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PREVALENCE, RISK FACTORS AND EFFECTS OF INTESTINAL PARASITIC INFECTIONS IN CHILDRENS PERFORMANCE ATTENDING THE GOVERNMENT PRACTICING NURSERY AND PRIMARY SCHOOL BAMENDA

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ABSTRACT

Background: Intestinal parasitic infections (IPIs) continue to pose a major public health challenge, particularly among school-aged children in developing countries where inadequate sanitation, poor hygiene practices, and limited access to clean water prevail. This study assessed the prevalence, risk factors, and effects of IPIs on the academic performance of children attending Government Practicing Nursery and Primary School in Bamenda, Cameroon. **Methods:** A cross-sectional design was employed, involving the collection and microscopic analysis of stool samples from 65 pupils, complemented by structured questionnaires capturing socio-demographic information, sanitation practices, and dietary habits. Informed consent was gotten from the parents or guardians of the children who were sampled using the convenience sampling technique. Stool analysis was done in the FLEHNHIBS laboratory after having concentrated the stool samples using the Formol Ether concentration technique, following all standard protocols. Data analysis was done using SPSS version 21, and statistical significance was considered if p value was less than or equal to 0.05. **Results:** The study revealed a 36.9% prevalence of intestinal parasitic infections among primary school pupils in Bamenda, with *Ascaris lumbricoides* being the most common (23.1%), followed by *Entamoeba histolytica* (10.8%) and *Giardia lamblia* (3.1%). Among the risk factors examined, consumption of undercooked meat or fish (p=0.03) and the number of users of a defecation medium (p=0.04) were significantly associated with higher infection rates. Other factors such as handwashing habits, pet ownership, and source of drinking water showed no statistically significant relationship with infection (p>0.05). Furthermore, the presence of parasitic infections was found to significantly affect academic performance (X^2=13.2, p=0.04), with infected pupils shifting from excellent to lower performance grades (very good or good). Pupils infected with *A. lumbricoides* and *E. histolytica* showed greater academic decline compared to others. This underscores the detrimental impact of parasitic infections on learning outcomes, especially in resource-limited school settings. **Conclusion:** Regular deworming programs and improved hygiene practices should be implemented in schools to reduce parasitic infections and enhance pupils' academic performance.

KEYWORDS: Prevalence, risk factors, Intestinal parasitic infections, Effects on academic performance of children, Government Practicing Nursery and Primary School in Bamenda, Cameroon.

BACKGROUND

Intestinal parasitic infections (IPIs) are caused by parasites inhabiting the gastrointestinal tract and represent a significant global public health burden, especially among children.[1] According to the World Health Organization (WHO), approximately 3.5 billion individuals are infected annually, with the highest burden observed in developing regions.[2,3] Factors such as globalization, international travel, and migration have contributed to an increasing incidence in developed nations as well.[4] However, the most affected regions remain sub-Saharan Africa, Asia, Latin America, and the Caribbean—areas characterized by tropical climates, overcrowding, poor sanitation, inadequate clean water supply, and low socio-economic status.[5] Additional risk factors include poor hygiene practices, insufficient health education, and food handlers carrying infections.

Children are especially vulnerable to IPIs, which are strongly associated with malnutrition, stunted growth, malabsorption, and learning impairments. In many developing countries, including Cameroon, children with IPIs often present with significant wasting and developmental delays.[6,7] In response, the WHO recommends periodic deworming of school-aged children in endemic areas to improve their nutritional status, hemoglobin levels, cognitive ability, and general well-being.[8] Given the variability in prevalence across and within countries, regular localized assessments are essential for guiding effective interventions. This study seeks to address this gap by assessing the prevalence, risk factors, and consequences of IPIs on the growth and academic performance of children in government nursery and primary schools in Bamenda.

Despite the availability of effective treatment options, IPIs remain a persistent global health issue, particularly among children, where they contribute to impaired academic performance, absenteeism, and cognitive delays.[6,7] These infections are endemic in many low and middle-income countries and are often linked to poor hygiene, lack of clean water, and limited public health infrastructure.[6] In rural settings, such as those found in parts of Cameroon, a lack of awareness and poor health-seeking behavior further exacerbate transmission. Food handlers also contribute significantly to the spread of IPIs. Behavioral factors, including inadequate personal hygiene and non-compliance with preventive measures, play a crucial role in sustaining high infection rates.[6,7]

In Cameroon, the government has initiated several interventions aimed at reducing the burden of IPIs among school-aged children. These include the National Deworming Campaigns, which have been conducted annually since 2007, and health education programs in primary schools. These campaigns typically involve administering anti-parasitic medications such as Mebendazole and Praziquantel to millions of children. In 2024, for instance, over one million children were targeted for deworming in the Centre Region alone. Studies, such as one conducted in the South-West Region, have shown that health education can significantly reduce the prevalence of parasitic infections among school children.[5,9]

Despite these commendable efforts, parasitic infections remain prevalent in Cameroonian primary schools. The continued transmission has serious implications for children's academic outcomes, as these infections can result in anemia, stunted growth, and decreased cognitive function. A study in Ghana demonstrated that children infected with intestinal parasites performed worse academically compared to their uninfected peers, underscoring the educational impact of these infections.[8] To date, there is a dearth of research specifically targeting the prevalence and effects of IPIs in Bamenda, Cameroon. No studies have evaluated these parameters in the selected government nursery and primary school. This study therefore aims to fill this gap by assessing the prevalence, risk factors, and impact of intestinal parasitic infections on academic performance among school children in Bamenda.

METHODOLOGY

The study was conducted in Bamenda III Sub-Division, North West Region of Cameroon, targeting pupils of the Government Practicing Nursery and Primary school. A cross-sectional study design was employed between May 15 and June 10, 2025. The dependent variables studied included the prevalence and effects of intestinal parasitic infections on the educational performance of the children. The associated risk factors and socio-demographic characteristics in the study were the independent variables in the study. The study population comprised of conveniently sampled children whose parents or guardians gave informed consent, while children from other schools or those who did not consent, failed to fill questionnaires, or failed to submit stool samples were excluded. A minimum sample size of 65 was calculated using the standard formula with a 5% margin of error. Data collection involved parent/guardian-administered questionnaires and laboratory analysis of the children's stool samples using direct microscopy with normal saline and Lugol's iodine, and the Formol-Ether concentration technique following all standardised protocols in the Florence Nightingale Higher Institute of Health and Biomedical Sciences laboratory. Data was analyzed using SPSS version 21 with Chi-square tests for associations, and p-values ≤ 0.05 was considered statistically significant. Ethical clearance was obtained from relevant authorities, and informed consent and school permissions were secured, ensuring confidentiality and academic use of the data.

RESULTS

Demographic information of the study population

The study was dominated by the female pupils constituting 33(50.8%) of the total population, most of whom were of the age range 9-11 years 49(75.4%) (table 1).

Table 1: Distribution of respondents according to demographic data.

Variable	Characteristics	Frequency	Percentage (%)
Age	5-8 years	14	21.5
	9-11 years	49	75.4
	>11 years	2	3.1
	Total	**65**	**100.0**
Gender	Male	32	49.2
	Female	33	50.8
	Total	**65**	**100.0**

Prevalence of parasitic intestinal infections amongst primary school pupils

The field study realized an overall percentage prevalence for intestinal parasitic infections of 36.9% (24 infected out of 65 respondents). This prevalence was distributed amongst the parasites discovered to affect the participants, with *A. lumbricoides* leading with a percentage prevalence of 23.1%(n=15), followed by *E. histolytica* with a percentage prevalence of 10.8%(n=7), and lastly by *Giardia lamblia* with a percentage prevalence of 3.1%(n=2), (table 2)

Table 2: Prevalence of intestinal parasites among primary school pupils.

Characteristic	Category	Frequency	n	Prevalence per organism	Percentage prevalence (%)	n of infected	Prevalence of parasitic infections (%)
Microscopy	NPS	41	65	0.631	63.1	24	36.9
	A. lumbricoides	15		0.231	23.1		
	E. histolytica	7		0.108	10.8		
	Giardia lamblia	2		0.03	3.1		
	Total	65		1.0	100.0		

NPS-No parasite seen

Risk factors associated with the occurrence of parasitic infections in primary school pupils

Of the studied risk factors to parasitic infections with intestinal parasites, frequency of consumption of undercooked meat or fish was seen to be significantly associated with the occurrence of parasitic infections with a Chi square (X^2) of 3.54, and p-value of 0.03. And the number of users of a defecation medium, also came out significant with a X^2=2.01, and p=0.04 (table 3).

Table 3: Association of risk factors to the occurrence of intestinal parasitic infections.

Characteristic	Category	Parasitic infection		Total	X^2	p-value
		Negative	Positive			
Manner of hand wash with soap and water	Always	6	2	8	4.7	0.19
	Most of the times	27	12	39		
	Sometimes	8	9	17		
	Rarely	0	1	1		
Total		**41**	**24**	**65**		
Have pets at home	Yes	23	12	35	0.22	0.63
	No	18	12	30		
Total		41	24	65		
Frequency of consumption of Undercooked or raw meat or fish	Always	2	3	5	3.54	**0.03***
	Most of the times	10	7	17		
	Sometimes	18	11	29		
	Rarely	10	2	12		
	Never	1	1	2		
Total		**41**	**24**	**65**		
Hand wash after toilet visit	Yes	40	23	63	0.15	0.69
	No	1	1	2		
Total		**41**	**24**	**65**		
Form of drinking water	Tap	39	23	62	0.01	0.89
	Filtered water	2	1	3		
Total		**41**	**24**	**65**		
Number of users of defecation medium	1-3 users	2	0	2	2.01	**0.04***
	4-6 users	25	17	42		
	7-9 users	13	7	20		
	>9 users	1	0	1		
Total		**41**	**24**	**65**		
Defecation medium	Latrine	22	13	35	0.002	0.96
	Toilet	19	11	30		
Total		**41**	**24**	**65**		

***-statistically significant at 0.05 significance level**

The effects of intestinal parasitic infections on the performance of primary school children

The presence of parasitic infections on the children showed to have a minimal but significant effect on them, deviating them from excellent performance to very good and good grades. This is seen with a X^2=13.2, and p=0.04, with *A. lumbricoides* being the most frequent organism, followed by *E. histolytica* and lastly *G. lamblia* (table 4).

Table 4: Effects of parasitic infections on children's performance at school.

Characteristic	Category	Recent child performance at school			Total	X^2	p-value
		Excellent	Very good	Good			
Microscopy	NPS	4	30	7	41	13.2	**0.04***
	A. lumbricoides	3	9	3	15		
	E. histolytica	0	3	4	7		
	Giardia lamblia	0	0	2	2		
Total		**7**	**42**	**16**	**65**		

***-statistically significant at 0.05 significance level, NPS-No parasite seen**

DISCUSSION

The present study found a relatively high prevalence of intestinal parasitic infections (IPIs) among primary school pupils, with 36.9% of the 65 respondents testing positive. This prevalence aligns with findings from similar studies conducted in resource-limited settings, particularly in sub-Saharan Africa, where environmental sanitation challenges and poor hygiene practices persist.[10] Among the parasites identified, *Ascaris lumbricoides* was the most prevalent (23.1%), followed by *Entamoeba histolytica* (10.8%), and *Giardia lamblia* (3.1%). The predominance of *A. lumbricoides* is typical in school-age children due to its transmission through contaminated soil and unwashed hands. The findings underscore a public health concern in school environments, where children are often exposed to unhygienic conditions and have limited health education on preventive measures.[11] The variation in prevalence among different parasites could be attributed to differences in their life cycles, modes of transmission, and environmental resistance.[12] Furthermore, this prevalence rate is alarming given the high vulnerability of school-aged children to parasitic infections and the long-term implications on their health and development.[13]

Several risk factors were evaluated for their association with the occurrence of IPIs. Among them, the frequent consumption of undercooked or raw meat or fish showed a statistically significant association with parasitic infections ($\chi^2 = 3.54$; $p = 0.03$), indicating dietary habits as a key contributor to the transmission of these infections.[14] Additionally, the number of users per defecation medium also had a significant association ($\chi^2 = 2.01$; $p = 0.04$), suggesting that overcrowded sanitary facilities may increase the risk of exposure to parasite eggs or cysts through shared contaminated surfaces.[15] In contrast, factors such as handwashing after toilet visits, form of drinking water, and pet ownership did not show statistically significant associations. These results highlight the importance of targeting specific behaviors and infrastructural inadequacies when designing interventions to reduce the burden of IPIs.[16] Effective health education, improved sanitation infrastructure, and routine deworming campaigns could significantly reduce infection rates, especially in settings where resources are scarce.[17]

The presence of parasitic infections had a statistically significant impact on the academic performance of pupils ($\chi^2 = 13.2$; $p = 0.04$). Children infected with intestinal parasites showed a decline in academic performance, with fewer achieving excellent grades compared to their non-infected peers. Infected children mostly fell into the "very good" and "good" categories, indicating that even subclinical infections could have cognitive and educational consequences.[18] The observed decline in performance may be due to factors such as abdominal discomfort, anemia, malabsorption of nutrients, and fatigue, common symptoms associated with helminthic and protozoal infections.[19] *A. lumbricoides* was the most frequently associated with reduced performance, reinforcing its clinical and educational significance. This finding supports earlier reports that link parasitic infections with impaired cognitive development, absenteeism, and reduced concentration in school-age children.[20] Consequently, addressing parasitic infections through school-based health programs not only improves child health but also contributes to educational achievement and long-term societal development.[21] The data clearly demonstrate the dual burden of disease and education loss due to parasitic infections in vulnerable child populations.

CONCLUSION

The study revealed a high prevalence (36.9%) of intestinal parasitic infections among primary school pupils, with *Ascaris lumbricoides* being the most common parasite. This indicates that parasitic infections remain a significant public health concern in school-aged children, especially in environments with poor sanitation and hygiene.

Two key risk factors were found to be significantly associated with these infections: frequent consumption of undercooked or raw meat/fish and the number of users per defecation facility. These findings suggest that food hygiene practices and sanitation infrastructure play

critical roles in the transmission of intestinal parasites among children.

Intestinal parasitic infections were also shown to negatively affect the academic performance of pupils. Infected children had fewer excellent grades compared to their non-infected peers, highlighting the need for regular deworming, improved hygiene education, and targeted health interventions in schools to support both health and learning outcomes.

Author's contribution

LHS, Study conception and design, writing of the manuscript; CCN, Data collection and critical revision of the manuscript; LHS/CCN, Study design, supervision of data collection and critical revision of manuscript; CCN, Data analysis and critical revision of manuscript; TLM, Study design, acquisition and interpretation of data, critical revision of manuscript; WEC/CNT, Study conception and design, supervision of data collection and critical revision of manuscript. All authors gave their consent for publication. All authors read and approved the final manuscript.

Availability of data and materials

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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