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PARASITIC DISEASES IN CHILDREN

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Abstract
Parasitic infections in children remain a major concern in global public health. This analytical article examines the prevalence, risk factors, and socio-hygienic contexts of intestinal parasites and other parasitic diseases affecting children. Recent studies (for example, in Egypt, where the prevalence among preschool and school-aged children was found to be approximately 46.5%) demonstrate that poor sanitation and economic disadvantages are strongly associated with increased infection risk. This article analyzes the epidemiological status of parasitic diseases in children and outlines prevention strategies.

Keywords: Children; parasitic infection; intestinal helminths; hygiene factors; epidemiology; prevention.

Introduction

Intestinal parasites (such as soil-transmitted helminths, protozoa, and schistosomiasis) continue to pose a serious global health burden with significant impact on child health. According to the World Health Organization, soil-transmitted helminths (STH) may infect approximately 1.5 billion people worldwide, with preschool and school-aged children being the most affected groups. In 2023, millions of children were identified as requiring preventive chemotherapy. These indicators confirm the heavy public health burden of parasitic diseases and highlight their widespread distribution, especially in low-income regions.

Epidemiological studies and recent meta-analyses show that the prevalence of parasitic infections among children remains high in many regions. Despite geographical variation, in some low- and middle-income countries the prevalence among school-aged children may range between 20–50% or even higher. This heterogeneity is largely influenced by socioeconomic conditions, sanitation and water supply quality, education levels, and the presence of local prevention programs. Epidemiological mapping suggests that targeted interventions based on regional and age-specific characteristics are essential to reduce the burden of parasitic diseases.

Parasitic infections in children negatively affect multiple dimensions of health. Intestinal helminths and certain protozoa impair digestion and micronutrient absorption—particularly iron, zinc, and vitamin A—leading to anemia, stunted growth and development, undernutrition, and reduced cognitive function. Numerous epidemiological and clinical studies demonstrate a strong association between parasitic load and nutritional status, with severe or recurrent infections negatively affecting overall well-being and school performance. Therefore, parasitic diseases should be regarded not

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only as infectious dermatological or enterological conditions but also as complex socio-biological issues influencing children's development.

Age-related behavioral patterns and socio-environmental factors play a central role in transmission. Behaviors such as playing in dusty soil, putting fingers in the mouth, poor hygiene practices, lack of clean drinking water, inadequate sanitation infrastructure, and low parental or household educational levels are all associated with increased infection risk. Higher prevalence is also observed in rural areas and in populations with significant migration flows. Analysis of these risk factors highlights the importance of prevention strategies such as large-scale deworming (preventive treatment), WASH (Water, Sanitation and Hygiene) programs, and health education.

Challenges in diagnosis and monitoring also persist. In many low-resource settings, limited laboratory capacity and the low sensitivity of diagnostic methods allow a portion of infections to go undetected, hindering the effective targeting of prevention and treatment programs. Therefore, proper surveillance—including standardized diagnostics, regional prevalence monitoring, and adaptive response measures—is a crucial component of effective parasitic disease control strategies.

Materials and Methods

This work was conducted using a literature review methodology. International and regional studies published over the last 5–10 years were selected.

The aim was to provide an evidence-based analysis of the prevalence, risk factors, and prevention strategies of parasitic infections in children. Scientific articles concerning preschool and school-aged children were reviewed, and general indicators were summarized through tables and graphs.

Selected studies were analyzed in terms of methodology, sample characteristics, diagnostic tools, and data analysis techniques.

Statistical indicators (e.g., prevalence and risk-factor association coefficients) were used to conduct comparative analysis.

Results

Prevalence and Overall Distribution

Intestinal parasitic infections (IPI) among preschool and school-aged children remain widespread in various countries. For example, in the study "Prevalence of intestinal parasitic infection and its associated risk factors among primary school children in Ethiopia: a systematic review and meta-analysis", an analysis of 30 articles involving 14,445 children revealed that 46.09% (95% CI: 38.50–53.68) were infected with at least one intestinal parasite.

Another study, "Prevalence and risk factors of intestinal parasitic infections among preschool and school-aged children in Egypt: a systematic review and meta-analysis" (Egypt, 21 studies, 54,282 children), reported a prevalence of 46.5% (95% CI: 40.5–52.5) for at least one IPI.

A summary of these data is presented below:

Study location	Number of children	Infection with at least one parasite, %	Notes
Ethiopia meta-analysis	14,445	46.09% (95% CI: 38.50–53.68)	preschool and school-aged children
Egypt meta-analysis	54,282	46.5% (95% CI: 40.5–52.5)	21 studies, 2009–2021

Distribution of Parasitic Species. The Egyptian meta-analysis also provided species-specific prevalence rates:

- Entamoeba spp. – 10.9%
- Giardia duodenalis – 7.3%
- Enterobius vermicularis – 4.9%

According to a Turkish study ("Prevalence of intestinal parasites in school age children in Turkey: systematic review and meta-analysis"), based on 204,754 samples, the overall IPI prevalence among school-aged children was 29% (I^2 = 99.88%), with the highest regional level recorded in Southeastern Anatolia at 41%.

Multiple Infections (Polymicrobial parasitic infections). In the study "Prevalence of intestinal parasitic diseases in school age children in Brazil", monoinfection among school-aged children accounted for 50.6%, dual infections for 22.2%, and triple infections for 7.4%.

Results

Related to Risk Factors.

The Egyptian meta-analysis identified several key risk factors:

- Age 6–10 years: RR = 1.5 (95% CI: 1.2–1.7)
- Living in rural areas: RR = 1.4 (95% CI: 1.1–1.9)
- Low socioeconomic status: RR = 2.4 (95% CI: 1.9–3.0)
- Poor handwashing practices: RR = 2.1 (95% CI: 1.1–4.0)

In Ethiopia, notable risk factors included: lack of latrines (OR = 4.39; 95% CI: 2.50–7.73), poor nail hygiene (OR = 2.37; 95% CI: 1.67–3.35), open defecation (OR = 1.67; 95% CI: 1.64–4.36), among others.

Physical Impacts and Clinical Manifestations. Many studies have demonstrated associations between IPI and nutritional deficiencies, anemia, and poor school performance. For example, the study "Intestinal parasitic infections among children aged 7–14 years in Ethiopia: prevalence and associated factors (2024)" reported a noticeable link between IPI and anemia, as well as growth retardation among school-aged children.

Regional Differences and Trends. In Turkey, clear regional differences were documented: the prevalence reached 41% in Southeastern Anatolia, while it was lower in other regions. The Egyptian meta-analysis also showed that IPI prevalence had not significantly declined over time (2009–2021), as indicated by meta-regression analysis ($p = 0.88$, $R^2 = 0.4\%$).

Discussion

The findings of this study reaffirm that intestinal parasitic infections (IPI) in children remain a significant global epidemiological problem. Comparative analysis of meta-analyses from various countries demonstrates that the prevalence of parasitic infections in children remains within the range of 30–50%, indicating deeply rooted and persistent socio-hygienic determinants. The similarity between prevalence rates in Ethiopia and Egypt (46.09% and 46.5%, respectively), despite differences in geography and population characteristics, highlights a shared epidemiological pattern. This suggests the universality of key determinants influencing the spread of parasitic

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infections—insufficient sanitation infrastructure, low per capita income, and inadequate access to safe drinking water.

The composition of parasitic species also shows regional variation. The higher prevalence of protozoa (Giardia and Entamoeba spp.) in Egypt and the predominance of helminths in Turkey, influenced by geographic and environmental factors, indicate the close link between epidemiological patterns and ecological conditions. Such differences emphasize the need for locally adapted prevention strategies rather than uniform, one-size-fits-all approaches. For example, in areas where protozoal infections are common, improvements in water supply and filtration systems are essential, whereas mass deworming programs are more effective in regions where helminths predominate.

Countries with high rates of multiple infections—particularly Brazil, where 22.2% of children were infected with two parasites and 7.4% with three—demonstrate the complexity and cumulative nature of the epidemiological process. High levels of polyparasitism are known to exacerbate health consequences, including chronic undernutrition, anemia, growth retardation, and weakened immune function. These effects are especially pronounced in socially and economically vulnerable populations, amplifying health disparities.

Analysis of risk factors also reveals age-specific vulnerability profiles. Children aged 6–10 years constitute a high-risk group due to increased physical activity, outdoor play, and immature hygiene habits. The elevated infection risk observed among rural children (RR = 1.4) corresponds to disparities in sanitation, sewage systems, and water quality. The more than twofold increase in risk among children from low socioeconomic households (RR = 2.4) underscores the need to consider parasitic infections as "social diseases." This reflects the fact that parasitic infections are not merely biological events but mirror broader social inequities.

Several studies also highlight persistent challenges in diagnostic capacity. In many resource-limited settings, traditional microscopic methods such as Kato-Katz are still widely used, though these techniques have low sensitivity for detecting infections with light parasite loads. As a result, true prevalence is likely higher than reported. Limited implementation of molecular diagnostics often leads to underestimation of protozoal infections and undermines the accuracy of epidemiological surveillance as well as the effectiveness of prevention programs.

Regional analyses of temporal trends also provide important insights. The Egyptian meta-analysis showing no significant change in IPI prevalence from 2009 to 2021 ($p = 0.88$) indicates that existing prevention and deworming programs may not be producing sustained effects. This suggests that environmental and social factors may exert stronger influence on transmission dynamics than current public health interventions.

The clinical and physiological consequences of parasitic infections in children also require attention. Studies consistently demonstrate associations between IPI and growth retardation, anemia, and reduced cognitive performance. This perpetuates the "disease–poverty cycle": poverty increases the risk of infection, and infection further deepens poverty by impairing school performance, limiting future economic opportunities, and reinforcing social disparities.

Overall, the findings indicate that reducing parasitic infections in children requires a comprehensive, multifaceted approach. Mass deworming alone is insufficient—it provides short-term benefits but does not address the underlying determinants. Long-term epidemiological stability can only be

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achieved through integrated measures involving sanitation, water supply, hygiene education, nutritional programs, and modernization of diagnostic systems. Emphasizing regional epidemiological characteristics is essential for designing effective, targeted interventions.

Conclusion

The review and analysis confirm that intestinal parasitic infections in children remain a persistent global health burden. Meta-analytic findings from various countries—particularly large-scale studies from Ethiopia (46.09%) and Egypt (46.5%)—show that at least one parasitic infection is widespread among children. The similarity in prevalence rates, despite geographical differences, emphasizes the common socio-hygienic factors underlying transmission.

1. Although species composition varies by region, protozoa such as Giardia and Entamoeba spp., along with helminths such as Enterobius and Ascaris, remain the leading causative agents among school-aged children. High rates of polyparasitism reflect significant environmental, sanitation, and hygiene deficiencies and lead to severe outcomes such as malnutrition, anemia, growth retardation, and weakened immunity.
2. Risk-factor analysis shows significantly higher prevalence among children aged 6–10 years, those living in rural areas, and those from low socioeconomic households. Poor handwashing habits, limited access to clean drinking water, and inadequate sanitation infrastructure remain the main epidemiological drivers of transmission.
3. Regional and temporal analyses demonstrate that in some countries (e.g., Egypt), IPI prevalence has remained largely unchanged over the past decade. This suggests that existing prevention strategies—including mass deworming—are insufficiently integrated with sanitation, hygiene education, and infrastructure improvements.

In summary, reducing parasitic diseases in children requires more than pharmacological interventions. Sustainable epidemiological improvements demand a combination of social and biological measures, including enhanced sanitation and water systems, hygiene education, healthier household and school environments, and modernized diagnostic and surveillance systems. Implementing molecular diagnostic methods and strengthening epidemiological monitoring will improve accuracy of prevalence assessments and allow for more targeted and effective prevention strategies.

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