in the female sex (43.5%) compared to the male sex (39.1%).

The main species of parasites found in children and adolescents, both protozoa and helminths, were: Amoeba Coli cyst 26%, Amoeba histolytica cyst 24% and Giardia Lamblia cyst 13% and the other species are found in a lower percentage (Table 5).

Table 3. Body Mass Index/age in relation to intestinal parasitosis

IMC/E	Intestinal parasitosis	Frequency	%
Malnutrition	Parasitosis	1	2.2%
	Unobservable parasitosis	0	0.0%
	Total	1	2.2%
Risk of malnutrition	Parasitosis	2	4.3%
	Unobservable parasitosis	0	0.0%
	Total	2	4.3%
Normal	Parasitosis	24	52.2%
	Unobservable parasitosis	7	15.2%
	Total	31	67.4%
Overweight	Parasitosis	9	19.6%
	Unobservable parasitosis	1	2.2%
	Total	10	21.7%
Obesity	Parasitosis	2	4.3%
	Unobservable parasitosis	0	0.0%
	Total	2	4.3%
Total	Parasitosis	38	82.6%
	Unobservable parasitosis	8	17.4%
	Total	46	100%

Source: Prepared by the author

Table 4. Prevalence of parasitosis and unobservable parasitosis by sex

Sex	Intestinal parasitosis	Frequency	%
Female	Parasitosis	20	43.5%
	Unobservable parasitosis	4	8.7%
	Total	24	52.2%
Male	Parasitosis	18	39.1%
	Unobservable parasitosis	4	8.7%
	Total	22	47.8%
Total	Parasitosis	38	82.6%
	Unobservable parasitosis	8	17.4%
	Total	46	100%

Source: Prepared by the author

Table 5. Species of parasites found in children and adolescents

Species of intestinal parasites		Frequency	%
Protozoa	Giardia Lamblia Cyst	13	13%
	Amoeba Coli Cyst	26	26%
	Amoeba Histolytica Cyst	24	24%
	Endolimax Nana Cyst	12	12%
	Chilomastix Mesnilli Cyst	1	1%
	Embadomonas Intestinalis Cysts	6	6%
	Total	82	82%
Helminths	Ascari lumbricoides eggs	18	18%
	Total	100	100%

Source: Prepared by the author

Discussion

Intestinal parasitosis occurs more frequently in developing countries, since it produces several infections in adults, but especially in children. These infections are transmitted by the consumption of water or food contaminated with fecal matter, intradermal larval penetration from the soil, person-to-person transmission or from animals to humans, thus generating a public health problem (Gómez & Jaramillo, 2022). A study was carried out on children from 5 to 9 years old and adolescents from 10 to 19 years old at the Jardín del Edén Foundation in which 46 children and adolescents participated, of which 51.1% were male and 48.9% were female.

According to a research carried out on children from the Ambato, Totoras canton, it is concluded that the children of the parish have a high frequency of intestinal parasitosis, so it is important to carry out prevention campaigns and antiparasitic treatment in this community of children, in order to reduce the prevalence of these microbial agents (De la Torre et al., 2023), these results agree with what was shown in our research, being a public health problem, these results may vary depending on the place of residence, socioeconomic level, education, poor hygiene measures, as well as the diagnostic techniques used to detect the disease. On the other hand, emphasis is placed on maintaining hygiene standards in low socioeconomic conditions or in vulnerable people, since promoting healthy living conditions in the population contributes to reducing the prevalence of parasitic infections in children in health centers, which causes various health problems and therefore endangers their health and healthy development (Štrkolcová et al., 2024).

After carrying out the research in the 46 children and adolescents, the high prevalence of parasitosis (82.6%) was evident, similar to other studies carried out in Ecuador and in different countries, which handle similar or even high values in relation to this study, as is the case of the province of Los Ríos and Bolívar in Ecuador, a study in two educational institutions in a group of 8 to 12 years of age, where 87.1% belonged to the María Luisa de Sotomayor Educational Unit and 89.3% to the Francisco Pizarro Basic Education School (Rodríguez et al., 2020). However, other investigations carried out in the Paján canton in Manabí reflect percentages much lower than the study in which 351 samples of children between the ages of 5 and 9 were analyzed, in which a general prevalence of parasitized people of 45.30% was determined (Durán et al., 2019).

According to data obtained in a study conducted in rural areas, the most prevalent species were Blastocystis sp., Enterobius vermicularis and Giardia lamblia. Entamoeba dispar, where underweight, stunting and obesity were higher in the peri-urban group, while overweight, emaciation and parasitism rates were higher in the rural group. The urban group showed the lowest parasite prevalences. Co-sleeping, maternal education, and animal husbandry were associated with parasitic infections (Zonta et al., 2024), contrasting with the data obtained in the research where the BMI/E according to the standard deviation can be seen that the highest percentage is normal 67.4%, overweight 21.7%, risk of malnutrition and obesity 4.3% and malnutrition with 2.2%, however, not only children and adolescents with malnutrition have parasites, but also children and adolescents with normal BMI/E 63.2% of intestinal parasites as stated in other studies, which is why it is reflected that BMI does not interfere with having intestinal parasitosis but due to the risk factors of each country (Ortiz et al., 2022).

In this context, Castañeda et al., (2024) states that parasitic infections by protozoa and helminths present important public health challenges, especially in developing countries with rural populations characterized by inadequate hygiene practices and socioeconomic limitations. Thus, the researcher included the study population, their pets and water sources in the study. The results revealed a high frequency of parasitic infections denoting various degrees of polyparasitism, which emphasizes the complexity of transmission dynamics, agreeing with the results of the study where various species of parasites are seen and which are related to the water quality and the pets of the study population.

Regarding sex, a higher prevalence of parasitosis was found in the female sex 43.5% compared to the male sex 39.1%, the same happened in a population of the Nabón Canton, Ecuador, with 58.4% and in the Paján Canton 52.20% (Durán et al., 2019; Vanegas et al., 2022). On the contrary, a research carried out in a child population in a rural area shows that men have more parasitosis 62.23% unlike women (Cuenca et al., 2021), however other studies show that parasitosis is not only associated with sex and age, but also by inadequate environmental sanitation, personal hygiene, socio-economic conditions, residence, role in the home and the usual practice of washing hands (Cedeño et al., 2021; Feleke et al., 2019).

According to the species of parasites found in children and adolescents, the greatest amount of evidence is in protozoa with 96.5% as opposed to helminths with 3.5%, data that is similar to the results of a study carried out in the Ambato canton where 91.7% were infected by protozoa and 8.3% infected by helminths (Torre et al., 2023), also in a study carried out in Ecuador in the Paján canton and in Manabí, show that the main species found in said investigation were protozoa as opposed to helminths (Durán et al., 2019) (Castro et al., 2020), on the other hand, in an investigation of rural areas it was shown that 78.69% are helminths and 21.31% protozoa (Tékpa et al., 2019).

In relation to each parasite, the laboratory results showed that protozoa were present in greater quantity, in which the main ones were amoeba coli cyst 30.6%, amoeba histolytica cyst 28.3% and giardia lamblia cyst 15.3%, and the others in a lower percentage, with respect to helminths, the only parasite found was the egg of Ascaris lumbricoides 3.5%, these values

are similar to a study carried out in Riobamba in the province of Chimborazo where different types of parasites were identified, but the most prevalent was entamoeba coli 26%, followed by entamoeba histolytica 9.3% and giardia lamblia 4.3% (Durán et al., 2023). However, in another study the opposite is stated, the main species found were Blastocystis sp. 42.2%, enterobius vermicularis 33.6% and Giardia Lamblia 17.0% (Cociancic et al., 2021), the same happened in the province of Bolívar, Ecuador Blastocystis hominis 58%, guardia lamblia 50% and Entamoeba histolytica 36% (Rodríguez et al., 2020)

It has been shown that both helminths and protozoa can affect the composition of the intestinal microbiome favoring the presence of specific bacterial communities can also influence the establishment of parasites, the study indicated that children with ascariasis had higher values of leukocytes and neutrophils, while total hemoglobin levels were lower and with respect to the intestinal microbiome, the presence of intestinal parasites reduced the prevalence of some beneficial bacteria, namely: Lactobacillus, Bifidobacterium, Cuneatibacter, Bacteroides uniformis, Roseburia and Shuttleworthia (Delgadinho et al., 2024; Cando et al., 2023).

On the other hand, Dua et al., (2024) states that the presence of intestinal ascariasis is the cause of acute intestinal obstruction when it is exacerbated, which results in the development of a bolus of worms, which leads to an acute intestinal blockage, so that research denotes multiple problems that occur in children and adolescents who have intestinal paratosis. Therefore, it is important to consider public health strategies in Ecuador such as strengthening mass deworming programs, education in hygiene and sanitation, epidemiological monitoring and surveillance, incorporation of nutritional strategies, with the purpose of avoiding or reducing children under 5 years of age from having growth retardation, which is associated with increased mortality, cognitive dysfunction and loss of productivity.

Thus, the following interventions are proposed to address this problem, such as: reducing exposure to feces and contact with animals through programs such as improved water, sanitation and hygiene; strengthening breastfeeding programs and greater dietary diversity; including the use of probiotics and prebiotics in healthy child check-ups; implementing nutritional supplements, including zinc, polyunsaturated fatty acids and amino acids as well as anti-inflammatory agents such as 5-aminosalicylic acid; and antibiotics in the context of acute malnutrition and infection (Owino et al., 2016).

Therefore, in addition to the above, risk factors must be integrated into the assessment, anthropometric measurements must be taken including abdominal circumference, family history, educational level, and the environment must be assessed (Dórame et al., 2024). A study addresses very important characteristics from the nutritional aspect where the factors associated with the nutritional status of the mother before, during and after pregnancy, excessive gestational weight gain and the duration of breastfeeding, maternal pathologies are raised, determining that all these aspects are crucial for the child and adolescent to develop malnutrition in the development of their life (Rivera et al, 2022).

The limitations of this study were centered on the scarce information on intestinal parasitosis related to malnutrition in this group of the population considered as vulnerable, which made it difficult to compare the results with other research developed in the country. At an international level, similar studies are evident but they lack exact diagnostic methods in rural areas, other studies related other aspects that did not agree with the subject of study, in the methodological part, research was found that was mostly cross-sectional in design that limited the results relating parasitosis to malnutrition, the sample size was not adequate, there were research studies that presented selection biases in the study population, therefore it is proposed to continue with this line of research in other provinces of the Sierra, especially in communities or parishes where there are high rates of malnutrition.

Currently, techniques are being used for the evaluation of alarm notification by artificial intelligence in automatic parasite detection analyzers in order to identify and label the morphology of parasitic pathogens through the development of deep learning in the field of target detection, microscopic images are based on the convolutional neural network that in the future will speed up early detection processes, reducing health complications in children and adolescents (Wang et al., 2024).

CONCLUSIONS

The prevalence of intestinal parasitosis in children and adolescents of the Garden of Eden Foundation was Ameba coli cyst with 30.6%, but according to the nutritional status, the parasitosis was not associated only with malnutrition, since there was a large percentage % that according to their BMI/E were normal, but despite that they had intestinal parasitosis. That is why the correct hand washing is important, especially before eating or preparing food or after going to the bathroom and the conservation of food and environmental sanitation of the place where they live.

Based on this research, it is possible to contribute to future research to generate strategies and thus be able to prevent and control parasitosis, also the research can lead to the development of new diagnostic methods and treatments to be able to avoid morbidity and mortality due to intestinal parasitosis, since it is a public health problem that not only occurs

in children and adolescents of that Foundation, but in the entire general population of the world.

It is worth noting that the role of nursing is very important in this research, because, based on primary health care, it was possible to work on the prevention of intestinal parasitosis by giving educational talks on proper hand washing, proper food handling and sterilization of water for consumption, in addition, in the future this can generate a great positive impact on the country's economy, since it would reduce health care costs even by reducing the incidence of parasitosis, also, it would help improve the quality of life of affected children and adolescents. Based on the data obtained in the study, a research agenda is proposed for future investigations.

Table 6. Possible paths of research for future studies

1	Effects of intestinal parasitosis on the development of soft skills in children and adolescents with malnutrition
2	Nursing role in the prevention of intestinal parasitosis in children and adolescents with malnutrition
3	Resistance to antiparasitic drugs and their effects on development in children and adolescents
4	Vitamin deficiency in children and adolescents with intestinal parasitosis
5	Nursing process in intestinal parasitosis and malnutrition in children and adolescents
6	Academic performance of children without intestinal parasitosis versus children with intestinal parasitosis

Source: Authors' development

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C. elaboration of figures and tables:	50%	50%
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