# INTESTINAL PARASITOSES IN INDIGENOUS COMMUNITIES OF BRAZIL: A SYSTEMATIC LITERATURE REVIEW

# PARASITOSES INTESTINAIS NAS COMUNIDADES INDÍGENAS DO BRASIL: UMA REVISÃO SISTEMÁTICA DA LITERATURA

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**ABSTRACT: Objective:** To identify the prevalence of intestinal parasites, risk factors and control strategies to reduce rates in the Brazilian indigenous population. **Methodology:** A systematic literature review study was carried out. The PRISMA protocol was applied for data collection. Pre-existing articles in the PubMed, Science Direct and Scielo databases, published between 2014 and 2024, were used. After applying the exclusion criteria, the final sample consisted of 16 articles **Results:** The most prevalent parasites were: Ascariasis, Trichuriasis, Toxoplasmosis, Giardiasis, Strongyloidiasis and Amebiasis. Among the risk factors, the most prominent was the lack of basic sanitation. **Conclusion:** Gaps in preventive care perpetuate problems that could be avoided, highlighting the need for more effective interventions to reduce or eliminate the consequences of parasitic diseases.

**KEYWORDS:** Parasitic diseases; Indigenous peoples; Neglected disease; Public health.

**RESUMO: Objetivo:** Identificar a prevalência das parasitoses intestinais, fatores de risco e estratégias de controle na população indígena brasileira. **Metodologia:** Realizou-se uma revisão sistemática da literatura, utilizando o protocolo PRISMA para organização dos dados. Foram selecionados artigos das bases PubMed, Science Direct e Scielo, publicados entre 2014 e 2024. Após a aplicação dos critérios de exclusão, a amostra final incluiu 16 artigos. **Resultados:** As parasitoses mais prevalentes foram Ascaridíase, Tricuríase, Toxoplasmose, Giardíase, Estrongiloidíase e Amebíase. O principal fator de risco identificado foi a ausência de saneamento básico. **Conclusão:** As lacunas no cuidado preventivo perpetuam problemas evitáveis, destacando a necessidade de intervenções mais eficazes para reduzir ou eliminar as consequências das doenças parasitárias.

**PALAVRAS-CHAVE:** Doenças parasitárias; Povos indígenas; Doença negligenciada; Saúde pública.

## 1 INTRODUCTION:

Parasitic diseases represent a persistent challenge to public health in Brazil, being strongly influenced by socioeconomic, environmental and cultural factors. Among these diseases, intestinal parasites are relevant, since their transmission occurs mainly through the ingestion of contaminated water and food, directly reflecting sanitary conditions and access to basic health services (Antunes *et al.*, 2020).

The lack of adequate sanitation, combined with poor hygiene practices and the lack of effective public policies, contributes to the vulnerability of certain populations, especially those located in areas of greater social inequality. Communities that receive less support from the government, such as indigenous and riverside groups, often face difficulties in accessing drinking water and sewage infrastructure, which are determining factors in the spread of parasitic diseases. These health problems result not only in recurrent infections, but also in severe nutritional consequences, which can compromise psychomotor and social development, especially in children, in addition to overloading the Unified Health System (SUS) (Karen *et al.,* 2019).

Intestinal parasites can be classified into three main groups: nematodes, flatworms, and protozoa. Nematodes include Ascariasis, popularly known as "roundworm"; flatworms include tapeworm infections; and protozoa, such as amoebas and Giardia. Lamblia, also pose a significant health risk. The transmission cycle of these parasites is directly linked to inadequate living conditions and sanitary practices, making the disparity in the distribution of these diseases evident. Studies indicate that populations in the North and Northeast regions, including indigenous peoples and riverside communities, are more exposed to these pathogens due to the lack of *basic sanitation infrastructure and the limited supply of health services (De Meira et al.,* 2021).

Particularly among indigenous peoples, intestinal parasites represent an important factor of morbidity and mortality, with an alarming prevalence in children under five years of age. Due to immunological immaturity and greater exposure to sources of contamination, these children are at greater risk of complications such as malnutrition and iron deficiency anemia, conditions that negatively impact neurocognitive development and quality of life (Pereira, de Albuquerque and Cavalcanti, 2020). Estimates indicate that approximately 50% of indigenous children between three and seven years of age are infected with at least one enteroparasitosis , contributing significantly to the high rates of malnutrition in these communities (da Silva *et al*., 2022).

In addition to the direct impacts on health, intestinal parasites have significant socioeconomic repercussions. Individuals affected by parasitic infections often suffer from debilitating symptoms, such as chronic diarrhea, fatigue, and weight loss, which compromise their ability to work and study. In children, these conditions hinder learning and reduce school attendance, perpetuating the cycle of poverty and social vulnerability. Studies indicate that infectious diseases, when not treated properly, reduce cognitive performance and productivity throughout life, further aggravating the social exclusion of these communities (Silva *et al.*, 2021). Therefore, parasitic diseases should not be seen only as a public health problem, but also as a determining factor in the human and economic development of the affected populations.

Given this scenario, it becomes clear that the relationship between health and disease is not restricted to the presence of the etiological agent, but also involves social, environmental and economic factors that contribute to the perpetuation of these diseases.

Identifying sources of contamination, health education and the implementation of effective public policies are essential to mitigate the impacts of these diseases and improve the quality of life of vulnerable populations. Therefore, preventive actions, such as access to decent housing, basic sanitation and medical care, should be seen as priorities in promoting health and sustainable social development.

Despite the seriousness of the problem, the implementation of effective public policies to eradicate these diseases faces numerous challenges. The lack of basic infrastructure, combined with logistical difficulties in serving remote populations, compromises the provision of adequate preventive and therapeutic measures. In addition, bureaucratic obstacles and the lack of investment in indigenous health make it difficult to expand programs aimed at sanitation and access to treatments. In this context, it is essential that the State adopt intersectoral strategies, promoting actions that integrate health, education and social development to ensure a lasting impact on the quality of life of these populations.

## 2 METHODOLOGY

This is a descriptive study that, according to Selltiz *et al. (2006)*, aims to describe a situation in detail, allowing the association of events characteristic of a given group covered in such a situation. The research was developed in the form of an integrative literature review. Scientific evidence was selected between the years 2014-2024, found in the *PubMed, Science Direct and SciELO* databases. using the descriptors “parasitoses”, “indigenous” and “Brazil”. As eligibility criteria, only complete scientific articles, case studies, cohort studies, retrospective observational studies, systematic reviews and meta-analyses, experimental and quasi-experimental studies, in English, Portuguese and Spanish were used. To cross-reference data and obtain the largest possible number of samples, the authors used the Boolean denominators *AND and NOT*. The PRISMA score served as a verification tool and credibility score for the sources used. The following PICO question was used: What are the most prevalent parasitoses in the indigenous community in Brazil, their main causes and consequences? Duplicates and articles that do not answer the guiding question will be excluded.

The studies found were independently analyzed by the authors and, based on the abstracts, were selected according to the inclusion criteria: original studies that aimed to investigate the prevalence of intestinal parasites and/or associated factors in indigenous children and adults in Brazil. In the case of selecting abstracts of theses or dissertations that had their results also published in the form of articles, it was decided to select only the articles.

Abstracts selected according to the criteria described had their texts read in full, while studies that met any of the exclusion criteria were eliminated. These criteria were: a) identification of the parasitosis by methods not scientifically recognized or without description of the methodology applied; b) single case studies were excluded; c) no specification of the location where the study was conducted or the study was not conducted in Brazil. In cases of duplicates (two or more studies with the same sample), the most complete or most recent publication was used and the others were excluded.

To collect data from the selected publications, a standardized form was used that included information about the works analyzed in the review. The fields covered were: authors, year

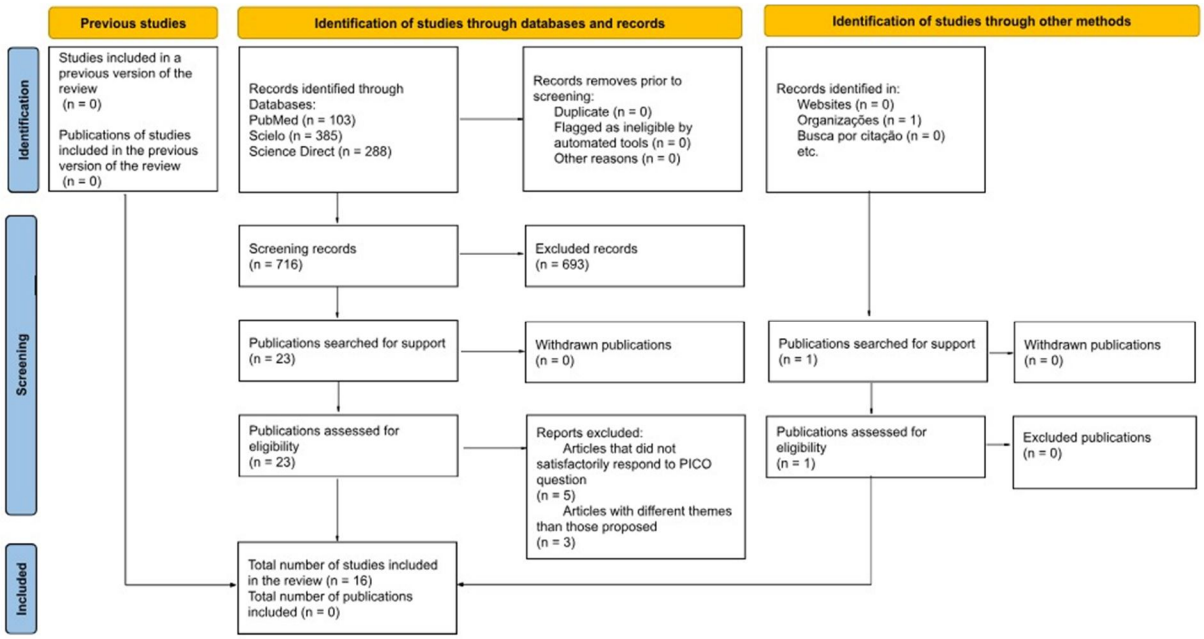
of publication, language, geographic location, type of study, number of participants, age range, sex, resources and diagnostic criteria, prevalence of parasites and associated factors, in addition to other analyses performed in the study. Data extraction was performed by a reviewer and then verified by a second evaluator. Any discrepancies in data collection and doubts were resolved by consensus, through analysis of the original article.

Regarding ethical aspects, the analyses and discussions were conducted based on data available in the online databases mentioned above. This is an exploratory-descriptive study, whose objective was to analyze secondary data, not directly involving human beings. Thus, according to the ethical guidelines in force in Brazil, established by Resolution No. 466/2012 of CONEP, studies that use secondary data and ensure the anonymity of participants do not require approval by the Research Ethics Committee (CEP).

## 3 RESULTS

The search resulted in a total of 716 articles, from the following databases: *PubMed (n = 103), SciELO (n = 385) and Science Direct (n = 288* ), all published between 2014 and 2024. After a preliminary analysis and screening based on titles and keywords, 693 articles were excluded because they did not address the central question of this review. In the second phase, the 23 articles that remained eligible were evaluated by their abstracts, and only 15 that satisfactorily answered the guiding question were selected. And during the writing of the work, one more literature (n = 1) was added, as the need to describe the diagnostic techniques for intestinal parasitosis was identified. Throughout the search process, no duplicates or any other problems that could make the records ineligible for the review were identified. Among the selected studies, 5 were written in English, 10 in Portuguese and 1 in Spanish. The figure below presents the PRISMA flowchart, which illustrates the selection process and the reasons for the exclusion of articles evaluated for their eligibility for review.

**Figure 1.** Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Flowchart




Source: the authors

## 4 DEVELOPMENT

### 4.1 Parasitosis:

Enteroparasitoses are widely distributed in Brazil, affecting thousands of inhabitants, especially individuals in vulnerable situations, particularly those living in conditions of inadequate basic sanitation, which perpetuates a cycle of infections that goes beyond the simple interaction between parasite and host. After a bibliographical survey, the present study found that the most cited parasitic diseases are: ascariasis (*Ascaris lumbricoides*), trichuriasis (*Trichuris trichiura*), toxoplasmosis (*Toxoplasma gondii*), giardiasis (*Giardia duodenalis*), strongyloidiasis (*Strongyloides stercoralis*), schistosomiasis (*Schistosoma mansoni*), filariasis (*Mansonella ozzardi*), and amoebiasis (*Entamoeba histolytica*). These parasitic diseases have a similar propagation cycle, being mostly related to the consumption of contaminated food, such as food derive

d from infected animals—raw or undercooked meat and milk—poorly sanitized vegetables, inadequate collective hygiene conditions, and contact and/or ingestion of water and soil contaminated by the feces of animals and people carrying the parasites (Santos *et al.,* 2019; Borguezan *et al*., 2014; Neres-Norberg *et al*., 2014; Galvão *et al.,* 2023).

Among the parasitic diseases with high potential for contamination in indigenous populations, according to Mattos, Calderón, and Acevedo (2018), microfilaria *Mansonella* ozzardi has a low risk of causing serious or disabling conditions. There are no records in the literature that directly associate the presence of microfilaria with the development of malignancies. However, the relationship between the disease and debilitating conditions is well documented, especially in immunosuppressed patients, suggesting its opportunistic

nature in contexts of immunological deficit. Furthermore, Mattos *et al.* (2018) emphasize that, although intestinal parasites are considered low-severity diseases, mass treatment is essential to reduce the parasite load in human hosts (reservoirs). This measure helps to minimize mosquito contamination and, consequently, transmission to other individuals, contributing to interrupting the disease cycle.

Although these enteroparasitoses have simple forms of infection, inadequate healthcare and basic health actions, as well as the cultural habits maintained by indigenous communities, are responsible for the lack of infectious-parasitic control that affects them (Cardoso, 2014). Furthermore, Borguezan *et al*. (2014, p. 53) state that "the indigenous population cultivates its own habits, which makes it difficult for these indigenous people to integrate with the educational proposals offered by official bodies," highlighting the challenges in eradicating these diseases.

**4.2 Risk factors:**

The historical construction of Brazil has at its core a trajectory marked by the domination of indigenous peoples by Europeans, a complex social relationship that resonates to this day, resulting in precariousness and marked disparities in the profile of the Brazilian indigenous population in all segments, such as education, health, poverty, worse morbidity and mortality profiles, malnutrition, social violence, and occupational risks. It is a direct result of inefficient and fragmented public policies, which date back to the 20th century (Borges, Silva, and Koifman, 2020). The Eighth National Health Conference, in 1986, was a historic milestone in the fight for the right to health, and months later, the first national conference for the protection of indigenous health was created. However, throughout the history of the creation and implementation of public policies aimed at this area, several irregularities, corruption, and misappropriation of resources have marked the process, directly impacting the quality of the services provided. Furthermore, the accelerated urbanization of the Brazilian population has resulted in an increase in health risk factors and the incidence of communicable diseases, especially in vulnerable social groups and regions, such as indigenous communities (Borges *et al.*, 2020).

Considering that one of the main means of transmission of intestinal enteroparasitosis is contaminated water, the study conducted by Simões *et al.* (2015, p. 42) investigated water samples from homes in the Xukuru-Kariri community of Caldas, Brazil. Of the 26 samples analyzed, 77.0% showed the presence of total coliforms, and 4.0% indicated bacteriological contamination of the water. This result can be explained by the fact that 60% of the water used in activities such as washing hands, dishes, and clothes was discarded directly onto the land. In addition, 4.8% of the sewage was disposed of inappropriately, and 27.3% of the village residents defecated in the open air, near their homes. All of these inappropriate waste treatments become risk factors for the proliferation of not only parasitic but also infectious diseases. This fact is confirmed by data indicating that 66% of the population tested positive for parasitic infection. Among the most prevalent parasitic diseases in the Xukuru-Kariri population, the following parasites stand out: *Entamoeba histolytica/dispar*, identified in four people (6.7%); *Entamoeba coli*, in 36 people (60.0%); *Endolimax nana*, in one person (1.8%); and *Giardia duodenalis*, in 10 people (16.6%) (Simões *et al.*, 2015).

In parallel, in another study with indigenous students from Paraná, aged between 5 and 19 years, a mass treatment was carried out to control parasitic infections in this population. However, the results of the laboratory samples indicated that, even after

treatment, the group under study remained infected, suggesting reinfection. It is worth noting that this problem affects an entire community, so carrying out treatment on only part of the population was not capable of minimizing self-contamination and recontamination. Furthermore, this occurred because the social environment remained unchanged, with continuous contact with contaminated soil and water (Lenartovicz-Boeira *et al.*, 2021). These results highlight the urgent need for investments in fundamental social sectors to enable the eradication of parasitic diseases.

In addition to the aforementioned health issues, such as the lack of basic sanitation and treated water, another important point is the interaction between indigenous peoples and animal husbandry, which is a significant factor, since health control, when it exists, is precarious. The lack of inspection leads to the absence of livestock vaccination, thus resulting in the generation and multiplication of several zoonoses, such as toxoplasmosis, which are also considered parasitic diseases and negatively impact human health (Galvão *et al.*, 2023).

One of the major markers of a population's quality of life is the mortality rate of children under one year of age. These deaths are often considered preventable, as they can be treated through interventions that could be carried out in Primary Health Care (Marinho *et al.*, 2019). According to Cardoso (2014, p. 862), the basic assistance contained in the National Indigenous Health Policy has several problems, such as poor coverage of territorial areas, lack of resources and infrastructure, and difficulty in training professionals integrated with the Unified Health System. Thus, the need for an effective model for Primary Care to be functional is clear.

Furthermore, according to Magalhães *et al.* (2017), there is a qualitative risk factor related to diagnostic tests, which corroborates the persistence of parasitic diseases in the indigenous community. A study carried out in the municipality of Primavera-PA sought to determine whether the current strategy used for diagnosing schistosomiasis is the most appropriate. Currently, the Ministry of Health follows the diagnostic methods recommended by the WHO, with the Kato-Katz (KK) technique being the most indicated due to its easy applicability in field conditions and low cost. In addition to schistosomiasis, the KK technique is recommended by the Pan American Health Organization for the diagnosis of *Ascaris lumbricoides*, *Trichuris trichiura*, *Ancylostomidae*, and *Taenia spp.* (PAHO, 2020). Despite these advantages, the methodology is ineffective for mass diagnosis due to its low sensitivity, which results in a high number of false negatives and, consequently, underdiagnosis (Magalhães *et al.*, 2017; Sousa *et al.*, 2017). Since public health policies are developed based on epidemiological data, significant underestimation directly affects adequate management. Low positivity rates lead to inadequate data on prevalence levels, resulting in ineffective government support to combat the disease. Furthermore, false negatives do not receive treatment, thereby perpetuating the disease.

Brazil, through the United Nations (UN) General Assembly and the Human Rights Council, has committed to meeting the Sustainable Development Goals (SDGs), including SDG 6, which aims to ensure the availability and sustainable management of water and sanitation for all by 2030. However, this target is still far from being fully achieved. Although the IBGE recorded advances in the provision of basic sanitation for the indigenous population between 2000 and 2010, the numbers remain insufficient to meet the goals established by SDG 6 (Raupp *et al.*, 2020).

### 4.3 Consequences

Among the indigenous population, an infant mortality rate 60% higher than that of non-indigenous children was observed, with one of the main causes of these deaths being parasitic infections (17.1%). Furthermore, higher prevalences of both malnutrition (40.8%) and anemia (66.4%) were found in the indigenous population when compared to the non-indigenous population (14.7%). Such clinical signs are frequently found in intestinal parasitic infections, as the mechanism for obtaining nutrients from parasites is through attachment to the intestinal wall, where they compete with the host for these nutrients (Marinho *et al*., 2019).

Still on the subject of malnutrition, a study conducted with children from the Karapotó people, living in São Sebastião, Alagoas, identified a structural deficit in children aged six to 59 months, with a prevalence of 15.6%, according to the WHO reference growth curves. This deficit is associated with several endogenous and exogenous factors. Among the primary factors, the lack of nutritional support necessary for adequate growth stands out and is directly linked to the high prevalence of enteroparasitosis, such as intestinal parasites, which hinder the absorption of essential nutrients. In addition, variables such as low maternal literacy limit knowledge about adequate hygiene and feeding practices, while insufficient family income aggravates precarious sanitary conditions.

These factors interact negatively, contributing to the impairment of child development and impacting both the physical growth and behavior of children in this population, as symptomatic signs such as fatigue, dizziness, and decreased muscle mass emerge (Campos *et al*., 2016).

Regarding anemia, it presents itself in many different forms; however, reference articles highlight the prevalence of iron deficiency anemia. Between 2018 and May 2023, the number of hospitalizations for iron deficiency anemia and malnutrition among indigenous people totaled 3,059, of which 1,622 were due to the first cause and 1,427 to the second. The variation in values is based on region of the country, sex, and age group. The condition is prevalent in the North region, particularly among women and indigenous children aged 1 to 4 years (Ferreira *et al.,* 2023). Furthermore, according to the National Indigenous Health Survey, 25.7% of children had a growth deficit for their age, indicating chronic malnutrition, and 51.2% had anemia.

Thus, malnutrition and anemia in a large part of the indigenous population of Brazil increase the incidence of infectious diseases and play a significant role in events that favor the progression of the humanitarian crisis. The challenges in combating pathogens due to the lack of resources and limited knowledge among the population contribute to their persistence and inefficient eradication, triggering events that can lead to death.

Other damages characteristic of enteroparasitosis include intestinal obstruction and diarrhea (Santos *et al*., 2019). Thus, the literature shows that gastroenteritis is the second leading cause of death in children and accounts for almost half of hospitalizations among indigenous children, while diarrhea is responsible for approximately 75% of hospitalizations due to parasitic diseases. These problems are often interconnected and represent a serious challenge to public health (Simões *et al*., 2015; Ferreira *et al*., 2017).

## 5 FINAL CONSIDERATIONS

Although the literature on parasitic diseases in indigenous populations is comprehensive in terms of prevalence, there is a lack of recent studies addressing effective and culturally adapted interventions. Most of the articles cited in the initial selection of this review, specifically those addressing intestinal parasitic agents, were published before 2014, a period not covered by this analysis. Furthermore, there is a lack of longitudinal data on the evolution of parasitic diseases after the implementation of public policies, making it difficult to assess the effectiveness of interventions. Limited infrastructure in many communities also compromises the effectiveness of specific actions, perpetuating cycles of infection and reinfection.

In this sense, future research should explore areas that are still poorly documented, such as the impact of sanitation programs and the provision of drinking water in remote communities, which are essential for reducing parasitic disease rates. Furthermore, the implementation of culturally adapted health education strategies is crucial for improving adherence to treatment and prevention. Studies are also needed on the interaction between climate change and the epidemiology of parasitic diseases, as environmental factors can influence the distribution and intensity of infections. These approaches can provide valuable insights for more effective strategies to combat parasitic diseases in indigenous populations.

Therefore, this review reinforces the relevance of parasitic diseases as a significant public health problem in indigenous populations in Brazil. It is clear that despite the advances made in the last century, there is still a long way to go in the struggle to implement effective indigenous management policies that respect their cultural individuality and integrity. Understanding the causes and consequences of these infections is crucial for developing more efficient public health policies in these communities. Only by implementing intervention strategies that respect local contexts and improve sanitary conditions will it be possible to reduce the burden of parasitic diseases and improve the health of the indigenous population in the long term.

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