

PREVALENCE OF INTESTINAL PARASITES AMONG CHILDREN ATTENDING DAYCARE AND ORPHANAGE CENTERS IN KADUNA METROPOLIS, KADUNA

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ABSTRACT

Intestinal parasites are globally endemic, affecting the health, growth and development of children world-wide. Daycare and Orphanage centres are some of the environments where children are potentially exposed to infections. This study was aimed at determining the prevalence of intestinal parasites among children in some daycare and Orphanage centres in Kaduna metropolis, Kaduna state, Nigeria, in order to assess the sanitary conditions under which these children are maintained. Stool samples were collected from 305 children (155 males and 150 females), age range 0 months to 6 years in 6 daycare centers. The samples were examined macroscopically and then microscopically for parasitic infections using visual observations and wet mount and concentration techniques. Overall prevalence of intestinal parasites in the study was 9.2%. The protozoan identified were *Entamoeba coli* 4 (1.6%), *Entamoeba histolytica* 2 (0.7%), *Giardia lamblia* 1 (0.3%) and *Taenia saginata* 1 (0.3%). The helminthes identified were *Ascaris lumbricoides* 1 (0.3%), Hookworms 11 (3.6%), *Trichuris trichiura* 2 (0.7%) and *Strongyloides stercoralis* 5 (1.6%). The infections rates were highest among age group 2 – 3 years, 18 (14.3%). The differences among age and sex related intestinal parasite infections rates were statistically significant ($p > 0.5$). Poor sanitation and domestic hygiene, bad eating habits and general ignorance of the diseases were identified as the predisposing factors to intestinal parasite infections in the study area. These results can be a catalyst for ministry of Health and KEPA to pay special attention to intestinal parasites infections among children in daycare and Orphanage centres in Kaduna metropolis, Kaduna State. Furthermore, intervention curriculums and teaching of children and environmental hygiene must be taken into consideration to prevent and control intestinal parasites infections in their area.

Keywords: Prevalence, Intestinal Parasites, Day Care Centre, Orphanage

INTRODUCTION

Intestinal parasitic infections (IPIs) are widely distributed throughout the world. Mortality and morbidity rates of these infections are significant in developing countries. Infections are mainly transmitted via ingestion of water, soil or food contaminated by faeces containing the cysts of protozoans or eggs/larvae of helminths (Saki et al., 2012). Intestinal parasitic infection is one of the neglected tropical diseases (NTD) that thrive where there is poverty. Mostly affected are the poorest populations, living in isolated rural areas, in urban slums or in

crisis prone areas (WHO, 2012). Soil-transmitted helminth infections especially hookworm infection which causes childhood and maternal anaemia, results in the greatest disability, and the highest burden of neglected tropical diseases (Hotez et al., 2009). These infections cause iron-deficiency anaemia, growth retardation in children, intestinal obstruction and some other physical and mental health problems (Evans and Stephenson, 1995; Anoski et al., 2006; Tebit et al., 2016; Thomas, 2014). The helminths *Trichuris trichiura*, *Ascaris lumbricoides* and the hookworms as well as the protozoa such as *Entamoeba histolytica* cause infection in 800, 1,400, 1,200 and 48 million people respectively worldwide (Houmsou et al., 2010).

It has been revealed that more than three billion people are infected with intestinal parasites (Anvari, 2014), with children being more susceptible and constitute the greatest risk population and can contribute to malnutrition especially in children in day care centers and orphanages. This is due to ignorance, low levels of safety, direct contacts and sharing toys with other children (Ashbolt, 2004; Stephenson, 2000; Chala, 2013; Kuma et al., 2016). Exemplary case is the infections of *Giardia lamblia* which damages the intestinal mucosa and results in mal-absorption of nutrients, particularly fat (Eltayeb, 2015).

Studies have shown that the prevalence of intestinal parasites in children below six years old varies in countries around the globe (Tafti et al., 2003).

MATERIALS AND METHOD

Sample Collection: A total of 305 stool samples were collected from the children (aged 0-6 years). Clean specimen screw-capped containers were given to day care-centers and orphanage homes workers (Nannies) and instructed on how, when and quantity of early morning stool to be collected from their wards. Demographics gathered included name, age, sex, day care-centers and orphanage homes. Samples collected were immediately taken to the laboratory in an ice box and examined within 1 hour of collection (Philip, 2012).

Macroscopic examination: The visual odour assessment of collected stool samples was carried out for color, shape, consistency (watery, soft, and formed), mucus, pus, smell and presence of blood macroscopically (Philip, 2012).

Microscopic examination: Wet mount: One gram (1g) of stool sample was picked using a applicator stick, and mixed with seven millilitre (7ml) of formal saline or clean glass microscopic slide

which was emulsified for 2 to 3 seconds to produce a homogenate and a cover slip was placed on it. This was mounted on microscope stage for observation using times forty (40x) objective, as previously done by Eltayeb (2015) in order to locate the egg, cyst, ova and live parasites.

Sedimentation method: One gram (1g) of stool to seven millilitre (7ml) of distilled water (1:7) were mixed in a centrifuge tube, after which it was emulsified with a stick for two to three seconds. The suspension was centrifuged at 4000rpm for five minutes (5min) to separate sediment from supernatant, and the supernatant was discarded. The sediments were smeared on two different slides, each containing normal saline and lugol's iodine. The prepared slides were observed using (x4, x10 and x40) of the microscope for eggs, ova, cysts of different parasites as previously done by Chakraborty (2011). The eggs, ova and cysts of parasites were identified using standard morphological keys such as size, shape, thickness of the egg, color, and presence of special features e.g., spine, plugs, hooks and polar filament (Cheesbrough, 2006).

Statistical Analysis: The analytical and descriptive statistics were carried out using SPSS 24.0 software (SPSS Inc., Chicago IL, USA). The percentage prevalence (%) was calculated in each case. Comparative analysis of the results was done using two-tailed chi-square (χ^2). A p-value less than 0.05 ($P<0.05$) was considered statistically significant

RESULTS

Table 1: Demographics of pupils at Daycare centres and Orphanages in Kaduna Metropolis

Gender	Child care facility	
	Daycare	Orphanage
Males	87	68
Females	78	72
Total	165	140

The total number of stool samples collected based on gender from the study centres

Table 2: Distribution of parasite infections among pupils in some daycare and orphanage centres in Kaduna metropolis

	No. infected	P (%)	χ^2	p value	OR	CI (95%)
Sex						
Male (n = 155)	14	9.03	0.008	0.927	0.733	0.719 - 28.14
Female (n = 150)	14	9.33				
Total	28					
Location						
Orphanage (n = 140)	16	11.4	1.569	0.210	4.5	0.137 – 3.938
Daycare (n = 165)	12	7.27				
Total (n = 305)	28	9.2				

χ^2 =chi square; OR = odds ratio; CI = confidence interval

The table above shows the distribution of the parasites infections among the pupils according to gender from the study centres

Table 3: Distribution of Helminthic and Protozoan Parasites observed from the stool samples collected from the study centres

Parasite	Orphanage	Daycare	Total	Infection rate (%)
Helminthes				
<i>A. lumbricooides</i>	1 (6.25%)	0 (0%)	1	3.57
<i>T. trichuria</i>	2 (12.5%)	0 (0%)	2	7.14
<i>S. stercoralis</i>	4 (25%)	1 (8.5%)	5	17.9
<i>A. duodenale</i>	4 (25%)	7 (58%)	11	39.3
<i>T. saginata</i>	0 (0%)	1 (8.5%)	1	3.57
Total (worms)	11 (68.8%)	9 (75%)	20 (71.4%)	
Protozoa				
<i>E. coli</i>	4 (25%)	1 (8.5%)	5	17.9
<i>E. histolytica</i>	1 (6.3%)	1 (8.5%)	2	7.14
<i>G. lamblia</i>	0 (0%)	1 (8.5%)	1	3.57
Total(protozoa)	5 (31.2%)	3 (25%)	8 (28.6%)	
Overall		16	12	28
				100

Table 4: Relative Prevalence Rates of Protozoan and Helminthic Intestinal Parasites observed from the study centres.

	Protozoa			Helminthes				
	No.	P (%)	χ^2	RR	No.	P (%)	χ^2	RR
Sex								
Male (n=14)	2	14.3	2.00	0.33	12	85.7	0.80	1.500
Female (n=14)	6	42.9			8	57.1		
Locations								
Orphanage (n=16)	5	31.3	0.50	1.25	11	69.7	0.20	0.917
Daycare (n=12)	3	25.0			9	75.0		
Total								

χ^2 =chi square; RR = relative risk

The table above shows the relative prevalence rates of the intestinal parasites observed in the study centres.

DISCUSSION

The results of these study indicated an overall low prevalence rate, which is comparable to those of Okpala *et al.* (2014) and Achi *et al.* (2017). The study was conducted during the less humid (drier) season of the year (November-December). Such conditions do not favour the hatching of parasitic eggs or the survival of infective larvae. Improved sanitary conditions might have also accounted for the low incidence rate of intestinal parasitic infections among the children (Esiet *et al.*, 2017). Observations made during the survey showed that the personnel/staff who work at these centres have acquired tertiary level of education and periodic seminars usually organized for the members of staff on personal hygiene and environmental sanitations. Moreover, detergents, disinfectants and other sanitizers were regularly provided for the cleaning of the facilities. It was also observed that hygiene awareness program is routinely organized for the children at the centres.

The higher prevalence of helminthic infections compared to protozoan infections observed during this study may be attributed to the multiple routes of helminthes infection (oral and dermal) compared with the single route for protozoan infection (oral). *Ancylostoma duodenale* (hookworm) was the most prevalent intestinal helminth identified in the children. Incidence of

hookworm infection is directly related to exposure to soil where filariform larvae live in and penetrate human skin. Thus, poor personal hygiene and sanitation observed in some of these children centres increased the risk of hookworm infection as previously reported by Jiraanankul *et al.* (2011).

The overall prevalence rate of intestinal parasites was comparable between male and females, with no significant association between prevalence rate of infection and gender of child. The absence of statistically significant difference in infection rates (14 each) between males and females has also been reported by Sah *et al.* (2003), Abah and Arene (2015), Udensi *et al.* 2015), Nwaneri and Omuemu (2012) and Achi *et al.* 2017). These observations may be due to the exposure of these children to the same maintenance conditions in both the daycare and the orphanage centres. Furthermore, the result indicates that male and female children are equally susceptible to infection with intestinal parasites.

Age related prevalence was observed with the highest parasitic infection rates seen among children of age range 2-3 years. Mekonnen and Ekubagewargies (2019), El-Nadi *et al.* (2017), and Okpala *et al.* 2014) made similar observations from their study. The high level of physical activity exhibited by children of this age group exposes them to greater risk of infection than the others because of their multiple routes of exposure. Children within this category are also highly geophagic and tend to walk barefooted on soils and floors.

Intestinal parasites, as identified in this and other studies, have been reported to occur mostly in the high humid tropical regions of the world, Nigeria inclusive. The climatic conditions over these regions favour the survival and transmission of these parasites. Other factors such as low income, poor environmental sanitation and personal hygiene, lack of potable drinking water and inadequate healthcare, and poor educational awareness, encourage the high prevalence rates of these infections at any given time/place. In places where there is increased public sensitization and awareness programmes coupled with good sanitation and proper personal hygiene, very low incident rates of gastrointestinal infections with parasites are usually recorded (Esiet *et al.*, 2017).

The moderate levels of parasitic infections might have been contracted mostly by the children that were observed to play and walk barefooted on playgrounds. The presence of *Ascaris lumbricoides*, and *Trichuris trichuria*, as well as *Entameoba* sp observed at the Orphanages was indicative of fecal-oral transmission which may be related to non-washing of fecal contaminated hands by the children after the use of their toilets. *Strongyloides stercoralis* and *Ancylostoma duodenale* seen in samples of both Daycare centres and Orphanages were indicative of regular bare body contact with soil by the children, through which cysts/larvae of the parasite bear through the skin. The only case of *Taenia saginata* may have resulted from ingestion of undercooked beef infected with the parasite Waldrum (2017) Thus, despite the low prevalence rate recorded in this survey, efforts should be made to inculcate in children the maintenance of proper personal hygiene such as washing of the hands before and after eating, and washing of the hands after visiting a rest-

room. These efforts may help to further reduce the prevalence rate of intestinal parasitic infection among the study subjects. Furthermore, direct contact with soils and floors should be curtailed by ensuring that the wards do not walk/play on soils which may be infected cysts/larvae of the parasites.

Conclusion

Out of three hundred and five stool samples collected from the children in the orphanage and Daycare centres, twenty-eight were positive for intestinal parasites, with an overall prevalence of 9.2%. The infection rates in day care is marginally lower (7.27%) than orphanage (11.3%). The low prevalence of gastrointestinal infections with parasites may be attributed to the moderate level of hygiene practices, environmental sanitation, and regular administration of anti-helmintics.

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