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INCIDENCE OF *STRONGYLOIDES STERCORALIS* INFECTIONN IN UNGOGO, NASSARAWA, DALA AND FAGGE LOCAL GOVERNMENT AREAS OF KANO STATE, NIGERIA

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ABSTRACT
This study was carried out between October, 2005 and August, 2006 to determine the occurrence and distribution of Strongyloides stercoralis in Dala, Fagge, Nassarawa and Ungoggo Local Government Areas of Kano State. A total of 280 stool samples from primary schools pupils in the area were examined for the presence of S. stercoralis using direct smear technique. 104 (37.14%) stool samples were found positive. Pupil ages 11 – 13 years had the highest infection 44 (42.30%). Male pupils were more infected 76(73.07%) and Nassarawa Local Government Area had the highest rate of infection 30 (42.85%). 560 S. stercoralis were isolated from the soil of the study area. The soil analysis showed that most of the parasites 174 (31.07% were also found at Nassarawa Local Government Area. Chi – square method was used in analyzing the data obtained. This study stands as a point for further research on S. stercoralis in the study area. Adequate financial provision for the support of fundamental and applied research programme into this topic is strongly recommended.

Keywords: Flariform, Strongyloides, Kano, Nassarawa

INTRODUCTION

Strongyloidiasis is currently recognized as a worldwide health problem. The disease is estimated to affect about 95 million people mainly in Asia, Europe, Middle East and tropical Africa (Gillard, 1999).

Strongyloides stercoralis is a common intestinal parasite of man. Most of the infection is caused by filariform larva of the worm. The filariform larva (1.5mm long and 35µm broad is developed from Rhabditiform larva and become established in man either by oral ingestion or by penetrating the skin. Those which penetrate the skin undergo a migration through various circulation and from there through the heart to the lungs, then up to the bronchi and trachea where they are coughed, swallowed and pass down into the intestine (Grove, 2003). The clinical symptoms posed by *S. stercoralis* include gastrointestine upsets, skin reactions, oedema, itching and diarrhoea (Woolman, 2002).

The effects of strongyloides are severe and adverse on nutritional, immune and economic status of a population, therefore, there is need to conduct more epidemiological surveys of *S. stercoralis* (Youseffa, 2003).

MATERIALS AND METHODS

Study Area

The studies were conducted in four local government areas of Kano State namely, Dala, Fagge, Nassarawa and Ungogo. Kano is situated at latitude 12^{o} 35'N and longitude 8^{o} 30'E. It is about 840Km from the edge of the Sahara desert and 475.45 meters above sea level. It also falls mostly within the Sudan Savannah Zone, it is semi arid region. The total land area of the State is 20,760Km^2. The minimum and maximum temperature range between 15.86^{0}C and 33^{0}C and falls as low as 10^{0}C during the harmattan season between December and February. Rainfall ranges from 500mm to 1200mm and starts from May and ends in October, while dry season starts in November and ends in April (Geography Department, Bayero University, Kano).

Kano state is inhabited predominantly by Hausa and Fulani ethnic groups while other notable ethnic groups include Kanuri, Nupe, Ibo, Yoruba, Tiv, Idoma, Igala and other races. The state has a population of 12, 376, 110 (National Population Commission, 2006).

Choice of the Study Area

The study area lies along the Jakara river system which runs along Kwakwaci, Sabon –Gari, Jagule and Fanisau all in Dala, Fagge, Nassarawa and Ungogo Local Government Areas of Kano State respectively. The soil of this area is sandy, moist with decaying vegetation, and contaminated with human excreta resulting from indiscriminate defaecation and faecal disposal. Peri – urban cultivation is practiced throughout the year in which human faeces is used as fertilizer (KNARDA, 2003). Considering the factors above, the environment is suitable for both the free – living and parasitic mode of life of *S. Stercoralis.*

In this study, faecally contaminated soil from the area was randomly collected and analysed for *S. stercoralis,* also four primary schools were selected from the four Local Government Areas namely Goron – Dutse special primary school, Fagge special primary school, Gama – Tudu special primary school and Kadawa special primary school, where pupils of different ages and sexes were examined for the presence of *S. stercoralis* infection.

Stool Sample Collection and Analysis

Stool samples of 280 primary school pupils of different sex and age strata were collected and examined for the presence of *S. stercoralis.* The stool samples were collected using clean, wide – mouth and screw – cork bottles. Sex and age of the pupils were written against each of the sample bottles and transferred to the laboratory for analysis.

Direct smear technique was used. 10mg of stool was collected from the sample bottle and dropped onto a filter paper using an iron loop. A smear of the stool was thinly made on the filter paper using a microscope slide positioned at an angle of 45^{o}. The filter paper was placed into a petridish containing a shallow layer of water. Actively motile larvae of *S. stercoralis* were observed floating on the filter paper within 15 minutes (Harada-Mori Technique). In this way, all the stool samples were examined and positive samples were recorded (Youseffa, 2003).

RESULTS

Prevalence of *S. stercoralis* Infection in Dala, Fagge, Nassarawa and Ungoggo Local Government Areas

A summary of prevalence rate of *S. stercoralis* in the four Local Government Areas (Dala, Fagge, Nassarawa and Ungoggo) is shown in Tables 3.2, 3.3 and 3.4. Seventy stool samples from each of the four Local Government Areas were examined and 22 (31.42%), 24 (34.28%), 30 (42.85%) and 28 (40.00%) were found with *S. stercoralis* at Dala, Fagge, Nassarawa and Ungoggo respectively. Male pupils had most of the infections 76 (73.07%) while the female pupils had 28 (26.93%). The prevalence according to age strata revealed that pupils aged 5 to 7 years had 14 (13.47%), 8 – 10 had 16 (15.38%), 11 – 13 had 44 (42.30%) and 14 – 16 had 30 (28.85%) of the total infections 104 respectively.

Prevalence of *S. stercoralis* Infection in Dala Local Government Area

Table 3.5 reveals the details of the prevalence of *S. stercoralis* infection at Dala Local Government Area. The total number of pupils examined was 70, out of which 35 were females and 35 were males. 22 pupils were infected out of the 70 pupils examined, 16 (72.73%) were males while 6 (27.27%) were females. 3 (13.64%) were of the age group 5 to 7 years, 3 (13.64%) were of age group 8 – 10, 11 (50.00%) were of the age group 11 – 13 years and 5 (22.73%) were of the age group 14 – 16 years. It was clearly observed that the age group 11 – 13 years had the highest prevalence, while the age group 5 – 7 and 8 – 10 years had the least prevalence. Male pupils had most of the infections (72.73%) while the female pupils had (27.27%) of the infection.

Prevalence of *S. stercoralis* Infection in Fagge Local Government Area

Table 3.6 reveals the details of the prevalence of *S. stercoralis* infection at Fagge Local Government Area. The total number of pupils examined was 70 (35 females and 35 males) out of which 24 pupils were found infected. 20 (83.33%) were males while 4 (16.67%) were females. Considering the age strata, 4 (16.67%) were of the age group 5 to 7 years, 4 (16.67%) were of age group 8 – 10, 10 (41.66%) were of the age group 11 – 13 years and 6 (25.00%) were of the age group 14 – 16 years. It was observed that pupils at age group 11 – 13 had the highest infection while pupils at age group of 5 – 7 and 8 – 10 had the least infection. Male pupils had most of the infections (83.33%) while the female pupils had the lower infection of 16.67%.

Prevalence of *S. stercoralis* Infection in Nassarawa Local Government Area

Table 3.7 reveals the details of the prevalence of *S. stercoralis* infection at Nassarawa Local Government Area. The total number of pupils examined was 70 (35 females and 35 males). 30 pupils were infected out of which 22 were males and 8 were females. Considering the age strata, 4 (13.33%) were of the age group 5 to 7 years, 6 (20.00%) were of age group 8 – 10, 14 (46.67%) were of the age group 11 – 13 years and 6 (20.00%) were of the age group 14 – 16 years. The highest prevalence was found in the age group 11 – 13 years, while the least prevalence was found in the age group 5 – 7 years. Male pupils had most of the infections (73.33%) while the female pupils had the lowest (26.67%) of the infection.

Prevalence of *S. stercoralis* Infection in Ungoggo Local Government Area

Table 3.8 reveals the details of the prevalence of *S. stercoralis* infection at Ungoggo Local Government Area. The total number of pupils examined was 70 (35 females and 35 males). 28 pupils were infected out of which 18 were males and 10 were females. According to the age strata, 3 (10.71%) were of the age group 5 to 7 years, 3 (10.71%) were of age group 8 – 10, 12 (42.86%) were of the age group 11 – 13 years and 10 (35.72%) were of the age group 14 – 16 years. Male pupils had most of the infections (64.28%) while the female pupils had (35.72%) of the infection. Pupils aged 11 – 13 years had the highest infection 12 (42.86%) while the least infection was observed among the age group 5 – 7 and 8 – 10 years 3 (10.17%) each.

Frequency of Occurrence of *S. stercoralis* In Four Local Government Areas as Observed from Soil Analysis

The main findings of this research work had confirmed the occurrence (Plates 1 – 2) and distribution of *S. stercoralis* in the study areas. Table 3.9 reveals the total number of *S. stercoralis* found in four Local Government Areas from the soil analysis. A total of 560 *S. stercoralis* were found, Dala had 126 (22.50%), Fagge had 122 (21.78%), Nassarawa had 174 (31.07%) and Ungoggo had 138 (24.65%). The highest number of *S. stercoralis* was observed at Nassarawa, 174 (31.07%) while Fagge had the least number of 122 (21.78%).

Table 3.1: Prevalence of *Strongyloides stercoralis* infection in Dala Local Government Area

Age (years)	No. of females examined	No. of females positive (%)	No. of males examined	No. of males positive (%)	No. of Overall (female and male) examined	No. of Overall (female and male) positive
5 – 7	16	1(16.67)	7	2(12.50)	23	3(13.64)
8 – 10	8	1(16.67)	4	2(12.50)	12	3(13.64)
11 – 13	5	3(50.00)	16	8(50.00)	21	11(50.00)
14 – 16	6	1(16.66)	8	4(25.00)	14	5(22.72)
Total	**35**	**6**	**35**	**16**	**70**	**22**

Table 3.2: Prevalence of *Strongyloides stercoralis* infection in Fagge Local Government Area

Age (years)	No. of females examined	No. of females positive (%)	No. of males examined	No. of males positive (%)	No. of Overall (female and male) examined	No. of Overall (female and male) positive
5 – 7	14	1(25.00)	6	3(15.00)	20	4(16.67)
8 – 10	6	1(25.00)	10	3(15.00)	16	4(16.67)
11 – 13	8	2(50.00)	14	8(40.00)	22	10(41.66)
14 – 16	7	(00.00)	5	6(30.00)	12	6(25.00)
Total	**35**	**4**	**35**	**16**	**70**	**24**

Table 3.3: Prevalence of *Strongyloides stercoralis* infection in Nasarrawa Local Government Area

Age (years)	No. of females examined	No. of females positive (%)	No. of males examined	No. of males positive (%)	No. of Overall (female and male) examined	No. of Overall (female and male) positive
5 – 7	10	2(25.00)	5	2(9.09)	15	4(13.33)
8 – 10	10	2(25.00)	10	4(18.18)	20	6(20.00)
11 – 13	6	3(37.50)	15	11(50.00)	21	14(46.67)
14 – 16	9	1(12.50)	5	5(22.73)	14	6(20.00)
Total	**35**	**8**	**35**	**22**	**70**	**30**

Table 3.4: Prevalence of *Strongyloides stercoralis* infection in Ungoggo Local Government Area

Age (years)	No. of females examined	No. of females positive (%)	No. of males examined	No. of males positive (%)	No. of Overall (female and male) examined	No. of Overall (female and male) positive
5 – 7	14	2(20.00)	12	1(5.56)	26	3(10.71)
8 – 10	11	2(20.00)	4	1(5.56)	15	3(10.71)
11 – 13	6	2(20.00)	11	10(55.55)	17	12(42.86)
14 – 16	4	4(40.00)	8	6(33.33)	12	10(35.72)
Total	**35**	**10**	**35**	**18**	**70**	**28**

Table 3.5 Distribution of *Strongyloides stercoralis* in four Local Government Areas as observed from soil analysis

Local government area	Number of Samples Examined	Number of Positive Samples	Frequency (%)
Dala	200	126	22.50
Fagge	200	122	21.78
Nassarawa	200	174	31.07
Ungoggo	200	138	24.65
Overall	**800**	**560**	**100**

DISCUSSION

More unsanitary disposal of human faeces determined the level of *Strongyloides stercoralis* to be found in an area and this accelerates the development of soil – transmitted helminths (Youseffa, 2003). Thus, this agrees with findings of this study in which indiscriminate defaecation contributed to the prevalence observed whereby Nassarawa (28.85%) and Ungoggo (26.92%) have the highest rate of infection than Dala (21.15%) and Fagge (23.08%), because more open – space defaecation and faecal disposal is observed in the former two Local Governments.

Human activities such as the use of Night soil (human excreta used as fertilizer) in agricultural activities in the study area had probably contributed a lot to the persistence of the parasite (*S. stercoralis*) in the area. It was witnessed that human faeces is heavily used as fertilizer in the area and soil analysis of these areas shows that 560 of the parasites were realized. The mode and extent to which contact is being made between the inhabitants of the area particularly the farmers and vegetable traders and the excreta serves as the means of helminth infection (Durugu, 2002).

Movement on – foot which is common among the males and particularly those at the age between 11 – 13 had immensely accelerated prevalence of *S. stercoralis* (Rowland, 1966) this agreed with this work whereby males had most of the infection (73.07%) and pupils aged 11 – 13 had the highest infection (42.30%) among the groups examined.

Climatic conditions, soil structure and texture determine the survival of *S. stercoralis* which its free – living form is favoured in damp, sandy or friable soil with decaying vegetation (W.H.O, 1964). Comparably, the study area has these climatic conditions and the occurrence and distribution of *S. stercoralis* is most in Nassarawa (31.07%) from the soil analysis and 42.85% from the stool analysis. Moreover, the ample supply of water in the study area had also contributed a lot to high occurrence of *S. stercoralis* throughout the period of this research and this had agreed with findings of (Maxwell, 2005), that the very low and optimal condition of warmth, oxygen, light and moisture are required for survival of its free – living soil inhabiting reproductive generation.

The result of the combined data had statistically shown that the difference in total infection and distribution among L.G.A.s (χ^2 = 7.815, df = 3 at P < 0.05) is significant and could be attributed to environmental factors and human behaviour towards better health.

Host factors such as malnutrition and undernutrition with their resultant effects on cellular immune response or the ability of the immune system to respond to antigenic stimuli with *S. stercoralis* infection may be the cause of the prevalence observed among the age strata as pupils aged 5 – 7 years (13.47%), 8 – 10 years (15.38%), 11 – 13 years (42.30%) and 14 – 16 years (28.85%). This agrees with the work of Davis (2005).

Auto-infection which is the characteristic of *S. stercoralis* that likely occurred among the already infected pupils may be the important factor that significantly (χ^2 = 3.48, df = 1 at P < 0.05) influenced the prevalence in relation to sex with males (73.07%) while females (26.93%) as observed in a similar work conducted by Miller (2004).

Inadequate preventive measures and economic status of the inhabitants of the area may also play great role in the increase of the infection. Medical care, efficient chemotherapy, availability of social amenities among others play a role in eradication of disease as Youseffa (2003) was able to clearly explain that availability of hotels, restaurants and lodges are good factors that control a spread of helminthiasis.

Overcrowding and temporary settlement due to the high cost of living observed in Fagge and Nassarawa could be an indication of higher rate of *S. stercoralis* infection observed during this study. Similarly Betberton (2001) had reported that unsanitary attitude especially indiscriminate defaecation is due to overcrowding.

Low standard of health education contributes to a lot of transmission, occurrence and endemicity of disease (Woolman, 2002). Coincidentally, the standard of health education and or its application may be very low in the study area as such this may contribute to higher figure of the parasite witnessed during the study.

CONCLUSION

The main findings of this research work had confirmed the occurrence (Plates 1 – 2) and distribution of *S. stercoralis* in the study areas. A total of 104 (37.14%) primary school pupils were infected and 560 *S. stercoralis* were obtained from soil analysis. Nassarawa Local Government Area had most of the infection (42.85%). Pupils aged 11 – 13 years were mostly infected (42.30%). The infection in relation to sex revealed male pupils were more infected (73.07%) than female counterparts.

Moreover, the study had clearly revealed that the occurrence and distribution of *S. stercoralis* is based on bad personal hygiene of the inhabitants of the study area.

This research work can stand as baseline information for further investigation in Kano.

Recommendations

Relief from the burden of illness associated with the soil-transmitted helminthiases will be facilitated by better knowledge of the epidemiology of the infections and their pathogenicity and pathology. Of particular concern is the contribution made by the soil – transmitted helminthes to the aetiology and persistence of childhood malnutrition. Adequate financial provision for the support of fundamental and applied research programmes into these topics is strongly needed.

The control of strongyloidosis is greatly dependent on the safe disposal of human faeces. Indiscriminate defaecation and poor human excreta disposal should be avoided.

There is need to avoid the use of waste water for agricultural activities and as well the use of human excreta as fertilizer. Progress made in controlling infections will be sustained by the construction and use of acceptable types of latrine and accommodation. There is need to establish a good personal hygiene among individuals.

The standard of health educations should be improved.

A combined effort of treatment and introduction of adequate reinforcement of health legislation such as on sanitation and health education would help in the control of strongyloidosis.

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