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The Prevalence of Intestinal Parasites in Secondary School Students in Kumbo, North West Region of Cameroon.

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ABSTRACT

Intestinal parasitic infection remains a major public health concern particularly in low- and middle-income countries where inadequate sanitation, poor hygiene practices, limited access to safe drinking water, poverty facilitate transmission. In Cameroon, these infections continue to be reported in many communities despite ongoing control measures. Secondary school students are among the vulnerable groups because they are frequently exposed to contaminated food, water, and soil. Determining the prevalence of this infection will provide valuable evidence on the magnitude of the problem and identify the need for appropriate public health interventions. To establish the prevalence of intestinal parasitic infestation among secondary school students in Kumbo – Bui Division, North West Region of Cameroon, 727 stool samples were examined microscopically in the Catholic School of Health Sciences Shisong Laboratory involving six different secondary schools. During health education, knowledge on basic hygiene and sanitation was assessed among the students and clarifications made on the questions posed. It was a prospective cross-sectional community and laboratory-based study from the 29th of November, 2010 to March 10th, 2011. Stool samples were analyzed using both the wet (saline, iodine) mount and the formol-ether concentration techniques and the later proved to be more efficient as it gave 60% as opposed to 40% wet mount of the total intestinal parasitic prevalence. The general prevalence of intestinal parasite was 30.4% that is, 221 students out of the 727 students had intestinal parasites implying one-third of the population were harboring intestinal parasites with 40% prevalence of mixed infections. Nine different intestinal parasites were identified with *Entamoeba coli* having the highest prevalence of 45.4% and *Taenia* species had the least prevalence of 0.26% and SAC had the least prevalence of 2.61%. Female had a higher prevalence of 23.25% compared to 7.15% in males. Junior classes had higher prevalence compared to senior classes. Intestinal parasites remain a call for concern in Kumbo municipality. The high prevalence was linked to poor hygiene and low level of education among these students, domestic animal rearing (though to a lesser extent) which serves as reservoirs for some of these parasites especially helminths. **Keywords :** Intestinal parasitic Infestation, secondary school students, risk factors, prevalence.

INTRODUCTION BACKGROUND

Intestinal parasitic infections remain a major public health concern, particularly in low- and middle-income countries where inadequate sanitation, poor hygiene practices, limited access to safe drinking water, and poverty facilitate transmission. School age and adolescents are among the most vulnerable groups because they are frequently exposed to contaminated food, water and soil (Sultana F., *et al*, 2026; James F., *et al*, 2025).

In Cameroon, intestinal parasitic infections continue to be reported in many communities despite ongoing control measures. However, there is limited recent data on the burden of these infections among secondary school students in Kumbo. Determining the prevalence of intestinal parasites among secondary school students in Kumbo will provide valuable evidence on the magnitude of the problem and identify the need for appropriate public health interventions. The findings will support school-based health education, regular deworming programs, improvement in water, sanitation and hygiene (WASH) services and policy decisions aimed at reducing the burden of intestinal parasitic infections and improving the health and academic performance of students.

MATERIALS AND METHOD

Study area

This study was carried in Kumbo in Bui-Division, North West Region of Cameroon. It has two main seasons; rainy (from mid-March to early October) and dry (mid-October to early March) seasons. It has temperatures of about 10°C to 20°C in the morning and 35°C to 37°C in the noon. In the rainy season, it varies from 20°C to 30°C with rainfall that becomes heavy in August and September. The indigenous population is about 70 to 80 thousand inhabitants with “Lamso” as the native language. Most of the inhabitants are farmers, teachers and traders with coffee as the main cash crop. Their food crops are corn, beans and huckleberry. Fufu corn and huckleberry called “Kiban and Nyusege” with potatoes and beans called “Tookuni” as

their main traditional dishes. Pidgin and grammar English together with French (common among the educated) are the main languages spoken. Here, there is a nuclear and isolated settlement mostly towards the periphery (main roads).

Kumbo has a hilly or undulating topography with two main Hospitals; Bansa Baptist Hospital and St. Elizabeth Catholic Mission General Hospital and Cardiac Center Shisong. Kumbo has 30 nursery schools, 90 primary schools, 50 secondary schools and about 7 professional schools.

Study design

It was a prospective cross-sectional community and laboratory-based study carried out on 727 stool samples from the 29th of November, 2010 to March 10th, 2011 in Kumbo.

Study population

Secondary school-based study involving students from both day-to-day and boarding schools, private and public schools in Bamkikai, Kumbo and Shisong.

Data collection and processing

It was a prospective cross-sectional community and laboratory-based study carried out on 727 stool samples from the 29th of November to March 10th, 2011. A stratified (arranging them according to classes) method of sample collection was used. Health education was given to the students before sample collection on the importance of screening for intestinal parasites. The purpose of the study was explained to students to obtain their informed consent and they were assured of the confidentiality of their assay results. Clean dry stool (Bijoux) bottles labelled with the code of the school and serial number were given to students. They were instructed on how to collect and bring the samples. The stool samples were analyzed using both the wet (saline, iodine) mount and the formol-ether concentration techniques.

Data on results was entered into a password protected computer which could be accessed only by the principal investigator. Daily data

monitoring was done to ensure completeness and timeliness of data.

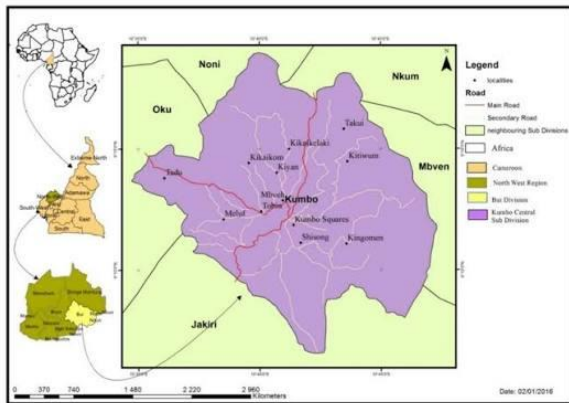


Fig1: The map of Kumbo in Bui Division, North West Region of Cameroon (Research Gate, 2026).

Data Analysis

Raw data was entered into Microsoft Excel spreadsheet and later imported into R version 4.2.3 for statistical analysis. Descriptive statistics were used to analyze the clinical data according to the different parasites which was then presented as percentages, on table, bar charts, scatter graph, area graph and pie charts. Frequencies, means and standard deviations were computed to summarize the data and calculations were done for continuous variables while frequency distributions were calculated for categorical variables (schools, gender, various classes, the different parasites). To compare proportions between the dependent (intestinal parasites) and the independent (the various classes, gender, schools) variables, Pearson Chi square and Fisher exact tests were used.

RESULTS

General Prevalence of Infestations

Table 1: Overall prevalence of infections

	Number Infected	Total	Prevalence
Infections	221	727	30.4%

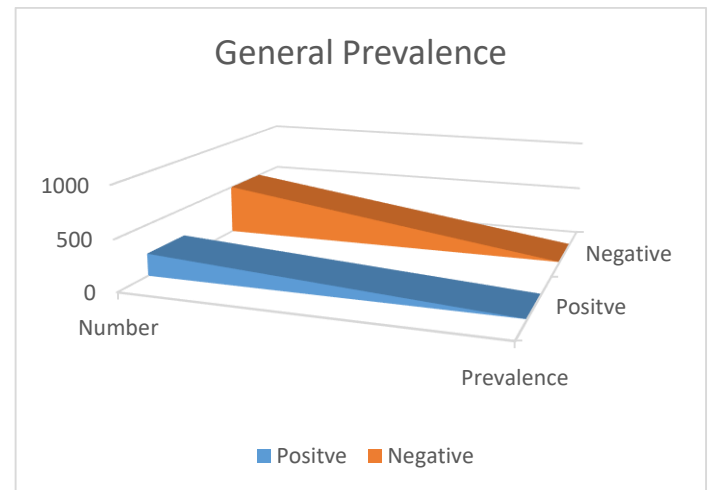


Fig 2: An area graph showing overall prevalence of infections.

From the 29th of November, 2010 to the 10th of March, 2011, 727 stool samples were collected from secondary school students in Kumbo, 221 of them had intestinal parasites giving a general prevalence of 30.4%.

Prevalence According to the Different Parasites

Table 2: Prevalence according to the different parasites

Group	Parasite	Number Seen	Percentage Prevalence (%)
Protozoa	<i>Entamoeba histolytica</i>	58 (21.40)	14.80 (25.52)
	<i>Entamoeba coli</i>	178 (65.68)	45.4 (25.51)
	<i>Giardia lamblia</i>	20 (7.38)	5.10 (25.50)
	<i>Iodamoeba butschlii</i>	15 (5.54)	3.83 (25.53)
	Total	271	69.14
Yeast	<i>Candida species</i>	88 (22.45)	22.45 (25.51)
Helminths	<i>Ascaris lumbricoides</i>	25 (6.38)	6.38 (25.52)
	<i>Taenia species</i>	01 (0.26)	0.26 (2.6)
	<i>Trichuris trichiura</i>	03 (0.77)	0.77 (25.67)
	Hookworm	05 (1.28)	1.28 (25.6)
	Total	34	8.69
Grant total		392	100

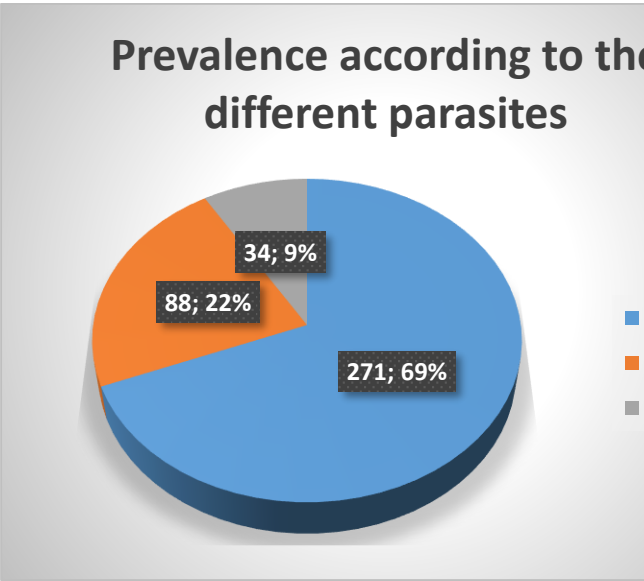


Figure 3: A pie chart showing prevalence of the different parasites identified

34 students had helminthic infection (4.67%), 271 (37.27%) had protozoa infection and 88 (12.10%) had yeast infection. Protozoa was more prevalent with a percentage of 69.14%. Mixed infection was observed in about 40% of the students.

The high prevalence of protozoa infection shows that person-to-person transfer through food or water is high level of contamination by human faeces. There are problems of drainage where by manure heaps and faecal droppings from both animals and humans are found in most places, as such contaminates originally clean wells by the sinking of contaminated water. The students hardly take the ant-protozoa drugs.

The good hand-washing practice which ordinarily should interrupt the transmission of some of these parasites as expected is inadequate since clean water supply is limited and or takes a lot of manual effort and the tendency to use water sparingly. This eventually results in further transmission by direct and indirect contact.

The prevalence of yeast infection is due to the fact that the students take anti-fungal agents only on prescription. They consume a lot of fermented product like “garri”, “meyondo”, bread, yogurt that enhance the growth of yeast cells.

The prevalence of helminth infection is due to the fact that most of these students live in crowded or unhealthy situations which facilitate the spread, distribution and sustenance of various helminthic factors. The socio-economic (poverty, malnutrition, low standard of living, home visits), and agricultural practices of the students coupled with ecosystem degradation in creating conditions favorable for high transmission and sustenance of many human diseases especially parasitic diseases. In addition to that, only few of these students are dewormed by parents/guardians who are health conscious.

In Kumbo, there are many food vendors from which these students buy and eat food. Some of these food stuffs are not well cooked and thus carries viable forms of the parasites. Most of these food vendors have limited knowledge on hygiene and sanitation thus high chances of transmitting some of the intestinal parasites from contaminated objects into ready food. Most of these food vendors do not take anti-helminthic and anti-protozoa drugs except on prescription, so if infected, will become a source of infection to customers especially at the

School	Total %	Number of positive (%)	Number of negative (%)	Positive prevalence in (%)
SAC	111 (15.27)	19 (17.12)	92 (82.88)	2.61
CMC	85 (11.69)	34 (40.00)	51 (60.00)	4.68
GSS Kimbo	101 (13.89)	27 (26.73)	74 (73.27)	3.71
OLICC	80 (11.00)	23 (28.75)	57 (71.25)	3.16
GVS	81 (11.14)	30 (37.04)	151 (62.96)	4.13
GSS Shisong	269 (39.00)	88 (32.71)	181 (67.29)	12.00
Total	727	221	506	30.39

subclinical phase.

Prevalence According to the Different Schools

Table 3: Prevalence according to the different schools.

Pearson’s Chi-square tabulated (5, 0.05) = 11.071, Chi-square calculated = 14.76

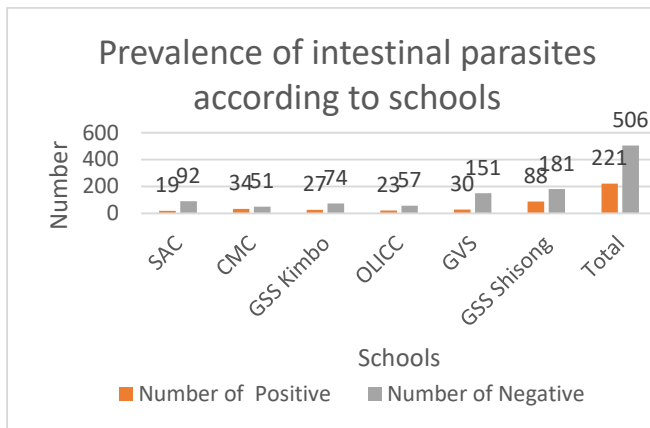


Figure 4: A bar chart showing prevalence according to the different schools.

From the above data, GSS Kimbo had the highest percentage prevalence of infection followed by CMC. SAC had the least students' evidence to say that intestinal parasites show prevalence according schools (locality).

Prevalence According to Gender

Table 4: Prevalence of Intestinal parasites according to gender

Gender	Number of positive (%)	Number of negative (%)	Total	Positive prevalence (%)
Female	169 (32.19)	356 (67.81)	525	23.25
Male	52 (25.74)	150 (74.26)	202	7.17
Total	221	506	727	30.4

Pearson's *Chi*-square tabulated (1, 0.05) = 3.841, *Chi*-square calculated = 2.86

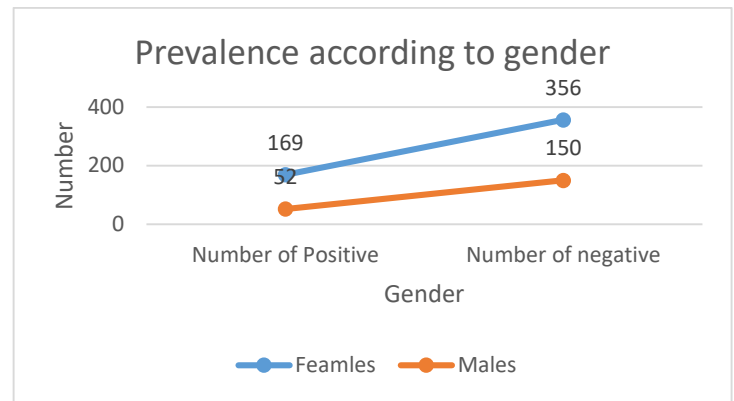


Figure 5: A scatter graph showing prevalence of Intestinal parasites according to gender

The data in table 4 shows a higher prevalence of intestinal parasites in females than males.

From the social aspects of it, many females in this study area are engaged in farming activities (since they are a farming community) than males hence, predisposed to these parasites. Some females are also engaged in animal husbandry and this might be responsible for the significantly high prevalence of intestinal parasites.

Females are involved in "cooking and tasting" of food thus eating life forms of these parasites in uncooked and undercooked food.

From the *chi* square - independent test, there is not enough evidence to show that intestinal parasitic infections are depended on gender.

Prevalence According to Classes

Table 5: Prevalence of parasites according to classes

Class (Form)	Number of positive (%)	Number of negative (%)	Total	Positive prevalence (%)
I	63 (22.63)	126 (77.37)	189	8.67
II	45 (41.28)	109 (58.72)	154	6.19
III	72 (44.44)	162 (55.56)	234	9.90
IV	41 (39.05)	105 (60.95)	146	5.64
V	0 (0.00)	4 (100)	4	0
Total	221	506		30.4

Pearson's Chi-square tabulated (4, 0.05) = 9.488, Chi-square calculated = 2.95

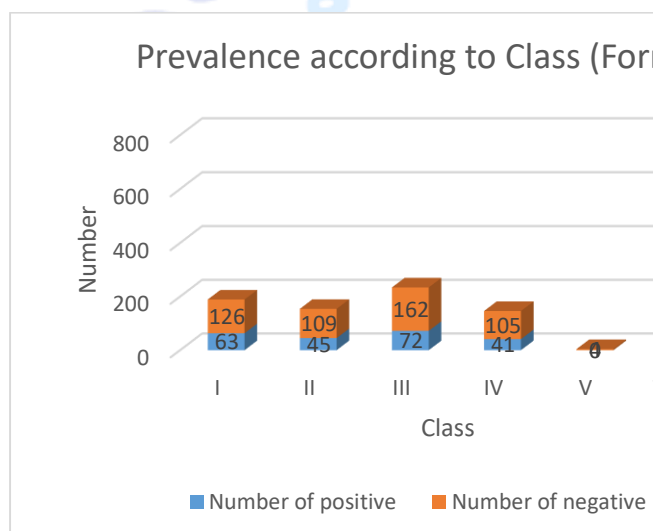


Figure 6: An area graph showing prevalence of parasites according to classes

From the above data, Form 3 had the highest prevalence (9.9%). Form 4 had the least prevalence (0.00%). The lower classes have little knowledge on hygiene and sanitation compared to the higher classes. Students in higher classes intentionally practice hygienic measures since they know that intestinal parasitic agents thrive mostly in polluted environment such as refused heaps, gutters and sewage units in and around human dwelling.

Younger students (lower classes) have lower immune systems compared to older students (higher classes) since immunity increases with

age. Due to this lower immunity, there is greater chance for an intestinal parasitic agent to establish when it gets into the body.

From the *chi* square - independent test, the prevalence of intestinal parasitic infections varies significantly according to classes.

DISCUSSION

This study indicates a high prevalence (30.4%) of intestinal parasites among the 727 secondary school students in Kumbo according to gender, class, and school. This is in line with the 34.2% general prevalence established among primary school children in Southern Ethiopia (Bhaumik S. *et al*, 2019). The prevalence of intestinal parasites can be related to the school, whether day-to-day or boarding, whether single or mixed gender. Other things such as social and economic status and climatic conditions may influence the prevalence of intestinal parasites in secondary school students in Kumbo.

From the results obtained, GSS Shisong had the highest general prevalence of 21.10%. SAC had a prevalence of 2.61%, CMC had 4.68%, GSS Kimbo had 4.71% and GVS had 4.13% which are all lower compared to GSS shisong. GSS Shisong is a mixed gender day-to-day school where hygiene and sanitation are not strictly observed, thus accounting for the highest prevalence.

From the results obtained, females had a higher general positive prevalence of 23.25% compared to males with 7.15%. This is similar to another study carried out in Southern Ethiopia where females had a positive prevalence of 35.9% while males had 32.1% (Bhaumik S. *et al*, 2019). This high positive prevalence is attributed to social and economic status.

The results obtained showed that lower classes had a higher prevalence compared to higher classes. The trend of prevalence decreases from one class to another; form I with 8.67%, form II with 6.19%, form III with 9.9%, class IV with 5.64% and form V with 0.00%. This is similar to the higher prevalence established among school children aged 10-12 in Southern Ethiopia (Bhaumik S. *et al*, 2019). This implies that senior

students practice hygiene and sanitation more than junior students since they are more knowledgeable.

From the results obtained and among the nine parasites identified, *Ascaris lumbricoides* came out with the prevalence of 6.38%. This shows a decrease compared to the 42.0% in Sierra Leone among students (James F., *et al*, 2025) and higher than the 5.9% in Southern Ethiopia (Bhaumik S. *et al*, 2019). This shows that there is a general decrease of prevalence in secondary school students compared to primary school pupils which is due to increase hygiene and sanitation as a result of increasing awareness. The prevalence in secondary schools can be attributed to social and economic status as well as climatic conditions.

CONCLUSION

Intestinal parasitic infection is one of the most important factors that account for health problems in our society. Since all these parasites has their main mode of transmission as faeco-oral route, the Kumbo municipality should focus on prevention, early detection, treatment, and health promotion in schools.

It is also indicated that sanitary measures can no longer keep pace with the problem created by the fast growing urban and rural population therefore, based on the WHO recommendations and risk factors in the area, the following interventions are practical and actionable: implement school-based deworming programs, strengthen water, Sanitation and Hygiene (WASH). Introduce regular health education, establish routine screening and surveillance, train teachers and school health coordinators, strengthen school health services, engage parents and the community in preventive activities, improve food safety in schools. Strengthen multisectoral (Council, Health District service, Ministry of Secondary Education) collaboration. Monitor and evaluate interventions.

These integrated interventions are expected to reduce the prevalence of intestinal parasitic infections, improve students' health and enhance academic performance.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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