

A Comparative Study of Gastrointestinal Parasites among Secondary School Students in the Rural and Urban Communities of Makurdi Local Government Area of Benue State

Abstract

Intestinal parasitic infections have always been an important public health problem in the tropics and subtropics particularly in developing countries. A comparative study involving 300 school children of both sexes and ages of 10-24 years from two rural and two urban secondary schools in Makurdi Local Government Area of Benue State Nigeria was investigated between the months of October, 2016 through March 2017. Saline wet mount and sedimentation techniques were employed for the study. Among the 300 samples examined 127(42.3%) were infected with different intestinal parasites. The parasites found were *Giardia lamblia* (6.3%), *Entamoeba histolytica* (9.4%), *Ancylostoma duodenale* (3.1%), *Ascaris lumbricoides* (37.8%), *Tania spp* (3.1%), *Enterobius vermicularis* (1.6%), *Trichuris trichiura* (8.7%), Hookworm (19.7%), *Fasciola hepatica* (6.3%), *Fasciola* (3.9%) respectively. *Ascaris lumbricoides* recorded the highest prevalence 48(37.8%) while *Enterobius vermicularis* had the lowest 2(1.6%). UBE Junior Senior Secondary School, Apir had highest prevalence 39(46.2%) and Padopas Harmony Secondary School High level had the lowest prevalence 18(28.57%) ($P<0.05$). Rural school children had the highest prevalence 61(44.2%) While urban school children had the lowest 66(40.7%) ($P<0.05$). The prevalence of intestinal parasites in relation to sex and age showed no significant difference. However, it was observed that there was a slight decline in prevalence as the age increased. Single parasitism was 30% while poly-parasitism was 6.66 % ($p>0.05$). The prevalence of parasitic infection in relation to water source showed no significant difference ($P>0.05$) while occupation of parents showed a significant difference ($P<0.01$) in the parasitic infection among students. Prevalence based on mode of faecal disposal showed a significant difference ($p<0.01$) in the infection rate. Result showed that there was a direct link between ones hygiene and prevalence.

Keywords: Gastrointestinal Parasites, Secondary School Students, Rural, Urban, Makurdi.

1.0 INTRODUCTION

Parasitic infections have continued to present a major challenge to the health and well-being of millions of people across the world, particularly those living in the poorest regions of the tropics and subtropics [1]

Intestinal parasitic infections are endemic worldwide and remain major public health problems in many tropical and subtropical countries [2]. It is estimated that more than three billion people are infected with intestinal helminthes and protozoa [3]. Gastro-intestinal parasites are identified as a cause of morbidity and mortality throughout the world particularly in the under developed countries [4]. They can be largely categorized into two groups, protozoans (e.g. *Entamoeba histolytica*, *Giardia duodenalis*, *Trichomonas hominis*, *Balantidium coli* etc.) and helminthes (e.g. *Ascaris lumbricoides*, *Trichuris trichura*, *Necator americanus* etc) [5]

In sub-sahara Africa, intestinal helminthes are the most common diseases with higher negative public health and socio-economic impact [6]. The transmission of this intestinal parasites infection has behavioural, environmental and biological bases [5]. These parasites are transmitted by ingestion of contaminated food or water or when contaminated hands come into contact with the mouth by skin penetration of the larva when in direct contact with contaminated soil.

According to [7] Personal hygiene, dietary habits, education level of the community, socio-economic status and climate are among the common factors that influences the distribution and the prevalence

of intestinal parasitic infections. The effects of intestinal parasitic infections depend on the species of the parasites, the affected organ and the host immunological status. In an immune-competent person, early infection of intestinal helminthes and protozoa may cause diarrhea and other gastrointestinal discomfort such as vomiting and bloating [8]

Patients infected with intestinal parasites often experience abdominal discomfort, dysentery or other general symptoms such as bloating, diarrhea and fever. In heavy infection, serious health conditions and problems such as malnutrition and mental retardation especially in children may occur [8]. Most of parasitological survey of common parasitic infections in Nigeria has been confirmed to rural villages, where poor sanitation and hygiene as well as general ignorance of the disease, provide optimal environment for transmission (Damen *et al.*, 2010).

Therefore the study is aimed at investigating the comparative prevalence of intestinal parasites among students attending secondary schools in the rural and urban communities in Makurdi, Benue State, Nigeria.

2.0 MATERIALS AND METHODS

2.1 Study Area

The research was carried out in Makurdi the capital of Benue State, a town with latitude of 90 metres above sea level. It lies on the sandstone flood plain of its prominent geographical feature the River Benue. Makurdi is located in the heart land of the guinea savanna zone of central Nigeria. The climate of the area is tropical and the vegetation characteristic is predominantly guinea savanna with an annual rainfall of 1000mm. The urban area is defined by a 16km² radius with the centre at point with geographical coordinates, latitude 07° 44'30 and 08° 31 '24' located within the premises of the general post office and represented on the ground by survey pillar number GMC (Gazette, No 5) (land survey office Makurdi, unpub data). The town is divided into zones, North bank, Wurukum, High level, Wadata, low level and Ankpa ward. It is inhabited mainly by civil servants, paramilitary, soldiers, trades, fishermen, farmers and craftsmen. Makurdi has a temperature range between a minimum of 27, 38°C and 28, 00°C and a maximum of 30.10°C to 34.09°C (Meteorological Department, Nigerian Air force Base Makurdi, Unpublish Data). There are two seasons, the rainy season which last from April to October and the dry season which last from November to March.

2.2 Study Population

A total number of three hundred (300) students aged between 10-24 years are selected from 4 secondary schools in Makurdi, Benue state. Using systematic random sampling method, two schools were selected from the rural and two from the urban communities. The principals, tutors and students of the schools were consulted and briefed on the objectives of this study.

2.3 Sample collection and ethical consideration

Informed consent was obtained from the authority of each of the schools and subjects enrolled for the study before samples were collected. The students were educated on the consequences of gastrointestinal parasitic infections among school-aged children.

All enrolled students were given a clean, dry, wide mouthed sample bottle labeled with serial number, school and demographic information. Questionnaires were also administered to the students to obtain their demographic information. The students were instructed on how to collect their faecal sample and immediately return them for microscopic examination.

2.4 Sample analysis

All samples were examined on the same day of collection, using wet mount and sedimentation techniques as described by [1]. The preparations were examined microscopically using X 10 and X 40 objective and observations were recorded.

2.5 Data analysis

Chi-square test was used to compare the relative frequencies between group (sex and age). Data analysis was conducted using SPSS version (20 IBM) set at alpha range which shows that when $p > 0.05$ it means there is no significant difference in the rate of infection among the frequencies and when the value of $p < 0.01$ it means there is a significant difference in the rate of infection recorded.

3.0 RESULTS

Various parasites were identified among secondary school students in both rural and urban communities in Makurdi. Out of the 300 faecal samples examined, a total of 127 (42.3%) were found to be infected with one parasites or more. *Ascaris lumbricoides* recorded the highest prevalence rate of 48 (37.8%), this was followed by Hookworm 25(19.7%), *Entamoeba histolytica* 12(9.4%), *Trichuris trichiura* 8(8.7%), *Giardia lamblia* 8(6.3%), *Fasciola hepatica* 8 (6.3%), *Fasciola buski* 5(3.9%), *Ancylostoma doudenale* 4(3.1%), *Tania spp* 4(3.11%), while *Enterobius vermicularis* had the least prevalence 2(1.6%) as shown in table 1.

Table 1: Prevalence of gastrointestinal parasites identified

Parasites	Number infected (%)
<i>Giardia lamblia</i>	8(6.3)
<i>Entamoeba histolytica</i>	12(9.4)
<i>Ancylostoma duodenale</i>	4(3.1)
<i>Ascaris lumbricoides</i>	48(37.8)
<i>Tania spp</i>	4(3.1)
<i>Enterobius vermicularis</i>	2(1.6)
<i>Trichuris trichiura</i>	11(8.7)
Hookworm	25(19.7)
<i>Fasciola hepatica</i>	8(6.3)
<i>Fasciola buski</i>	5(3.9)
Total	127(42.3) (p> 0.05)

Age related prevalence of the infection among students shows that those between ages 10-14 years had the highest prevalence 45.0% followed by those between the ages 15-19, while ages 20-24 had no infection. There was no significant difference between the different age groups ($P > 0.05$) (table 2). Distribution by sex showed more prevalence of Gastro-intestinal parasites in female (44.2%) than in

male (40.7%). However no significant difference in the rate of infection between the two sexes ($P>0.05$) as shown in table 2.

Table 2: Prevalence of gastrointestinal parasites in relation to age and sex

Age (years)	No examined	No infected (%)
10-14	160	72(45)
15-19	138	38(27.53)
20-24	2	0(0.00)
Total	300	110(36.67)
Sex		
Male	162	66(40.7)
Female	138	61(44.2)
Total	300	110(36.67)

The result in table 3 showed the Prevalence of gastrointestinal parasites in relation to the selected schools. students of UBE Junior secondary school had the highest infection rate of (46.4%), followed by St. Mark's secondary school 30(37.5%), Ecwa secondary school 23(31.5%) while Padopas Harmony secondary school had the lowest infection rate of 18(28.5%). However, statistical analysis showed no significant difference ($p>0.05$).

Table 3: Prevalence of gastrointestinal parasites in relation to the selected schools

Name of School	Number examined	Number positive (%)
ECWA	73	23(31.50)
PADOPAS	63	18(28.57)
UBE	84	39(46.42)
ST. MARK	80	30(37.50)
Total	300	110(36.67)

Table 4 showed the prevalence of single and multiple parasitic infections as observed. The analysis shows 30 % prevalence for single parasitism and 6.6 % prevalence for co-infection. Analysis showed no significant difference between locations (rural/urban).

Table 4: Prevalence of Gastro-intestinal parasites in relation to single and co-infection

Parasitism	Urban	Rural	Overall infections (%)
Single parasitism	34	56	90 (30.00)
Poly-parasitism	6	14	20(06.66)
Total	40	70	110(36.67)

From the result obtained, out of the 300 samples examined, in figure 1, students residing in the rural areas of Makurdi recorded the highest infection rate of (48.7%). While students residing in the urban areas had lower infection rate of (34.5%) ($p>0.05$)

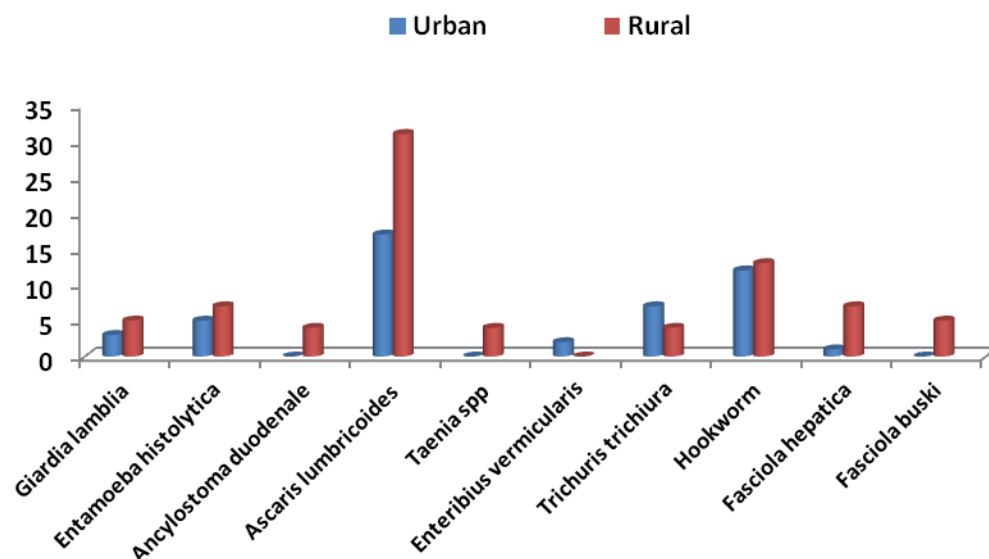


Fig. 1: Prevalence of gastrointestinal parasites in urban and rural communities in Makurdi ($p>0.05$)

Responses from the questionnaires showed that students who used well as their source of water had the highest prevalence of infection with (38.4%) followed by students who used Tap (37.5%) as source of water and the lowest prevalence was recorded by students who used borehole as source of water with (33.3%) infection rate. There was no significant difference ($p>0.05$) in the rate of parasitic infection among the studied subjects as shown in table 5. Prevalence of infection according to occupation of parents, students whose parents were farmers had the highest infection rate (44%) followed by students whose parents were traders (39.1%). While students whose parents were civil servants recorded the least prevalence of (26.5%). There was a significant difference ($p<0.05$) in the distribution of parasites among the students base on the occupation of the parents.

Prevalence of infections according to method of faecal disposal, students who defecate in the open had the highest infection rate (47.2%), followed by those who defecate in pit latrine toilets (41.6%) while students who defecate in water closet had the lowest infection rate of (12.5%). Chi-square analysis shows a significant difference in the distribution of parasites base on the toilet types.

Table 5: Demographic variables of respondents

Factors:	No examined	No infected (%)	
Water source			
Tap	80	30(37.5)	(p>0.05)
Well	130	50(38.46)	
Borehole	90	30(33.33)	
Total	300	110(36.67)	
Occupation of parents			
Farmers	100	44(44.00)	
Traders	87	34(39.08)	
Civil servants	113	30(26.54)	

Total	300	110(36.67)	
Toilet used			(p<0.01)
Water closet	208	26(12.50)	
Pit latrine	120	50(41.66)	
Bush	72	34(47.22)	
Total	300	(36.67)	p<0.01)

Discussion

The result of the present study revealed that 42.3% of the secondary school students examined in Makurdi Local Government Area of Benue State were infected with different gastro-intestinal parasites. The result obtained from this study is lower when compared with previous studies conducted by [10] who reported 58.5% among Children in Makurdi, Benue State, [11] who reported 84.6%, [12] 42.7% in river state, [13] reported 72% in Awka-Etiti, Anambra state, Nigeria, [14] reported 68.1% in Thailand and [15] reported 71.2% in Nepal. The low prevalence in this study may be attributed to an improved sanitation and personal hygiene. In contrast, the overall prevalence was higher in our study compared to the studies by Odu *et al.* (2011) reported 30.7%, Wokem and Wokem 2014 reported 19.2% in River state, in Turkey 13.8% and 22.4%, Oman 38.7%, Saudi Arabia 10.94% and 24.4% Gaza 24.5% and 27.6%, Tehran 18.4% and in Cambodia 25.7% Patel and Khandekar, (2006). This high prevalence of intestinal parasitic infection may be due to the lack of awareness about personal cleanliness and hygiene among rural population and care free attitude among the rural dwellers.

Parasites identified in this study were *Giardia lamblia*, *Entamoeba histolytica*, hookworm, *Ascaris lumbricoides*, *Tania spp*, *Enterobius vermicularis*, *Trichuris trichuria*, *Fasciola sp*. Among these parasites, *Ascaris lumbricoides*, hookworm sp. And *Entamoeba histolytica* were the most encountered in all the samples. These three parasites are the most common intestinal parasites in the tropics. Poor environmental hygiene and socioeconomic conditions are among the factors that promote the survival and transmission of these parasites.

Comparatively, the study showed higher prevalence at the rural areas 44.25% than the urban areas 40.7%. Studies by Houmsou and Amuta (2009) revealed that schools located in the slums of Makurdi (Wurukum and Wadata) and University of Agriculture staff school recorded the high prevalence of intestinal parasitic infections this was attributed to the residential conditions of most parents. Some of the parents reside in the neighboring villages or in the pre-urban quarters such as North-Bank where most areas are unsanitary with widely scattered waste dumps. A combination of factors such as age, area of residence, lack of sanitation facilities especially latrines, shortage of adequate water supply, poor sewage systems, poor personal hygiene practices of students and parental occupations of the students could be responsible for the high prevalence of intestinal parasitic infections among secondary school students (Houmsou and Amuta, 2009). The highest prevalence recorded by UBE junior secondary school could be that the school constitutes more children who play within and outside the school with soil, bare footed and could pick objects on the ground or eat without washing hands. It could also be lack of good sanitary environment and good water.

This study revealed that the children residing in the rural schools had the highest prevalence while the children in urban schools had least prevalence. There was no significance difference between

parasitic prevalence and the location of the schools. This study was in agreement with Houmsou and Amuta (2009) who reported that schools located in the slums of Makurdi recorded the highest prevalence of intestinal parasitic infections. These areas are populated by mainly farmers, fishermen and traders. Schools in this areas lack good toilet systems and are surrounded by garbage dumps and the soil around are contaminated with both human and animal faecal matter.

Ascaris lumbricoides and hookworm were the major intestinal parasites identified from the school children with higher prevalence. Contrary to this finding, some studies in Nigeria and elsewhere had earlier on reported higher prevalence rate of *Entamoeba histolytica*. Padmaja *et al.* (2014) reported 63.27% around Amalaparam, India. However, similar findings had been reported by Biu *et al.* (2012) on the study carried out on the prevalence of intestinal parasites of school age of pupils in Mafa L.G.A Borno State, Nigeria.

This study revealed that *Ascaris lumbricoides* and Hookworm recorded the highest prevalence. This was in agreement with the study done on prevalence of intestinal parasitic infection in Wukro Town Eastern Trigray, Ethiopia by Eleni *et al.* (2014) who reported higher prevalence in *Ascaris lumbricoides* Hookworm and *Trichuris trichuria* respectively. Lack of sanitation facilities in these schools might also contribute to the high prevalence or lack of adequate water supply in the school and houses. Contrary to this, Odu *et al.* (2013) reported higher prevalence of 15.7% among school children in Rivers State, Nigeria.

The study reveals that there was a decline in prevalence as the age increased. This might be due to the fact that children in this age group are often in contact with contaminated water and soil, either in their play ground or during farming activities. Also this can be due to the fact that children within this age group have an under develop immune system and as such are more vulnerable to this parasitic infections. The decrease in the prevalence in older students may be explained by influence of age on behavior, good personal hygiene practices and developed immunity

This study showed a higher prevalence in females than in males. There was no significant difference between the enteric parasitosis and sex. This suggests that intestinal parasite is independent of sex in Makurdi, Benue State, Nigeria. It agreed favourably with Suresh *et al.* (2014) who reported that gender wise parasitic infection rate was found to be almost equal among males and females but disagree with Biu *et al.* (2012) who reported that intestinal parasites were significantly higher in males than females.

Students that used well had more cases of infection than those that use tap and bore-hole as source of drinking water. This might be due to the fact that most of the time; students get their water from the well where these water source are not usually covered; hence they are predisposed to contamination by waste including human and animal faeces containing cyst, ova or larvae, spread by vectors such as flies. The chances of ingesting parasites cyst or ova in water are thereby greatly enhanced. This finding is in agreement with the work done by Atu *et al.* (2006). But in contrast with the work by Luka *et al.* (2000).

This study revealed that students of lower socio-economic class had a high prevalence of infection. This high rate or infection may be attributed to lack of good drinking water, good toilet systems,

constant contact with contaminated soil and water, as most of their parents are farmers and they spend more time on their farms where good personal hygiene practices are not observed. It has been reported that the availability or lack of sanitary facilities particularly latrine would greatly determine the prevalence of intestinal parasite in any given place. In this study, students that defecate in water closet and pit latrine had fewer cases of parasitic infections than those that defecate in the open. It is in line with several studies in Nigeria. Houmsou and Amuta (2009) who reported that children who defecated in the open recorded high infection rate of hookworm but in contrast with the study carried out by Luka *et al.* (2000).

Conclusion

The study reveals that parasitic infections are prevalent in the study areas but most prevalent in the rural areas than urban areas. Wider population coverage may reveal the hidden facts and figures pertaining to gastrointestinal parasitic infections in rural and urban children.

Recommendations

Mass education on hygiene practices, mode of transmission of these parasites as well as prevention should be introduced and intensified in schools, public places and health care centers. Large scale deworming campaigns should be employed.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

REFERENCES

- [1] Arora, D.R. and Arora, B. (2010). Medical Parasitology. Third Edition. Bangalore, India, CBS Publisher New Delhi
- [2] Ngui, R., Ishak, S., Chuen, C.S., Mahmud, R. & Lim, Y.A.L. (2011). Prevalence and risk factors of intestinal parasitism in rural and remote west. *Malaysia. Plos Neglected Tropical Disease*. 5:eg74.
- [3] Balcioglu, I.C., Kurt, O., Limoncu, M.E., Dinc, G., Gumus, M., Kilimcioglu, A.A., Kayran, E. & Ozbilgin, A. (2007). Rural life, lower socioeconomic status and parasitic infections. *Parasitology international* 56:129-133.
- [4] Odu, N.N., Elechi, V.I. and Okonko, I.O. (2013). Prevalence of intestinal helminthes infection among primary school in urban and semi-urban area in Port-Harcourt, River State, Nigeria. *World Rural Observation*, 5(1):52-61.
- [5] Michael, O.H., John, H. and Pierol, O. (2010). Epidemiology and control of human gastrointestinal parasites in children. *Natural Library of Medicine and National Institute of Health*, 8:219-234.
- [6] Enimien, O.J., Fana, S.A. and Emmanuel, W.B. (2014). Intestinal helminthic infection in Numan (Northeast Nigeria)., *International Journal of Innovation and Applied Study*, 5(2):102-105.

- [7] Mahsol, H.H., Mat, D.Z.A., Jalit, M.F. and Ahmad, A.H. (2008). Gastrointestinal protozoan parasites amongst school children in Inanam, Sabah. *A Journal of Science and Technology* 23: 45-51.
- [8] Amuta, E.U., Olusi, T.A. & Houmsou, R.S. (2009). Relationship of intestinal parasitic infections and malnutrition among school children in Makurdi, Benue state-Nigeria. *International Journal of Epidemiology*. (online) 7http://www.ispub.com
- [9] Damen JG, Lar P, Mershak, P, Mbaawuga EM, Nyary BW (2010). A Comparative Study on the Prevalence of Intestinal Helminthes in Dewormed and Non-Dewormed Students in a Rural Area of North-Central Nigeria. *Lab. Med.* 41(10):585-589.
- [10] Houmsou, R.S. and Amuta, E.U. (2006). Effects of Environmental and Socio-economic factors on the prevalence of intestinal parasites in school children in Makurdi, Benue state Nigeria. *African Journal of Environmental Pollution Health*; 7(1):1-6.
- [11] Awi-Waadu, G. D. B. (2008) "The prevalence of gastro-intestinal tract parasites in the inhabitants of Bori Military Cantonment in Port Harcourt Local Government area of Rivers State, Nigeria," *African Journal of Applied Zoology and Environmental Biology*, 7: 50–6
- [12] Abah, A. E. and Arene, F. O. I. (2006) Intestinal Parasitic Infections among Primary School Children as an Index of Level of Sanitation in Akpor Area of Port Harcourt, Rivers State Nigeria, Abstract 2006, *Nigeria Society for Parasitology*.
- [13] Igbodika, Maryjude C.; Ekesiobi, Anthony O.; Emmy-Egbe, Ifeyinwa I. (2014) Prevalence of Intestinal Parasites among School Children in a Rural Community of Anambra State, Nigeria. *American Academic & Scholarly Research Journal*. 6. 4
- [14] Waikagul J, Krudsood S, Radomyos P. (2002) A cross-sectional study of intestinal parasitic infections among school children in Nan Province, Northern Thailand. *South Asian Jacintha. Trop Med Public Health*.33:218-23.
- [15] Rai DR, Rai SK, Sharma BK, Ghimire P, Bhatta DR. (2005) Factors associated with instenial parasitic infection among school children in a rural area of Kathmandu valley, Nepal. *Nepal Med Coll J.* 7):43-6.
- [16] Odu N. N., Okonko I. O., Erhi O. Study of Neglected Tropical Diseases (NTDs): gastro-Intestinal Helminthes among school children in port Harcourt, Rivers State, Nigeria. *Report and Opinion*. 2011;3(9):6–16.
- [17] Wokem, G.N and Wokem, V.C (2014) Epidemiology of intestinal Helminthiasis among Children attending public and private primary schools in port Harcourt, River State. *Nigeria Journal of Parasitology* 35(1-2); 41-45
- [18] Patel P.K and Khandekar R. (2006) Intestinal parasitic infections among school children of the Dhahira Region of Oman. *Saudi Medical Journal*. 27(5):627-32.
- [19] Houmsou RS, Amuta EU. Effects of environmental and socio-economic factors on the prevalence of intestinal parasites in school children in Makurdi, Benue State, Nigeria. *African J Environmental Pollution Health* 2009; 7(1): 19-23.
- [20] Padmaja, N. Sai, Swaroop, P. Nageswararao, (2014). Prevalence of intestinal parasitic infections among school children and around Amalapuram. *Journal of Public Health Medical Research*. 2(2):36-8.
- [21] Biu, A.A., Kyari, F. and John, W.M. (2012). Prevalence of intestinal parasites in school aged pupils in Mafia Local Government Area of Borno State, Nigeria. *Journal of Medicine and Applied Biosciences*, 4:54-55

- 315 [22] Eleni, K., Sissay, M., Ameha, K. and Mulugeta, D. (2014) Prevalence of intestinal parasitic
316 measurements of school children in selected primary schools. Wukro Town, Eastern Tigray,
317 Ethiopia, *International Journal of Current Microbiology and Applied Sciences*, 52:43-48.
318
- 319 [23] Suresh, J., Dhaka, R.P., Bwhnu, R.T., Jay, P.S., Ravin, B. and Shraddha, U. (2014).
320 Prevalence of intestinal parasites among school children Bharatppkharia V.D.c. Kaski, Nepal.
321 *British Microbiology Research Journal*, 4(9):1007-1012.
322
- 323 [24] Atu, B.O, Galadima, M. and Alice, F. (2006). Prevalence of intestinal parasites in Etulo
324 speaking area of Benue State, Nigeria. *The Nigerian Journal of Parasitology*. 7:1-6
325
- 326 [25] Luka, S.A., Ajogi, I. and Umoh, J.U. (2000). Helminthiasis among primary school children in
327 Lere L.G.A Kaduna State, Nigeria. *The Nigerian Journal of Parasitology*. 21:109-116.
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