

ORIGINAL ARTICLE

Intestinal Parasites in Children Attending Day Care Centers in Jos, Central Nigeria

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Abstract

Background: It is estimated that 3 billion people world wide are infected with intestinal parasites. Morbidity is highest amongst children; infestation causes a threat to the growth and development of the child. The study aims to determine the prevalence of intestinal helminthes in children attending day care centers in Jos metropolis.

Methodology: Ten day care centers were randomly selected from the total number of day care centers. From each centre children were randomly selected for study. Parents of selected children completed a structured questionnaire and stool specimens of the children were analyzed using iodine and saline preparation.

Results: Two hundred and twenty-one children (57.8%) of the 384 children studied had intestinal parasites. *Ascaris lumbricoides*, *Ancylostoma duodenale* and *Trichuris trichura* were the commonest parasites found. The relationship between intestinal parasite infestation and diarrhea in past 2 months ($X^2 = 19.5$, $df = 1$, $p < 0.001$ OR=3.87), de-worming in the past six months ($X^2 = 11.13$, $df = 1$, $p < 0.001$, OR=4.55) and domestic treatment of drinking water ($X^2 = 35.38$, $df = 1$, $p < 0.001$, OR=4.3) were statistically significant.

Conclusion: Intestinal parasite infestation in the children was high.

Key words: Intestinal parasites, water, excreta, diarrhea, antihelminthics, children, daycare centers.

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Introduction

It is estimated that 3 billion people world wide are infected with intestinal parasites.¹ Soil transmitted helminthes are responsible for 39.0 million DALY lost in Sub-Saharan Africa.² It is said that all persons living in this region have been affected at some stage of their lives.³ Studies have shown that 60% of persons living in developing countries harbor intestinal parasites.⁴ In Nigeria the prevalence ranges from 12-60% rural areas having a higher prevalence.⁵⁻⁷ This high prevalence is as a result of several factors including lack of proper sanitation, indiscriminate defecation, polluted water, over crowding and climate suitability for parasite development and transmission.^{8,9}

Morbidity is highest amongst children, 400 million school children world wide are infested with soil transmitted helminthes or Schistosoma.¹⁰ Infestation causes a threat to the growth and development of the child. It causes an imbalance in the nutritional equilibrium, anemia, growth retardation and impaired cognitive development.¹⁰ The most common parasites encountered are *Ascaris lumbricoides*, *Enterobius vermicularis*, *Giardia lamblia*, *Entamoeba coli*, *Trichuris trichuria* and *Strongyloides stercoralis*, *Schistosoma mansoni*.^{3,9}

Many epidemiological studies have shown that inadequate and unsanitary disposal of human excreta, occurrence of diarrhea, sanitary conditions in the homes, source of drinking water, lack of education and low social status are associated with intestinal parasite infestation.^{3, 9, 11} This study hopes to determine the prevalence of soil transmitted helminthes in day care centers.

Daycare centers were chosen as the population of pre-school aged children here are easily assessable. More so, more mothers are leaving home to work; children are often left in day care centers, for sometimes as long as 6-8 hours five days a week. Here more than one child is left in the care of a caregiver who may not be as vigilant as the mother.

This environment is favorable for the transmission of infective eggs.

Methodology

The study was done in Jos, the administrative and commercial headquarters of Plateau State, Central Nigeria. It is a cosmopolitan setting, with an area of 286km² and a population of 600, 155, which contributes about 20% of the entire population of Plateau State.¹² The projected target population i.e. the population of under fives (0-59 months), which is mainly the age group in day care centers, is 120,031 in 2008.

Most parts of the city is supplied with pipe-borne water and are on the National electrical grid. The city is multiethnic with Beroms, Hausa, Igbos and Yorubas predominating. Majority of the inhabitants are traders, civil servants and students.

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Study Design

The study was a cross-sectional study.

Study Population

Children attending daycare centers in Jos.

Sample size estimation

The Minimum sample size was determined using the formula:

$$\text{Sample size} = \frac{Z^2 pq}{d^2}$$

Where;

Z = Value at 95% confidence interval (1.96)

P = Prevalence of intestinal parasites, which is estimated at 44.4%¹³

Q = Complementary probability

= 1-P

= 1-0.444

= 0.556

d = absolute sampling error to be tolerated.

= 5% = 0.05

$$\text{Sample size} = \frac{(1.96)^2 \times 0.444 \times 0.556}{0.0025}$$

= 379

Approximated to 384

Sampling Method

A list of day care centers in Jos was made. This formed the sampling frame from which ten day care centers were randomly selected. A list of children attending the selected day care centers was made and from the list 38 children were selected from each the day care centre selected and in one center 42 children were selected.

Permission was obtained from the authorities of the day care centers. Informed consent was collected from each selected child, where parents did not give consent another child was randomly selected to replace the child whose parents were not willing to participate in the study. Clean, labeled specimen bottles were given to the parents or guardians of each child. A structured questionnaire was administered to the parents of each child. Background information on method of waste disposal and water supply in each selected daycare center. Stool samples collected early the next morning. The stool samples were analyzed microscopically the same day the using thick smears, iodine and saline preparations.

Results

This study sampled 384 children in different day care centers in Jos North, Plateau State, 190(49.2%) were

male while 194(50.8%) were female. The mean age of children studied was 18 months with the highest proportion within the age range of 13-24 months accounting for 217(56.22%) of the children and the lowest proportion being 0-12 months accounting for 9(2.33%) of the children.

One hundred and eighty four (48%) of the children's parents were civil servants, 154(40%) were self-employed in small scale business and artisan trades and 46(12%) were professionals and senior level civil servants.

Two hundred and twenty three (57.8%) were found to have one or more intestinal parasites. One hundred and thirteen (50.6%) of them were males and 110 (49.4%) were females. One hundred and seven (47.9%) children who had intestinal parasites had polyparasitism. The soil transmitted helminthes that were found were, *Ascaris lumbricoides* in 139(62.3%) of the children, *Ancylostoma duodenale* 52(23.3%) and *Trichuris trichiura* 2(0.9%). (Table1). Mixed infection of *Ascaris lumbricoides* and *Ancylostoma duodenale* was most prevalent 43 (19.3%). Other intestinal parasites found were *Entamoeba coli* 19(8.5%), *Taenia sp* 5(2.3%), *Entamoeba histolytica* 3(1.3%) and *Schistosoma mansoni* 3 (1.3%)

One hundred and twenty five (56.22%) children aged 25-48 months this was the highest rates of intestinal infestation, whilst the lowest rates were in the age group 0-24 months 5(2.33%). The relationship between age and infestation was found to be statistically significant (contingency coefficient=12.85, df =2, p=0.001) (Table2). A very weak association was found between sex and intestinal parasite infestation($X^2= 0.44$, df =1, p=0.50, OR=1.33).

One hundred and fifty four (40.1%) of the children who had intestinal parasites infestation had a history of diarrhea in the 2 months prior to the study. Thirty (7.8%) had diarrhea at the time of the study. A statistically significant relationship was found between history of diarrhea in the past 2 months and intestinal parasite infestation($X^2 =18.66$, df =1, p<0.001, OR=3.87) (Table2). Fifty-eight (15.1%) of the children who had intestinal parasites had been treated with antihelminthics in the past 6months. The association between treatment with antihelminthics in the past six months and intestinal parasite infestation is strong ($X^2 = 11.13$, df =1, p<0.001, OR=4.55) (Table2).

One hundred and thirty two (34.2%) of children who had intestinal parasites used pit latrines or defecated indiscriminately at home. A very weak association was

found between method of human waste disposal and intestinal infestation ($X^2 = 1.66$, $df = 1$, $p = 0.197$, $OR = 1.2$) (Table 3). One hundred and forty one (63.23%) of the children who had intestinal infestation used pipe borne water as a source of drinking water at home. There was no statistically significant relationship between source of drinking water at home and intestinal infestation ($X^2 = 0.99$, $df = 1$, $p = 0.321$, $OR = 1.95$) (Table 3). Only 69 (30.9%) of the children with intestinal infestation used treated water for drinking at home. None of the children who used filtered water at home had intestinal parasite infestation. Boiling or filtering of pipe borne or well water were the only form of treatment practiced in the households of the study population. There was statistically significant relationship between treatment of drinking water and intestinal infestation ($X^2 = 16.82$, $df = 1$, $p < 0.001$, $OR = 4.3$) (Table 3).

Table I: Pattern of Distribution of the Different Intestinal Parasites in Children in Daycare Centers in Jos

| Soil transmitted helminthes | No of children infected | Percentage |
|------------------------------|-------------------------|------------|
| <i>Ascaris lumbricoides</i> | 139 | 62.3 |
| <i>Ancylostoma duodenale</i> | 52 | 23.3 |
| <i>Tricuris tricuria</i> | 2 | 0.90 |
| Other intestinal parasites | | |
| <i>Entamoeba coli</i> | 19 | 8.5 |
| <i>Taenia spp</i> | 5 | 2.3 |
| <i>Entamoeba histolytica</i> | 3 | 1.3 |
| <i>Schistoma mansoni</i> | 3 | 1.3 |

Table III: The Relationship between Age, and Intestinal Parasite Infestation

| | Parasite in Stool (n=223) | No Parasite in Stool (n=163) | Total (n=384) | Statistical Test, df and p value |
|----------------------|---------------------------|------------------------------|---------------|--|
| Age | | | | |
| 0-24 months | 0 | 9 | 9 | C. coef. = 12.85, df=2, p= 0.001 |
| 25-48 months | 126 | 91 | 217 | |
| 49-72 | 97 | 63 | 160 | |
| Anthelmintic | | | | |
| In the past 6 months | | | | $X^2 = 0.00$, $df = 1$, $p = 0.99$, $OR = 4.55$ |
| Yes | 58 | 20 | 78 | |
| No | 165 | 143 | 308 | |
| History of diarrhea | | | | |
| In past 2 months | | | | $X^2 = 19.5$, $df = 1$, $p < 0.001$ $OR = 3.87$ |
| Yes | 154 | 77 | 231 | |
| No | 69 | 86 | 155 | |
| History of diarrhea | | | | |
| During study | | | | $X^2 = 2.7$, $df = 1$, $p = 0.1$ |
| Yes | 30 | 14 | 43 | |
| No | 193 | 150 | 343 | |

* = Contingency coefficient.

Table II: The Relationship between Source of Drinking water, Domestic Treatment of Drinking Water and Method of Excreta Disposal and Intestinal Parasite Infestation

| | Parasite infestation (n=223) | No parasite infestation (n=163) | Statistical Test, df and p value, odds ratio |
|--------------------------------------|------------------------------|---------------------------------|---|
| Source of drinking water | | | $X^2 = 0.99$, $df = 1$, $p = 0.321$, $OR = 1.95$ |
| Well | 82 | 52 | |
| Pipe borne water | 141 | 111 | |
| Domestic treatment of drinking water | | | $X^2 = 35.38$, $df = 1$, $p < 0.001$, $OR = 4.3$ |
| Boiling/filtered | 69 | 40 | |
| Not treated | 154 | 63 | |
| Method of excreta disposal of wastes | | | $X^2 = 3.69$, $df = 1$, $p = 0.06$, $OR = 1.1$ |
| Indiscriminate defecation | 35 | 38 | |
| Water closet system/ Pit latrines | 188 | 125 | |

Discussion

The prevalence of intestinal parasites in the studied population was 57.8%. Studies done on pre-primary children in different parts of Nigeria show a prevalence of 62% Lagos¹⁴ 33.6% Sagbama, and Delta state.¹⁵ In other parts of the world prevalence ranges from 18.4 - 97%.^{2-4, 8, 9} The differences observed may be due to the fact that intestinal parasite infestation is area specific in relation to settlement type and other environmental factors favoring the spread of the parasites.

The highest prevalence (56.22%) was found in children aged 25-36 months and the lowest (2.33%) in the age group 0-24 months. There was a statistically significant association between intestinal parasite infestation and age (Contingency coefficient = 12.99, $df = 2$, $p = 0.001$). This was similar other studies in Jos metropolis.¹³ At ages 25-36 months the child has started walking and has achieved some independence from the mother. The child does a lot of exploring and geophagia is not uncommon. Unlike other studies, males and females almost equally affected.³ There was no statistically significant relationship between sex and intestinal infestation.

The soil transmitted helminthes found were *Ascaris lumbricoides*, *Ancylostoma duodenale* and *Trichuris trichuria*. These are the most common soil transmitted helminthes reported globally. *Ascaris lumbricoides* was responsible for 62.3% of the infections. Mixed infection of *Ascaris lumbricoides* and *Ancylostoma duodenale* was most prevalent 43 (19.3%). This similar to other studies done in Lagos, Nigeria.¹⁴ Other intestinal parasites found were, *Entamoeba coli* which is a normal commensal in normal people, *Taenia spp*, *Entamoeba histolytica* and *Schistosoma mansoni*. This is consistent with other findings in Rural India⁴, Rural Kenya¹⁷ and Kartom Sudan¹⁸

Forty percent of the children who had intestinal infestation had a history of diarrhea within the past 2 months of the study, the association between history of diarrhea and intestinal infestation was found to be strong. This is not unexpected, occurrence of diarrhea is known to foster the transmission of intestinal parasites.¹¹ More so infestation with intestinal parasite often presents with diarrhea. A study done in Venezuela showed that 83% Of the children studied had diarrhea, nausea, abdominal pains etc. The symptoms were associated with the presence of *Cryptosporidium parvium* and *Blastocystis hominis*.¹⁹ These organisms were not identified in this study.

Anthelmintics administered in the past 6 months prior to the study was strongly associated with parasite infestation ($X^2 = 11.13$, $df = 1$, $p < 0.001$, $OR = 4.55$). More children who had antihelminthic in the past 6 months did not have parasite infestation. This is not surprising; chemotherapy has been shown to reduce helminthes load and number of eggs produced by as much as much as 70%.²⁰

What was however surprising was that the relationship between excreta disposal and intestinal infestation was a weak one and not statistically significant ($X^2 = 1.66$, $df = 1$, $p = 0.197$, $OR = 1.2$). Studies done in parts of Africa, South America and Asia have shown that indiscriminate defecation is associated with an increase in intestinal parasite infestation rates.³ However the relationship between treatment of drinking water and intestinal parasite infestation was strong and statistically significant ($X^2 = 16.82$, $df = 1$, $p < 0.001$, $OR = 4.3$).

From this study the prevalence of intestinal parasite infestation in children attending daycare centers within Jos North LGA is high. The parasites found were mainly of *Ascaris lumbricoides*, *Ancylostoma duodenal*, *Entamoeba coli*, *Taenia sp*, *Entamoeba histolytica*, *Schistosoma mansoni* and *Trichuris trichuria*. Children aged 25-48 months had the highest proportion of children infested. Lower rates of infestation occurred in children who had antihelminthics in the past 6 months. Health education of parents and teachers in daycare centers and mass deworming of these children may reduce the prevalence of intestinal parasite infestation.

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