Asian Journal of Social Science and Management Technology
ISSN: 2313-7410
Volume 4, Issue 1, January-February, 2022
Available at www.ajssmt.com

Socio-Environmental Conditions and Prevalence of Intestinal Parasitic Infection among Children in Bauchi Metropolis, Bauchi State

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Abstract: The study was conducted to investigate the socio-environmental conditions and prevalence of intestinal parasite infection among children in Bauchi metropolis, Bauchi state. The objectives of the study were to determine the prevalence of human intestinal parasite infection in the area of study, determine the relationship between sex of the infected children and to determine the socio-environmental condition of the infected children. Stool samples were collected from five hundred and sixty-two children. The samples were treated and examined microscopically for ova, cyst and eggs of intestinal parasite. The socio-environmental conditions were determined using questionnaire and anthropometric measurement. The result reveals that many children (28.11%) are infected with intestinal parasite. Ascaris lumbricoida, Trichuris trichura, Hookworms and eterobias vermicularis are the common prevailing parasites. While Giadia lamblia is the least common occurring parasite It was also discovered that there is no discrimination of infection among sexes. It was concluded that the prevalence of intestinal parasite infection among children is increasing compared to previous studies and the increase is related to poor socio-environmental condition of the children. It is therefore, recommended that there is need to embark on health education on prevention and control measures of intestinal parasite and government should strengthen and support WHO program of providing free antihelminthes drugs to children.

Key words: Intestinal parasites, socio-environmental conditions, prevalence, Bauchi Metropolis.

1. Introduction

Intestinal parasitic infections (IPIs) have been a big concern for low-income countries as they are the major cause of high morbidity and mortality. Annually, between 500 million and 1 billion people are estimated to be infected with intestinal parasites worldwide (WHO, 2010). Most infectious diseases caused by members of the intestinal parasites (protozoan and helminths) have been considered as Neglected Tropical Diseases (NTDs) and are affecting a large section of poor communities (Hotez, Alvarado, & Basáñez, 2014). Intestinal helminthiasis and protozoan infections are widespread throughout the world, Nigeria and Bauchi State in particular, millions of people in low-income countries are infected and/or ill with parasitic infections (PIs). Due to this, ending epidemics of NTDS through the control of the transmission of IPIs and the mitigation of possible risk factors is one of the sustainable development goals (SDG) of the United Nations (2030 Agenda (Ajayi, Sani, SMC, Afocha, & Adesesan, 2017).

School children are considered one of the most important sectors of population due to their continuous growth and development at all levels. They are vulnerable group for intestinal parasite infections that can affect their nutritional status (Samuel, 2015). In addition, school age children are one of the groups of high risk of intestinal parasite infections because they harbor heavy intestinal parasite and serve as important source of transmission

Children are affected by IPIs far more than adults due to their higher nutritional requirements and less developed immune systems. In children, IPIs affect growth rate, protein-energy balance, and iron availability and consequently reduce mental development (Samuel, 2015). Globally, millions of pre-schoolers and schoolchildren are vulnerable to infections by parasitic worms and pathogenic protozoan species (Ajayi, et al., 2017) and are demanding urgent treatment and preventive interventions. Parasites are common in most environments.

Parasite is an organism that is entirely dependent on another organism; refer as its host for all part of its life cycle and metabolic requirement. Strictly speaking, the term parasite can be applied to any infections caused by protozoa and helminthic excluding the viruses, bacteria and fungi (Arora, 2010).
The protozoan parasite (*Entamoeba histolytica* and *Giardia intestinalis/lamblia*) and soil-transmitted helminths (*Ascaris lumbricoides*, *Trichuris trichiura*, and hookworm) are the most prevalent intestinal parasites causing high morbidity and mortality in sub-Saharan Africa, affecting nearly all inhabitants at some point in their lives (Efstratiou, Ongerth, & Karanis, 2017). The prevalence of IPIs in the region is reported to be as high as 84% in Ethiopia, 90% in Central Sudan and 84.7% in Burkina Faso (Ajayi, et al., 2017).
Intestinal parasites produce a variety of symptoms most of which manifest in gastro-intestinal complications and general weakness (WHO, 2017). In addition, WHO identified Gastro-intestinal complication to includes diarrhea, nausea, dysentery and abdominal pain. These have negative impacts on nutritional status, including decreased absorption of micronutrients, loss of appetite, weight loss, hepatomegaly, splenomegaly and intestinal blood loss that can often result in amemia. They may also cause mental and physical disability, growth retardation in children and skin irritation around the anus. Several factors may be responsible for the spread of these parasites.

Factors related to poverty, lack of awareness, and unavailability of sufficient health care as well as the prevailing bad climatic and environmental conditions are the most aggravating risk factors for IPIs (Mathaparsadh, Kwitshana, Ashiru, Sturm, & Moodley, 2014).

Intestinal parasites are among the major contributors to the global disease burden but the non-acute nature of the infections has contributed to the prevalence of intestinal parasitic infections as being common but usually unimportant to the public health community (Living-Jamala, Eze, & Nduka, 2018).). Although several studies have been conducted on the distribution and prevalence of intestinal parasites in Nigeria, there are still several localities in the country including the study area, Bauchi metropolis, for which epidemiological information of gastro-intestinal parasitic infections are not available. This study provides current epidemiological information on the prevalence of human intestinal parasitic infections and their associated risk factors among primary school children 0-12years in Bauchi Metropolis. The aim of this research is to identify the prevalence of human parasitic infection among primary school pupils in Bauchi metropolis, Bauchi LGA, Bauchi state.

2. Materials and Methods

This study was carried out in Bauchi metropolis in Bauchi local government area of Bauchi state. Bauchi metropolis. Bauchi state is located in the North-Eastern part of Nigeria, sharing borders with Gombe, Plateau, Jigawa and Yobe state. The state lies between latitude of 9.3 and 12.3 North of equator, and longitude 8.5 and 11East of the Greenwich meridian with a total population of 4,653,066 (2006 National census). Bauchi town is located on latitude 10.315833, longitude 9.844167 with total population of 316,173. The inhabitants are mostly civil servants, famers and traders.

This study was a cross-sectional survey research design.in some areas in Bauchi metropolis (Federal low-cost, Ilelah & Bayan railway) situated in the center and peripheral parts of the town. Illela is an old settlement and densely populated with old housing design. Federal low cost is moderately populated with modern housing design. While Bayan railway is a new settlement comprising of an elite habitat and moderately populated with averagely modern housing design.

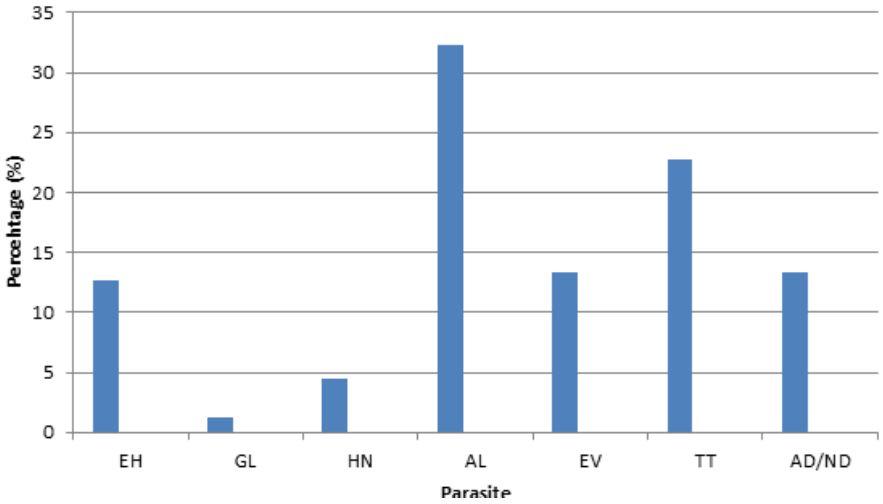
The study population include all children age 0-12 years that live in the three areas of the metropolis. 562 stool samples were collected from 562. The sample size was determined using the fisher's expression for cross sectional design.

$$n = \frac{z^2 p (1-p)}{d^2}$$

Prior to sampling the study area was visited so as to make arrangement toward collection of samples. A total of five hundred and sixty-two samples were collected from the study area using clean containers which were provided to the parent of the children and were educated to pick a portion of the stool as the child passes the stool on the newspapers. Age and sex recorded on the specimen battles and then transported to ATBU laboratory parasystole for examination.

Direct smear is a quantitative method of stool examination. One drop of normal saline was added to a clean microscope slide using an applicator stick. A portion of stool was picked with the tip of the applicator stick and emulsified with the saline water. A thin smear was made and covers with cover slivers, and examine under x10 objectives lens to give a good background. Presence of trophozoides and cyst of protozoa, and ova/eggs and adult worms were examined and recorded as described.

Closed-ended questionnaires were used to collect information from the parent of subject regarding child and house hold socio demographic, housing, water and sanitation characteristics. These items included subject sex, family size and composition, house contraction and water, sanitation and waste disposal, and economic status. The anthropometric data collected include height, or recumbent length (for children less than 24 month), mid-upper arm and thigh circumference. Weight was measured using a portable scale. Standing height in children age greater than 24 months was measured using a portable standio meter, measurement of the mid-upper arm circumference and mid-thigh circumference were measured using a semi flexible insertion tape measure, shoes, socks, soiled diapers and other heavy items were removed before all measurement were made.
The data collected was analyzed using simple percentages to show the rate of infected cases and. Results lose presented in frequency distribution tables. The association were determined by chi-square and t test analysis at p<= 0.05.
Results
Figure 1: Distribution of intestinal parasite found in stool sample of the children.
Distribution of intestinal parasite found in stool sample collected.



NB: Eh= *E. histolytica,* Gl= *Giardia lamblia,* Hn= *Hymenolepis nana,* Al= *Ascaris lumbricoides,* Ev= *Enterobius vermicularis,* Tt= *Trichuris trichuria, Ad/Nd = Ancydostoma Duodenale/Necatir Americanus*

The chart above indicates that *Ascaris lumbricoide* has the highest occurrence (38.61%) followed by *Trichuri trichura* (27.22%) *Ancyclostoma duodenale/Necator Americanus* (13.9%), *enterobium vermicularies* (13.9%) and *Entamoeba histolytica* (13%). The list occurring intestinal parasite is *Giardia lambilia* (1.27%)

Table 1: Sex distribution of infected individual sampled.

Sex	Number examine	Infected	Percentage
Male	281	82	14.59
Female	281	76	13.52
Total	562	158	28.11

The result indicates that out of five hundred and sixty-two (562) individual sampled, one hundred and fifty-eight (158) were infected with intestinal parasite 14.59% of the infected individual were male and 13.52% are female.

Table 2: Prevalence of infection with intestinal parasite in relation to source of drinking. water

Source of drinking Water	Number examined	Number infected	Percentage
Well	188	80	50.6
Tap water	188	70	44.3
Package water	186	08	5.1
Total	562	158	100

From the table above, the result indicate that 50.6% of the infected individual used well water as source of drinking water 44.3% use Tap water as source of their drinking water while only 5.1% use package water. This indicate that the rate of infection with intestinal parasite has significant in relationship with source of drinking water.

Table 3: Prevalence of infection with intestinal parasite in relation to types of toilet facility

Type of Toilet	Number examined	Number infected	Percentage
Pit latrine	281	130	82.28
Water system	281	28	17.72
Total	562	158	100

The result indicates that 82.28% of the infected individual sampled used pit latrine and 17.72% used water system. This shows that there is a significant relationship between infection with intestinal parasite and type of toilet facilities used.

Table 4: Prevalence of infection with intestinal parasites in relation to area of residence

Residence	Number examined	Number infected	Percentage
Upper class area	186	28	17.72
Middle class area	188	40	25.32
Lower class area	188	90	56.96
Total	562	158	100

Majority (56.98%) of the infected sampled individual lives in a lower-class area, 25.32% live-in middle-class area and 17.72% live-in upper-class area. This indicate that the prevalence rate of intestinal parasite has a significant relationship with the class of area the individual sampled live.

Table 5: Prevalence of infection with intestinal parasite according to population in the houses

Population in the house	Number examined	Number infected	Percentage
3-5	186	21	13.29
6-8	188	41	25.95
9 and above	188	96	60.76
Total	562	158	100

Majority (60.76%) of the infected sampled individual lives in families of 9 people and above, 25.95% live in families of 6-8 people and 13.2% live in families of 3-5 people. These suggest a significant relationship between population in the house and prevalence rate of intestinal parasite infection.

Table 6: Prevalence of infection with intestinal parasite in relation to weight, height and arm circumference

Population in the house	Number examined	Number abnormal findings	Percentage
Weight	158	140	65.82
Height	158	99	62.66
Arm circumference	158	101	63.92
Total			158

The result in table above indicate that majority(65.82%) of the infected sampled individual are under weight, 62.66% are stunted and 63.92% have smaller than normal size of arm circumference. This signifies a relationship between nutrition status of the infected individuals and prevalence rate of intestinal infection.

3. Discussion

Distribution of intestinal parasite found in stool sample collected

The prevalence rate of human intestinal parasite has been observed to increase. The study revealed an increase in the overall prevalence rate especially compared to some studies like Samaila *et al* (2015) findings, and Sitotaw, et al., (2020) who postulated that intestinal parasite infection will continue to prevail in Nigeria because of low level of living standard poor environmental sanitation and ignorance of health practices. *Ascaris lumbricoides* infection has the highest prevalence rate followed by *Trichuris Trichria*. The findings in agreement with (Samaila *et al.,*2015). The least occurring intestinal parasites are Giardia lambilia, Hymenolepsis nana and Enterobius Vermicalaris. The findings is line with WHO (2017) who reported that

several parts of Nigeria on intestinal parasite which recognized intestinal parasite infection as one of the most important public health problems. The high prevalence of Ascaris lubricodes infection may be attributed to unhygienic practices of the children and ability of the *A. lumbricodes* eggs to survive outside the host for years. This provides chances for children to contaminate their hands. Similarly, infection can be contacted through eating fresh vegetables that are not properly washed. Uncovered food can also be contaminated by wind blowing sand containing the eggs of *A. lumbricoides* into the food (Mathaparsadh *et al,* 2014).

The sex distribution of the infected children revealed insignificant difference between male and female. This is not in line with Samaila *et al* (2015) work that reported higher prevalence of the infection among male compared to female that reported higher prevalence among female compared to male.
The sources of drinking water for the infected children were mostly well and tap water. Only very few of the infected children have package water as source of drinking water. The high prevalence among the children taking well and tap water could be attributed to contamination of the water with fecal matter and lack of proper treatment before consumption.

Socio-environmental factors associated with prevalence of intestinal parasite
The infection was found to be high among children living in lower living conditions. It was discovered that many of the infected children use pit latrine and live in the lower-class area. This could be attributed to poor personal and environmental hygiene that exposes their drinking water and food to contamination with fecal matter. The finding agrees with Erismann *et al* (2016). The study further indicates that overcrowding can increase the chances of contacting intestinal parasite infection. Many children living in the household of 9 people and above are infected with human intestinal parasite. This could be attributed to inability to maintain personal and environmental hygiene in the overcrowded house where more than ten people utilize one toilet. Infection with human intestinal parasite has been observed to have effect on the growth of children. It was discovered that many of the infected children are underweight and the children's heights are below the normal level. Also, many of the infected children's arm circumferences are thinner than normal compared to World Health Organization Standard. The infections have effect on the children nutrition due to the fact that parasite share nutrients with the host and some of them cause loss of appetite, nausea and vomiting. The finding agrees with Efstratiou (2017*)* who link intestinal parasite infection with reduction in linear growth of children. Similarly, Living-Jamala, et al., (2018) reported that children infected with intestinal parasite have double the risks for stunted growth. The rate of the infection is generally of public health importance. Persistence occurrence of intestinal helminthes resulting into malnutrition may affect not only the physical development but may subsequently affect their talent and their performance academically.

4. Summary

Survey study on living condition and prevalence of intestinal parasite among children in Bauchi metropolis was conducted in three areas of the metropolis. The aim of the study was to provide a base line data that can be used for effective control of human intestinal parasite. Stool samples were collected from children of Kofar Fada, Kobi Primary Schools and Academy. Questionnaires were used to assess the living condition of the children. Anthropometric measurements were used to assess nutritional status of the children. Five hundred and sixty-two children were examined. The prevalence rate of 28.11% was recorded among the children. The parasite recorded includes *E. histolytica*, *G. Lambelia*, *H. nana*, *A. lumbricoidesm E.Vermicularis* and *T. Trichuria* Some of the factors associated with the infection includes: poor personality/ environmental hygiene and overcrowding. The most prevailing parasite infection recorded in the area of study is *A. lumbricoides*. The infected children were found to have poor nutritional status manifested by stunted growth low weight and thinner arm circumference.

5. Conclusion

In conclusion, the study revealed that the prevalence of human intestinal parasite infection has increased from 9.10 to 28.11% in two years and poor living condition such as poor environmental, hygiene, overcrowding and poor socio-economic status are related to the increased prevalence of the parasite in the area. The most

common prevailing parasite is *A. lumbricoides* infection. Human intestinal parasite infection can lead to impairment of physical growth and development of the infected children.

6. Recommendation

Based on the findings the following recommendations are made:

1. The increasing prevailing indicates the need to embark on health education on prevention and control measures of human intestinal parasite.
2. Government should strengthen and support the WHO program of providing free anti-helminthes drugs to children
3. Conduct research on the efficiency of anti –helminthes and protozoa drugs used in treatment of intestinal parasite.

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How to cite this article: Adamu, Ahmadu, Nasallah, Abubakar, Saleh, Ahmed, Othman, Ibrahim Mohammed, Rifkatu, B. Ajiji, Socio-Environmental Conditions and Prevalence of Intestinal Parasitic Infection among Children in Bauchi Metropolis, Bauchi State, Asian. Jour. Social. Scie. Mgmt. Tech.2022; 4(1): 335-341