Gastrointestinal Parasites among Pregnant Women Attending Antenatal in Parts of Jos, Plateau State Nigeria

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Abstract

Gastrointestinal parasites are endemic in Nigeria. Cases of asymptomatic infections also exist which maintains transmission of these parasites through ways which include vertical transmission. A total of five hundred and ten (510) stool samples were obtained from volunteer pregnant women attending anti-natal is some hospitals in Jos. they were analyzed using iodine and normal saline wet preparations as direct smears while saturated flotation and formol ether concentration methods were used. Pearsons's Chi-square test was used to compare infections in relation to age, trimesters, PCV and occupational groups. One hundred and sixty seven (32.7%) had single parasite infection, 32 (6.3%) were infected with two parasites while 3 (0.6%) had three parasites. The age groups >45 years had 3 (42.9%) infection, 16 - 25 years age groups had 35.8% and least infection was in the 26 - 35 years age group. infection across age groups showed no significant difference ($\chi^2 = 2.4078$, df = 3, $P > 0.05$). Those in the third trimesters had the highest infection (34.7%) and least in the first trimesters. Infection across trimesters showed no significant difference ($\chi^2 = 0.31645$, df = 2, $P > 0.05$). There was however significant difference in relation to PCV groups ($\chi^2 = 35.559$, df = 2, $P < 0.0001$) and occupational groups ($\chi^2 = 16.738$, df = 2, $P = 0.0001$). The highest infection was with *Entamoeba histolytica*, followed by *Ascars lumbricoides* and least with *Strongiloides* spp. Of those infected, 18 (10.78%) were bloody, 14 (8.38%) were watery, 6 (3.59%) were mucoid and 2 (1.20%) had fatty stool. There was significant difference ($\chi^2 = 54.29$, df = 6, $P<0.0001$) between parasites species pooled infection rates recorded in individuals. The result shows the need for routine screening of all pregnant women for gastrointestinal infection during anti-natal visits for treatment. Sensitization campaigns should be given to avoid habits that predispose to infection and effects.

Keywords: Antenatal, Gastrointestinal, Jos, Women

Introduction

Gastrointestinal parasites constitute a global health burden which culminates into clinical morbidity in 450 million people; many of these are women of reproductive age and children in developing countries (Derso *et al.,* 2016). The high prevalence of gastrointestinal parasitic infection observed in developing countries is caused by low socio-economic status, illiteracy, unavailability of potable water, poor hygiene and hot and humid tropical climate which supports the development of these parasites (Amuta *et al.,* 2010).

Intestinal parasitic infections, especially due to the helminths, increase anemia in pregnant women (Steketee, 2003). Furthermore, these infections cause deficiencies of iron, total energy, protein, and possible folate and zinc (Stephenson *et al.,* 2000). The results of this are manifested in low pregnancy weight gain and intrauterine growth retardation (IUGR), followed by low birth weight (LBW) (Allen, 2001). Therefore, this study aimed to determine the prevalence of gastrointestinal parasites among pregnant women attending antenatal in selected hospitals in Jos, Plateau State, Nigeria.

METHODOLOGY

Data Collection

A questionnaire was completed through interview by a research nurse in the local language. Data was collected on the women's age, education, last menstrual period, number of previous pregnancies and living conditions such as housing, source of drinking water and type of toilet used. Information on the pregnancy was collected from the Mother Health Books of all participants.

A random sample of fresh stool specimen was collected from 510 volunteer pregnant women. Subjects were provided with a labeled leak-proof stool container (polypots), toilet paper, and applicator stick. Approximately 5 gram of stool specimens was collected into polypots, using applicator sticks after which they were transported to the lab for macroscopic and microscopic examination. All stool samples were processed within 2 hours of collection (Alfonso *et al.,* 2006).

Macroscopic Examination

All specimens were macroscopically examined to detect the presence of adult worms. The consistency, color, presence of mucus and blood were also noted in the specimen collected.

Microscopic Examination: (Saline and Iodine Preparation)

At one end of a clean, grease free microscope slide, a drop of fresh physiological saline was placed, and a drop of iodine was placed on the other half of the slide. A small amount of stool specimen was emulsified in saline and iodine solution using an applicator stick. Each wet preparation was covered with cover slip and examined under the microscope for the presence or absence of intestinal parasite, larvae, ova or cysts. The preparation was systematically examined under the microscope using x10 and x40 objectives respectively (Cheesebrough, 2004; Egwuyenga *et al.,* 2004).

Saturated Sodium Chloride (Brine Floatation Concentration Method)

A universal bottle was filled to about one quarter with saturated Sodium Chloride solution (brine). One gram (1g) of faeces was then added, emulsified and mixed thoroughly using a glass rod. The universal bottle was then filled with saturated Sodium Chloride solution and was allowed to stand vertically. Using a Pasteur pipette, saturated Sodium Chloride was further added to ensure that the bottle was filled to the brim. A clean cover slip was placed on the top of the bottle and left for 30minutes; the cover slip was removed using forceps, placed on a slide and examined under the microscope using x10 and x40 objectives (Cheesebrough, 2004; Egwuyenga *et al.,* 2004).

Formol-Ether Concentration Technique for Rapid and Wide Range Concentration

Using a rod, 1g from each of the faecal specimen was emulsified in about 7ml of 10% formol saline contained in a screw-cap bottle. The emulsified faeces was sieved into a beaker. The suspension was later transferred into a glass centrifuge tube and 3ml of diethyl ether was added.

The tube was stoppered and shaken vigorously for 1 minute and then centrifuged at 3,000rpm for one 1 minute. The layer of faecal debris was loosened from side of the tube using an applicator stick and the supernatant poured away. The deposit was re-suspended by tapping the bottom of the tube with finger. The deposit was transferred to a slide using a Pasteur pipette; the slide was covered with a cover slip and examined under x10 and x40 objectives of the microscope (Cheesebrough, 2004; Egwuyenga *et al.*, 2004).

Data Analysis

Data obtained was analyzed using R Console software (Version 3.2.2). Pearson's Chi-square test was used to compare the proportion of infections in relation to age groups, trimesters, PCV groups, types of occupation, parasites and as well as organisms with multiple infections. P-values <0.05 were considered statistically significant.

RESULTS

Parasites Infection in Relation to Age Groups

One hundred and sixty-seven (32.7%) individuals out of 510 examined were infected (Table 1). Individuals with single infection were the highest 132(25.9%), followed by those infected with two parasites 32(6.3%), and the least was those with three parasites 3(0.6%). Therefore, there was a very high significant difference (χ^2 =32.218, df= 2, P<000.1) between those with one, two and three parasites.

The age group mostly infected was those >45 years which had 3(42.9%), followed by 16-25 years with 58(35.8%) individuals, then 36-45 years 34(35.1%) and the least infected was 26-35 years 72(29.5%). However, infection across age groups showed no significant difference (χ^2 = 2.4078, df = 3, P = 0.4922).

Single Infections across Age Groups

Infection was highest in age group 16-25 years 51(31.5%) and least in age group 26-35 years 53(21.7%). However, single infection across age groups showed no significant difference (χ^2 = 1.8729, df = 3, P = 0.5992) (Table 1).

Double Infections across Age Groups

Infection was highest in age group >45years 1(14.4%) and least in age group 16-25 years 7(4.3%). However, those with double infections across age groups showed no significant difference (χ^2 = 6.741, df = 3, P = 0.08063) (Table 1).

Triple Infections across Age Groups

There was no significant difference (χ^2 = 1.8444, df = 3, P = 0.6053) across groups with triple infections (Table 1).

Table 1: Parasites Infection Rate in Relation to Age Groups

Age Range (Years)	No. Examined	No. with Single Parasite (%)	No. with 2 Parasites (%)	No. with 3 Parasites (%)	Total No. Infected (%)
16-25	162	51(31.5)	7(4.6)	0(0.0)	**58(35.8)**
26-35	244	53(21.7)	17(6.9)	2(0.8)	**72(29.5)**
36-45	97	26(26.8)	7(7.2)	1(1.0)	**34(35.1)**
>45	7	2(28.6)	1(15.3)	0(0.0)	**3(42.9)**
Total (%)	**510**	**132(25.9)**	**32(6.3)**	**3(0.6)**	**16(32.7)**

Parasitic Infection in Relation to Trimesters

Those at their third trimester period were mostly infected 58(34.7%) followed by second trimester period 64(33.0%) and the least was first trimester period 45(30.2%) as shown in Table 2. However, infections across trimester periods showed no significant difference (χ^2 = 0.31645, df = 2, P = 0.8537).

Table 2: Parasites Infection Rate in Relation to Trimesters

Trimester	No. Examined	No. with Single Infection	No. with 2 Parasites	No. with 3 Parasites	Total No. Infected (%)
1st	149	35	9	1	45(30.2)
2nd	194	50	14	0	64(33.0)
3rd	167	47	9	2	58(34.7)
Total	**510**	**132**	**32**	**3**	**167**

Parasitic Infection in Relation to PCV

Table 3 shows that PCV group 16-25% had the highest parasitic infection 75(55.1%), followed by group 26-35% which recorded 88(26.7%) and the least was >36% with 4(9.1%) infected individuals. Therefore, parasitic infections in relation to PCV groups showed a very high significant difference (χ^2 = 35.559, df = 2, P <0.0001).

Table 3: Parasites Infection Rate in Relation to PCV Groups

PCV Groups (%)	No. Examined	No. with Single Infection	No. with 2 Parasites	No. with 3 Parasites	Total No. Infected (%)
16-25	136	54	19	2	75(55.1%)
26-35	330	76	11	1	88(26.7)
>35	44	2	2	0	4(9.1)
Total	**510**	**132**	**32**	**3**	**167**

Parasitic Infection in Relation to Occupation

The most infected group was civil/public servants 51(48.6%), followed by artisans, farmers and traders group 92(36.8%) while housewives group 24(15.5%) had the least number of infected persons (Table 4). Therefore, parasitic infections in relation to types of occupation showed very high significant difference (χ^2 = 16.735, df = 2, P = 0.0002323).

Table 4: Parasites Infection Rate in Relation to Occupation

Type of Occupation	No. Examined	No. with Single Infection	No. with 2 Parasites	No. with 3 Parasites	Total No. Infected (%)
Artisan, Traders, Farmers	250	73	17	2	**92(36.8)**
Civil/Public Servants	105	41	9	1	**51(48.6)**
Housewives	155	18	6	0	**24(15.5)**
Total	**510**	**132**	**32**	**3**	**167**

Composition of Parasites and a Pool of Single, Co-infection and Multiple Infections

Seven parasites were recorded in this study of which *Entamoeba histolytica* 86(31.7%) infected most individuals, followed by *Ascaris lumbricoides* 66(24.4%) while the least form of infection was observed in *Strongyloides* species 7(2.6%). Therefore, there was a very high significant difference (χ^2 = 54.29, df = 6, P <0.0001) between parasites species pooled infection rates recorded in individuals.

Table 5: Checklist of Parasites with Pooled Number of Individuals Having Both Single, Co-infections and Multiple Infections

Parasites	Pooled No. of those Infected with both Single, Co-and-Multiple Parasites (%)
Hookworm	50(18.5)
Ascaris lumbricoides	66(24.4)
Schistosoma mansoni	41(15.1)
Taenia species	11(4.1)
Strongyloides species	7(2.6)
Entamoeba histolytica	86(31.7)
Giardia lamblia	10(3.7)
Total	**271**

DISCUSSION

Parasites Infection in Relation to Age Groups

The prevalence of gastrointestinal parasite infections among the study population (32.7%) is epidemiologically significant. This result is however higher than was reported by other studies. Such studies include Usip *et al.* (2017), Omorodion *et al.* (2012) and Derso *et al.* (2016) who recorded a prevalence of 22.50%, 23.47% and 31.5% in Calabar, South-South Nigeria and Ethiopia respectively. This higher prevalence in this study could be attributed to environmental pollution of parasite cysts, ova, and larvae. This could possibly be one of the numerous reasons for the constant spread of parasites in endemic regions. Intestinal protozoa are known to be transmitted by the fecal-oral route and their transmission involves the ingestion of food or water contaminated with cysts. The ova of soil-transmitted helminthes such as *A. lumbricoides*, could be ingested from contaminated fingers, water, food or soil. Hookworm infections are acquired when the larvae penetrate exposed human skin from contaminated soil. *S. mansoni* infection is acquired when the larval stage, cercaria, penetrates the human body from contaminated water bodies.

The lack of variation (P = 0.4922) observed of gastrointestinal parasitic infection across age groups in this study suggests that these parasites were evenly spread within the age groups studied and is not age dependent. This result agrees with that of Usip *et al.* (2017) and Alli *et al.* (2011) who equally observed no variation (P<0.005) in their study. It however did not agree with Obiezue *et al.* (2013) who observed a variation in parasitic infection across the age groups studied.

Parasitic Infection in Relation to Trimesters

Findings of this study show that women in their third trimesters were most infected. Although the higher prevalence of infection recorded in pregnant women in their third trimester 58(34.7%) in this study did not agree with that of Obiezue *et al.* (2013) who observed a higher prevalence of infection in pregnant women in their first trimester (20.9%), they however agreed that there was no variation across trimester periods.

Parasitic Infection in Relation to PCV

The high significant difference observed in the parasitic infections in relation to PCV groups (P <0.0001) conforms to the findings of Obiezue *et al.* (2013) who equally recorded a high significant difference in their study. This indicates the need for periodical stool examinations during pregnancy as part of routine laboratory test in the prenatal control of helminthiases.

Parasitic Infection in Relation to Occupation

It has been revealed in this study that Civil/Public servants were most parasitized (48.6%). This did not agree with Usip *et al.* (2017) who reported more parasitic infection in business women (55.55%). The high prevalence observed in Civil/Public servants could be attributed to their habit of patronizing food vendors with poor hygiene.

Composition of Parasites and a Pool of Single, Co-infection and Multiple Infections

Among the intestinal parasites detected in this study, *Entamoeba histolytica* (31.7%) was the most prevalent. This agrees with Suparat *et al.* (2013) who equally reported *Entamoeba histolytica* as the most prevalent intestinal parasite in their study site. It however did not agree with Alli *et al.* (2011); Mordi and Ngwodo (2007) who recorded *Ascaris lumbricoides* (55.5% & 30%) as the most prevalent intestinal parasite in Ibadan and Edo State, Nigeria respectively.

The occurrence high prevalence of *E. histolytica* infections among pregnant women studied is indicative of faecal pollution of soil and domestic water supply around homes due to poor sanitation and improper sewage disposal (Omorodion *et al.*, 2012).

Helminth infections of moderate and high intensity in the gastrointestinal tract generally produce clinical manifestations (Chan *et al.,* 1994). The presence of large numbers of adult *Ascaris* worms in the small intestine can cause abdominal distension and pain, lactose intolerance and malabsorption of vitamin A and possibly other nutrients (Taren *et al.,* 1987). The main pathology of hookworm infection is as a result of the intestinal blood loss due to adult parasite invasion and attachment to the mucosa and submucosa of the small intestine. Heavy hookworm infection can also lead to chronic protein loss which could result in hypoproteinemia and anasarca (Omorodion *et al.,* 2012).

CONCLUSION AND RECOMMENDATIONS

The result of this study shows a relatively high prevalence of intestinal parasitic infection of which *Entamoeba histolytica* was the most predominant parasites recorded. Ingestion of soil-contaminated foods and lack of regular hand washing also contribute to the establishment of these infections as seen in the Civil/Public servants.

It is therefore recommended that antenatal clinics have routine stool examination to detect parasitic infections in pregnant women and send positive cases for appropriate medical treatment and routine deworming of all pregnant women. The findings from this study therefore support the necessity for establishing a health programme aimed at controlling gastrointestinal parasites in the community. For this reason, measures should be adopted to monitor, control or prevent this tendency of parasites and/or their eggs/cysts from invasion of the body system through preventive measures including: the improvement of general standards of sanitation through the installation of suitable sewage treatment and disposal facilities, and provision of pipe-borne water supply as pre-requisites for successful prevention and control. In terms of implementing control, the WHO urges member states to ensure access to good quality anthelminthic drugs at all levels of the health care system in endemic areas (WHO, 1999).

In agreement with Anosike (2002) health education in local dialects should be enthusiastically instituted to highlight the principles of basic personal or community parasitic diseases in Nigeria hygiene, vis-à-vis the life cycle, mode of transmission (vector), as well as possible preventive measures of some the prevalent parasitic infections in the area

Reference

Alfonso, J. R., Rosa, A. B., Cynthia, C., Melissa, A., Marisela, R., Henry, P., Oscar, U., Gloria, G., Nestor, R., Andrea, M., Ymora, A., Anna, V., Juan, J. B., Magdary, C., Elizabeth, H., Elianet, A., Gilberto, C., Jes ´ us, B., and Pedro R. (2006). Intestinal Parasitic Infections among Pregnant Women in Venezuela. *Infectious Diseases in Obstetrics and Gynecology*, 1-5. DOI 10.1155/IDOG/2006/23125.

Allen, L. H. (2001). Biological mechanisms that might underlie iron's effects on fetal growth and preterm birth. *Journal of Nutrition,* **131**(2S-2):581S–589S.

Alli, J. A., Okonko, I. O., Kolade, A. F., Nwanze, J. C., Dada, V. K., and Ogundele, M. (2011). Prevalence of intestinal nematode infection among pregnant women attending antenatal clinic at the University College Hospital, Ibadan, Nigeria. *Advances in Applied Science Research,* **2** (4): 1-13

Amuta, E. U., Houmsou, R. S. and Mker, S. D. (2011). Knowledge and risk factors of intestinal parasitic infections among women in Makurdi, Benue State. *Asian Pacific Journal of Tropical Medicine,* **3**(12): 993-996.

Anosike, J. C., Chighana, J. I., Nwoke, B. E. D., Ezike, M. N., Dike, M. U., Ukaga, C. N., Okere, M. S. C., and Ajero, C. M. U. (2002). A survey of intestinal parasite among students of post primary institutions in Imo State, Nigeria. 28th annual conference Abstract (63) *Nigeria Society of Parasitology* **20**: 74.

Chan, M. S., Medley, M. S., Jamison, G. F., and Bundy, D. A. (1994). The evaluation of potential global morbidity attributable to intestinal nematode infections. *Parasitol,* 109: 373– 87.

Cheesebrough, M. (2004). District laboratory practice in tropical countries. Part 2. Cambridge University Press. p.357

Derso, A., Nibret, E and Munshea, A. (2016). Prevalence of intestinal parasitic infections and associated risk factors among pregnant women attending antenatal care center at Felege Hiwot Referral Hospital, northwest Ethiopia. *BMC Infectious Diseases*, 16:530. DOI 10.1186/s12879-016-1859-6.

Egwuyenga, O. A., Ataikiru, D. P., Nmorsi, Q. P. G. (2004**)**. Studies on intestinal helminthes infection in Eku, Delta State, Nigeria. 28th annual conference Abstract (20) from the *Nigerian Society of Parasitology*, 20: 24.

Mordi, R. M. and Ngwodo, P. O. A. (2007). A study of blood and gastro-intestinal parasites in Edo state. *African Journal of Biotechnology,* **6** (19): 2201-2207

Obiezue, R. N., Okoye, C. I., Ivoke, N., and Okorie, N. J. (2013). Gastrointestinal Helminth Infection in Pregnancy: Disease Incidence and Hematological Alterations. *Iranian Journal of Public Health*, **42(**5):497-503.

Omorodion, O. A., Isaac, C., Nmorsi, O. P. G., Ogoya, E. M., and Agholor, K. N. (2012). Prevalence of intestinal parasitic infection among tertiary institution students and pregnant women in south-south, Nigeria. *Journal of Microbiology and Biotechnology Research*, **2**(5):815-819

Steketee RW. (2003). Pregnancy, nutrition and parasitic diseases. *The Journal of Nutrition*, **133**(5): 1661S–1667S.

Stephenson, L. S., Latham, M. C., and Ottesen, E. A. (2000). Malnutrition and parasitic helminth infections. *Parasitology*, **121**(7):23–38.

Suparat, P., Audrey, M., Wendy, S. K., William, S. P., and Anita, H. J. V. (2013). Intestinal parasitic infections and anaemia among pregnant women in the highlands of Papua New Guinea. *Papua New Guinea Institute of Medical Research Journal*, **56**(3-4): 19-125

Taren, D. L., Nesheim, M. C., Crompton, D. W., Holland, C. V., Barbeau, I., Rivera, G., Sanjur, D., Tiffany, J., and Tucker, K. (1987). Contributions of ascariasis to poor nutritional status in children from Chiriqui Province, Republic of Panama. *Parasitol*, **95:** 603-13.

Usip, L. P. E., Affia, U. U., and Akpan, M. N. (2017). Prevalence Of Intestinal Parasites Among Pregnant Women Attending Antenatal Clinic In General Hospital Calabar, Calabar, Nigeria. *American Journal of Research Communication*, **5**(7): 46-59.

World Health Organisation. (**1999**). The control of schistosomiasis and intestinal Nematodes: World health report database No. WHOCDSCSIP991