Prevalence of Intestinal Parasites among Children in Day Care Centres in Esan West Local Government Area, Edo State, Nigeria

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Abstract: Intestinal parasites are globally endemic, affecting the health, growth and development of children worldwide. The child day care centres are said to be one of the environments where children are potentially exposed to infections. This study aimed to determine the prevalence of intestinal parasites among children in day care centres in Esan West Local Government Area in Edo State, Nigeria and thus confirm whether child day care centres expose children to intestinal parasite infections in the local government area. Stool samples were collected from 80 children (36 males and 44 females), age range 4 months to 5 years from 7 day care centres, after parents or guardians gave their informed consent and filled a structured questionnaire on their wards. The samples were examined macroscopically and then microscopically for parasitic infections using wet preparation and formol-ether concentration technique. Overall prevalence of intestinal parasites in the study was 13.8%. The only protozoon identified was Entamoeba coli (2.5%), while the helminthes identified were Ascaris lumbricoides (8.8%) and Trichuris trichiura (2.5%). Multiple infections (1.3%) also occurred in the children. The intestinal parasite infections was highest in age group 2-3 years, 8 (15.7%) and in males, 5 (13.9%). Ascaris lumbricoides had the highest prevalence in age group 2-3 years, 6 (11.8%) and in females, 6 (13.6%). The differences in age and sex related intestinal parasites infections were statistically significant (p<0.05). Thus, this study indicated that intestinal parasites are prevalent among children in day care centres in Esan West Local Government Area, Edo State, Nigeria.

Keywords: Child health, day care centre, environmental sanitation, hygiene, intestinal parasites

INTRODUCTION

Intestinal parasitic infections caused by protozoa and helminths are globally endemic and have been described as constituting the greatest single worldwide cause of illness and disease (Chan, 1997; Pillai and Kain, 2003). The most common infections in humans are caused by intestinal parasites, which may give rise to intestinal obstruction, malnutrition, iron deficiency anaemia, diarrhoea, malabsorption and other damages to the hosts (Buchini et al., 2007). Intestinal parasitic infections have a worldwide distribution with high prevalence found in people with low socio-economic status and poor living conditions as well as people in over-crowded areas with poor environmental sanitation, improper garbage disposal, unsafe water supply and unhygienic personal habits (Adamu et al., 2006; Noor-Azian et al., 2007). These factors are the causes of a major proportion of the burden of diseases and deaths in developing countries (Adamu et al., 2006).

The pathogenic effects of some intestinal parasites are well established, while others may or may not cause symptoms, depending on the host immune status and other factors. Among the protozoa, Giardia intestinalis and Entamoeba histolytica have been associated with persistent and acute diarrhoea (Utzinger et al., 1999; Newman et al., 2001). Giardia intestinalis is considered to be one of the leading causative agents of diarrhoea in both children (Addy et al., 2004; Noor-Azian et al., 2007; Dib et al., 2008) and adults (Nyarango et al., 2008; Ayeh-Kumi et al., 2009). It is one of the most common causes of waterborne disease outbreaks associated with drinking water (Bertrand et al., 2004; Yoder et al., 2007). Pathogenic amoeba, Entamoeba histolytica can also be found in young children (Kappus et al., 1994; Phiri et al., 2000; Okyay et al., 2004). This is the most important amoeba of man. This amoeba invades the colonic mucosa, producing characteristic ulcerative lesions and a profuse bloody diarrhoea (amoebic dysentery) (Greenwood et al., 2007). In developing countries, diarrhoea causes more than 2.2
Laboratory Science of Ambrose Alli University, study was approved by the Department of Medical Ethics approval was obtained from the authorities.

Sample collection: Clean specimen containers - from seven day-care centres. Informed consent was obtained from the parents or legal guardians of each subject. The participants consisted of 80 children (36 males and 44 females) age ranged 4 months to 5 years.

RESULTS

MATERIALS AND METHODS

Study area: This study was carried out in selected day care centres in Esan West Local Government Area including Ekpoma, the administrative headquarters of the Local Government Area in Edo State, Nigeria. The area lies between latitudes 6°43' and 6°45' North of the Equator and longitudes 6°6' and 6°8' East of the Greenwich Meridian (Aziegbé, 2006) with a population of 127,718 at 2006 population census (NPCN, 2012). The occupation of the inhabitants includes civil service, trading, transportation, farming and studentship. Eguaire, Ujueolen, Ihumudumu, Uhiele Emaudo and Iruekpen were considered in this study. The samples were examined in the Research and Diagnostic Laboratory, of the Department of Medical Laboratory Science, College of Medicine, Ambrose Alli University, Ekpoma.

Subjects: The participants consisted of 80 children (36 males and 44 females) age ranged 4 months to 5 years from seven day-care centres. Informed consent was obtained from the parents or legal guardians of each child prior to enrolment after a clear explanation. The study was approved by the Department of Medical Laboratory Science of Ambrose Alli University, Ekpoma. Ethical approval was obtained from the university ethics committee and Day care centres authorities.

Sample collection: Clean specimen containers-universal bottles, were given to day care centre workers or parents and instructed on how, when and quantity of early morning stool to be collected from their wards. For each subject, a structured questionnaire was filled by a parent or guardian to ascertain the level of child hygiene and health. Demographics gathered included name, age, sex and day care centres. Samples collected were immediately taken to the laboratory and examined within 1 h of collection.

Examination of the samples: The samples were observed macroscopically for macroscopic parasites before being mixed with 10% formal saline (1 g of stool to 7 mL. of formol saline and 3 mL of diethyl ether), centrifuged, upper three layers discarded and the deposit examined for microscopic parasites-cysts, eggs and larvae of the parasites, examining two smears per sample (Cheesbrough, 2006). This method was preferred because it allowed diagnosing both protozoa and helminthes. Logistic limitations prevented the collection of more than one stool sample from each subject.

Statistical analysis: The percentage prevalence (%) was calculated in each case. Comparative analysis of the results was done using two-tailed Chi-square ($X^2$). A p-value less than 0.05 ($p<0.05$) was considered statistically significant.

Out of the 80 children (36 males and 44 females), age range 4 months-5 years examined, 11 of them were infected by intestinal parasites giving an overall prevalence of 13.8%. Three parasites were identified- Entamoeba coli (2.5%), Ascaris lumbricoides (8.8%) and Trichuris trichiura (1.3%) and infection with more than one parasite (1.3%) (Table 1). The age group 2-3 years had the highest prevalence (15.7%), followed by the age group 4-5 years (12.5%), with the age group ≤1 year having the lowest prevalence (9.5%). The differences in prevalence between the age groups were statistically significant ($X^2 = 7.818; df = 2; p<0.05$) (Table 2). The males were more infected (13.9%) than females (13.6%), though not statistically significant ($X^2 = 0.09; df = ; p>0.05$) (Table 3).

The age and sex related prevalence of various types of intestinal parasites shows that infection with the protozoon, Entamoeba coli, a commensal was seen in the age group ≤1 year (4.8%) and 2-3 year (2.0%) and also in males (5.6%). Among the helminths, Ascaris lumbricoides has the highest prevalence in the age group 2-3 years (11.8%) and in females (13.6%). Mixed infection (Ascaris lumbricoides and Trichuris trichiura) occurred only in age group 2-3 year (2.8%) and in males (2.8%). However, the difference in prevalence of various types of parasitic infections according to age was statistically significant ($X^2 = 12.67; df = 6$;
Table 1: Prevalence of intestinal parasites in stool samples

<table>
<thead>
<tr>
<th>Intestinal parasites</th>
<th>Number examined</th>
<th>Number infected</th>
<th>Prevalence (%)</th>
<th>$X^2$</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protozoa</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G. lambia</td>
<td>80</td>
<td>0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E. histolytica</td>
<td>80</td>
<td>0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E. coli</td>
<td>80</td>
<td>2</td>
<td>2.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Helminths</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. lumbricoides</td>
<td>80</td>
<td>7</td>
<td>8.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hookworm</td>
<td>80</td>
<td>0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T. trichiura</td>
<td>80</td>
<td>1</td>
<td>1.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S. stercoralis</td>
<td>80</td>
<td>0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mixed infection</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. lumbricoides and T. trichiura</td>
<td>80</td>
<td>1</td>
<td>1.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>80</td>
<td>11</td>
<td>13.8</td>
<td>29.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

$X^2_{tab} = 24.32; \alpha = 0.05; p<0.05; df = 7$

Table 2: Age related prevalence of intestinal parasites in day care centers

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Number examined</th>
<th>Number infected</th>
<th>Prevalence (%)</th>
<th>$X^2$</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤1</td>
<td>21</td>
<td>2</td>
<td>9.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-3</td>
<td>51</td>
<td>8</td>
<td>15.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-5</td>
<td>8</td>
<td>1</td>
<td>12.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>11</td>
<td>13.8</td>
<td>7.818</td>
<td>0.02</td>
</tr>
</tbody>
</table>

$X^2_{tab} = 7.824; \alpha = 0.05; p<0.05; df = 2$

Table 3: Sex related prevalence of intestinal parasites in day care centers

<table>
<thead>
<tr>
<th>Sex</th>
<th>Number examined</th>
<th>Number infected</th>
<th>Prevalence (%)</th>
<th>$X^2$</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>36</td>
<td>5</td>
<td>13.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>44</td>
<td>6</td>
<td>13.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>11</td>
<td>13.8</td>
<td>0.09</td>
<td>0.76</td>
</tr>
</tbody>
</table>

$X^2_{tab} = 0.148; \alpha = 0.05; p>0.05; df = 1$

Table 4: Age and sex related prevalence of various intestinal parasites

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Number examined N</th>
<th>Number infected N</th>
<th>Entamoeba coli N (%)</th>
<th>Ascaris lumbricoides N (%)</th>
<th>Trichuris trichiura N (%)</th>
<th>Mixed infection N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (years)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1</td>
<td>21</td>
<td>2</td>
<td>1 (4.8)</td>
<td>1 (4.8)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>2-3</td>
<td>51</td>
<td>8</td>
<td>1 (2.0)</td>
<td>6 (11.8)</td>
<td>0 (0.0)</td>
<td>1 (2.0)</td>
</tr>
<tr>
<td>4-5</td>
<td>8</td>
<td>1</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>1 (12.5)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>36</td>
<td>5</td>
<td>2 (5.6)</td>
<td>1 (2.8)</td>
<td>1 (2.8)</td>
<td>1 (2.8)</td>
</tr>
<tr>
<td>Females</td>
<td>44</td>
<td>6</td>
<td>0 (0.0)</td>
<td>6 (13.6)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
</tbody>
</table>

Age: $X_{cal}^2 = 12.67; x_{tab}^2 = 12.59, p = 0.04, Q = 0.05, p<0.05, df = 6; Sex: $X_{cal}^2 = 7.543; x_{tab}^2 = 7.815, p = 0.05, Q = 0.05, p>0.05, df = 3$

p<0.05), while that for sex was not statistically significant ($X^2 = 7.543; df = 3; p>0.05$) (Table 4).

Some child day care characteristics were relatively homogeneous in the study area; most daycares had electricity (99.9%) and a Water Closet system (71.4%). Private bore-holes were the main source of water (71.4%); garbage was usually burnt (99.9%). However, the level of hygiene and sanitation among the day care centres corresponded to level of prevalence of intestinal parasites. Child day care centres with the lowest level of hygiene showed the highest rate of prevalence, while day care centres with the highest level of hygiene and sanitation showed zero prevalence.

**DISCUSSION**

In this study, the overall prevalence of intestinal parasites was 13.8%. This finding is lower when compared with Chirdan et al. (2010) who reported a prevalence of 57.8% in Jos, central Nigeria. However, it is in agreement to some extent with Ribeiro (2011), who reported a prevalence of 29.3% in the region of Uberlândia, State of Minas Gerais, Brazil and also with the findings of Boonchai et al. (2007) who reported a prevalence of 27.9% of asymptomatic controls (66/236) and 17.4% of symptomatic cases (41/236) in Sangkhlaburi, Thailand, among day care (preschool) children. The low prevalence of intestinal parasitism in this study could be attributed to the level of hygiene and clean environment among the day care centres. High prevalence of intestinal parasitic infection is apt to occur in low socioeconomic conditions, characterised by inadequate water supply and poor sanitary disposal of faeces (Meremikwu et al., 1995; Rajeswari et al., 1994; Al-Agha and Teodorescu, 2000). The discriminate disposal of human wastes and hygienic way of life might have been predisposing factors, as the children play on a clean ground. The day care centres in this study were located in semi-urban areas with portable water, proper system of refuse and human waste disposal. However, few day care centres lack these factors leading to infection among these day care centres, as the children come in contact with contaminated playing ground. The lower prevalence
obtained could also be attributed to the timing and the geographical differences in the area, as this work was conducted between the months of November-January (dry season, when the soil is usually dry).

Children of the age group 2-3 years were significantly (p<0.05) most infected, while the age group ≤1 year were least infected. This is due to the fact that children ≤1 year have less contact with the playing ground. This is in agreement with De Souza et al. (2007) who says that “Intestinal parasitism tends to be less prevalent among children under 1 year of age, thereafter reaching a prevalence plateau around 50%, but these age-related differences did not reach statistical significance”. This direct relationship between the age and intestinal parasites might be due to decreased exposure of children to soil environment/interaction coupled with the level of cleanliness and good hygiene practice in day care centres, as they spend most of their playing time on very clean floors and are well cared for by day care workers and parents. The males were more infected than the females (13.6%), though the difference is not significant (p>0.05).

Furthermore, analysis on the type of parasites/infection in relation to age and sex revealed that only 3 (3) organisms were implicated. Among the protozoa, Entamoeba coli was significantly (p<0.05) highest in the age group ≤1 years. This finding is however in disagreement with the findings of Boonchai et al. (2007) who found the proportion of G. lamblia to be highest in 2-3 year olds pre-school children in Sangkhlaburi, Thailand and that of Ribeiro (2011) who reported Gardia lamblia to be highest in day care centres in preschool children in the region of Uberlândia, State of Minas Gerais, Brazil. It is however important to say that, prevalence estimates derived from the examination of a single stool sample have been considered accurate for most intestinal parasites (Gyorkos et al., 1989). However, our estimates for Giardia lamblia should be interpreted with caution, since due to the intermittent elimination of cysts, examination of a single sample may underestimate the prevalence of this species. The analysis of three serial stool specimens collected on alternate days has been reported (Garcia, 1999) to increase the detection rate of Giardia cysts by about 11%. Therefore, Giardia prevalence could be even higher than reported here and can be a serious health problem in children, leading to protein-energy malnutrition (Muniz-Junqueira and Queiroz, 2002).

Helminths were detected more often than protozoa, with only Ascaris lumbricoides and Trichuris trichiura identified. Infection with Ascaris lumbricoides was significantly (p<0.05) highest in this study and in the age group 2-3 years, but lowest in the age group ≤1 year. This is in agreement with Chukwuma et al. (2009) which say that, “The prevalence of Ascaris lumbricoides was significantly increased as the age of the pupils increased”. Dada-Adegbola et al. (2005) also supported this finding and reported a prevalence of 52.4% for children aged 0-5 years. Ascaris lumbricoides infection was also higher in females than in males. The high prevalence of Ascaris infection could be attributed to the fact that Ascaris lumbricoides were much higher in their water or food via contamination by Child’s parents/guardians, as eggs of Ascaris lumbricoides are highly persistent and ubiquitous. This is in line with Bundy et al. (1995) and Stephenson et al. (1993) who said, Ascaris lumbricoides was much common with ingestion of water and food contaminated with Ascaris lumbricoides eggs and occasionally via inhalation of contaminated dust. Also similar with Naish et al. (2004) who said, ova of Ascaris lumbricoides can survive a prolonged period of 10 years under a warm, shady and moist environmental condition which could be a reason for their long constant infection. The danger with ascariasis is that it is intimately related with intestinal obstruction and malnutrition in children. Trichuris trichiura infection only occurred in the age group 4-5 year and in males. The prevalence of Trichuris trichiura among the age group is however in accordance with that of Adikankwu et al. (2012) who reported a prevalence of 2.0% for male with overall prevalence of 1.3%. Hookworm and Strongyliodes stercoralis infections were not detected, which is suspected to be due to decreased exposure of day care children to the environment. This is in agreement with Boonchai et al. (2007) who reported that they did not identify hookworm in any of the 472 stool samples analyzed among pre-school children.

**CONCLUSION**

Despite the fact that the prevalence rates of intestinal parasites in this study were considerably lower than prevalence rates observed in similar studies conducted in other regions, the rates of the infections are however of public health significance. The occurrence of intestinal parasites among children in day care centres (preschool) can cause chronic infections which can negatively affect all aspects of children’s health, nutrition, cognitive development, learning and educational access and achievement.

This prevalence although low is directly related to the sanitary conditions, socioeconomic status, education level, the age and hygienic habits among the day care centres in relation to the children. Thus, necessary sanitary policies, awareness, screening and de-worming exercises and occasional check of intestinal parasites among children in child day care centres are recommended.
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REFERENCES


