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Correlations Between Haematological Parameters and Anaemia in Pregnant Women of South Eastern, Nigeria

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ABSTRACT

One hundred and eighteen (118) pregnant women were recruited into the study. The aim was to study the effect of soil transmitted helminthes in pregnant women vis-à-vis compared with other haematological parameters.Blood and stool samples were collected and analyzed with standard Haematological and Parasitological equipment.The result showed that there were anaemia, eosinophilia and raised platelet count, which were statistically significant at P d" 0.01 while the result of analysis showed that *Ancylostoma duodenale* had 67.8% prevalence rate, followed by *Ascaris lumbricoides* 53.4% and *Necator americanus* 39.8%. Conclusively, deworming is recommended for pregnant women in order to reduce anaemia in pregnancy.

Key words : Haematological Parameters, Anaemia, Pregnant Women, Nigeria.

INTRODUCTION

The soil transmitted helminthiases are ancient diseases that continue to cause misery and disability in poor populations especially in the tropics. About 2 billion people harbor these infections globally, of whom 300 million suffer associated severe morbidity, (WHO, 2002). Many cases of unexplained pregnancy loss are due to undiagnosed tropical diseases. Malnutrition or anaemia caused by intestinal worms may be worsened by pregnancy and make the pregnancy difficult, (Otieno-Nyunya, 1999). Among parasitic infections, malaria and intestinal helminthes coexist widely with micronutrient deficiencies and contribute importantly to anaemia and this cycle of retarded growth and development. It is much better to enter a pregnancy free of infection and nutritionally replete than the alternatives, (Steketee, 2003). Hookworm infections induce deficiencies of iron, total energy, protein, folate and zinc, (Nurdia *et al.,* 2001; Stephenson *et al.,* 2002). The authors revealed that low pregnancy weight gain and intrauterine growth retardation, followed by low birth weight, with its associated risks of infections and higher prenatal mortality rates. WHO (1996) reported that women infected with hookworm had a lower birth weight than women without hookworm. *Ascaris lumbricoides* infections were linked to severe *P. falciparum* malaria in Senegal, (Le Hesran *et al.,* 2004).

Data from studies specific to pregnancy and helminthes are also conflicting. Hookworm, not *P. falciparum* malaria, was considered the main cause of anaemia, (Shulman *et al.,* 1996; Guyatt *et al.,* 2000), while others reported an opposite result, (Muhangi *et al.,* 2007; Ndyomugyenyi *et al.,* 2008) or did not find any association, (Larocque *et al.,* 2006). Maternal co-infection with *P. falciparum* and helminths resulted in a significantly lower mean birth weight than with *P. falciparum* infection alone in Nigeria and Ghana, (Egwunyenga *et al.,* 2001; Yatich *et al.,* 2010). Two recent studies report an association with lower rates of *P. falciparum* infection in women

co-infected with *Ascaris lumbricoides*, (Hillier *et al.,* 2008; van Eijk *et al.,* 2008). There was a report from Yatich and colleagues that there was 4.8(95%, 3.4- 40) fold increase risk of *P. falciparum* with any geohelminth and the risk remained significant for hookworm and *Ascaris lumbricoides* alone, (Yatich *et al.,* 2009).

MATERIAL AND METHODS

study population

A total of 118 pregnant women were recruited into the study. They were classified according to the following age ranges viz: 16-20, 21-25, 26-30, 31-35 and 36-40 years respectively. The subjects were drawn from the three sectorial districts of Anambra State. The recruited pregnant women were attending antenatal clinic at Nnamdi Azikiwe University Teaching Hospital, Nnewi.

Oral consent of the subjects was obtained before embarking on the research study

The inclusion and exclusion criteria were put in place as the inclusion criteria was basically for pregnant women in respect of the gravidae while exclusion criterion was placed on pregnant women who were on herbal medication before visiting antenatal clinic.

Collection of samples

The blood and the stool samples were collected from the pregnant women during their registration and enrolment into the antenatal clinic, Nnamdi Azikiwe University Teaching Hospital, Nnewi.

The blood samples drawn from the subjects were put into EDTA containers. The blood was used for the analysis of Hb, WBC (total and differential counts) and platelet count. Also stool samples were collected from the same subjects into universal containers for the microscopic examination of intestinal parasites.

Laboratory procedures

Sysmex Haematological Analyzer Model KX-21 (Hb, WBC total and differential counts, platelet counts) was used. Blood cells are diluted in a buffered electrolyte solution. A measured volume of the sample passed through an aperture tube (e.g. 100µm in diameter) between two electrodes. Interruption of the current by the non conducting blood cells alters the electrical charges and a pulse is produced.

The amplitude of each pulse is proportional to the volume of the cell which causes it. A threshold circuit ensures only those that exceed present threshold are counted. The cell count determined from total number of pulse obtained from a measured volume of blood. In sysmex impedance analyzers, the haematocrit is determined from voltage pulse.

Sysmex analyzer is a sysmex corporation and it is made in Japan with serial no A 8901/07/2003

Blood samples were mixed evenly. Blood sample tube caps were removed and set to the sample probe. Start switch was pressed, buzzer sounds occurred twice. Blood sample tubes were removed when the screen displayed analyzing. The analyzer executed the display of results and the results were printed out.

The stool samples analysis was analyzed by emulsifying the stool sample with 0.85% saline on the slides and examined microscopically at x100 objective for the presence of intestinal parasites.

Statistical analysis

The data obtained from the study was statistically analyzed with the aid of SPSS-17 package. The level of significance in the research work was $P \leq 0.01$ or $P \leq 0.05$.

RESULTS

It was observed that the following age ranges viz: 21-25, 16-20 and 26-30 years exhibited the highest percentage prevalence rates of 22.9%, 17.8% and 16.9% of intestinal parasites respectively while pregnant women of the age range of 31-35 and 36-40 years showed no significant variation of percentage of intestinal parasites at 5.9% and 2.5% respectively. Table 1.

Our result also revealed the percentage prevalence rate of intestinal parasites diagnosed in 118 pregnant women studied during their antenatal visits. The study showed that *Ancylostoma duodenale* and *Necator americanus* (Hookworm)

showed percentage rate of infection of 67.8 and 39.8% respectively while 53.4% were infected with *Ascaris lumbricoides.* See table 2.

The relationship between haematological parameters and intestinal parasite established with application of statistical package. The level

Table 1: Percentage of age range of pregnant women infected and non infected with intestinal parasites

Intestinal parasites	Present	Absent	% Present	% Absent
Ancylostoma duodenale	80	38	67.8	32.2
Necator Americanus	47	71	39.8	60.2
Ascaris lumbricoides	63	55	53.4	46.6

Table 2: Percentage of intestinal parasites in pregnant women

Age (Years)	Infected	Noninfected	%infected	% Noninfected
16 - 20	21	9	17.8	7.6
21 - 25	27	12	22.9	10.2
26 - 30	20	13	16.9	11.0
31 - 35	7	3	5.9	2.5
36 - 40	3	3	2.5	2.5

Table 3: Relationship between haematological parameters in pregnant women infected with intestinal parasites

		ANOVA				
		Sum of Squares	df	Mean Square	F	Sig.
Haemoglobin (g/dl)	Between Groups	317.782	1	317.782	658.955	.000
	Within Groups	55.941	116	.482		
	Total	373.724	117			
White blood count	Between Groups	5.436	1	5.436	.576	.449
(x10^3 mm3)	Within Groups	1094.762	116	9.438		
	Total	1100.198	117			
Neutrophils (%)	Between Groups	33.792	1	33.792	1.109	.295
	Within Groups	3536.038	116	30.483		
	Total	3569.831	117			
Lymphocytes (%)	Between Groups	10.869	1	10.869	.244	.622
	Within Groups	5159.797	116	44.481		
	Total	5170.666	117			
Eosinophils (%)	Between Groups	15.700	1	15.700	7.693	.006
	Within Groups	236.723	116	2.041		
	Total	252.423	117			
Platelets (x 10^3 mm3)	Between Groups	6956.876	1	6956.876	6.949	.010
	Within Groups	116125.033	116	1001.078		
	Total	123081.909	117			

Haemoglobin, eosinophil and platelets are significant

of significance between groups was observed at P≤0.01. Haemoglobin, eosinophil and platelet parameters established a high level of statistical significance at 0.000, 0.006 and 0.010 respectively, (P≤01) while the rest of the haematological parameters never exhibited any statistical variation between the groups. See Table 3.

DISCUSSION

The finding of our research work showed that pregnant women under the age range 21-25 years exhibited high prevalence rate of 22.9% infection with intestinal parasites, followed by the age range of 16-20 years with 17.8% and closely followed by age range of 26-30 years with 16.9% while pregnant women under the ages of 31-35 and 36-40 years respectively exhibited very low prevalence rate of infection. Similar to a study in Kenyan women, *Ascaris lumbricoides* prevalence increased with gravidity, but whereas they observed the same trend with maternal age but this was not observed on the Thai-Burmese border (van Eijk *et al.,* 2009). They reported that hookworm prevalence peaked amongst the lowest age groups and reached a plateau after 25years of age, which is similar to the pattern from Kenyan pregnant women. Pena-Rosas *et al,* (2004) reported that the burden of disease imposed on helminth-infected girls and women of childbearing age especially when pregnant, may very well define the single most important contribution of intestinal parasite infections to the calculation of their global disease burden. Pregnancy requires extra nutrients, especially iron, produces physiological anaemia due to haemodilution, (Steer 2000; Pena-Rosas *et al.,* 2004). This would be attributed to the environmental and poor nutritional status in the tropics, since these are soil parasites, it is possibly that women who are basically farmers in the course of tilling the earth soil may be infected with these intestinal parasites and also coupled with other associated acquired infections.

Our findings also revealed that *Ancylostoma duodenale* exhibited a prevalence rate of 67.8% amongst pregnant women of South Eastern Nigeria, closely followed by *Ascaris lumbricoides*, 53.4% and *Necator americanus*, 39.8%. Women may acquire helminth infections in the process of using human faeces as fertilizer to increase the yield of their farm products, and invariably infection with hookworm increase their degree of anaemia in pregnancy; a classical example is in Vietnam, where insufficiently composed human faeces may be used as fertilizer in the farm, (Humphries *et al.,* 1997).

Basically, the pregnant women in tropics usually show varying degree of anaemia. From the result, the comparative analysis of haemoglobin with other parameters is statistically significant at P≤ 0.01. Virtually all the pregnant women enlisted in the study are anaemic. We observed that there was eosinophilia which was statistically significant at P≤0.01. From various studies reported so far in literature, it has shown that immunological eosinophilia has linked with soil transmitted helminths, (Chessbrough 2000).But the most important risk factor to be found with anaemia in pregnancy at this series was to be simply presented an intestinal parasitic infections, independently if this was helminth or protozoans. Species adjusted analysis showed that for this study the most important parasite representing a risk to be found with anaemia at pregnancy was *Ascaris lumbricoides*, the risk of anaemia has been frequently represented for Necator Americanus, Ancylostoma duodenale, *Trichuris trichuria*, *Strongyloides stercoralis* and *Enterobius vermicularis* (Layrisse *et al.,* 1967, Lotero *et al.,* 1974 and Stephenson *et al.,* 2002) but rarely for Ascaris lumbricoides, (Rosenberg and Bowman, 1984). The pregnant women infected in the tropics showed a high level of Ascaris lumbricoides, coupled with varying degree of anaemia, a significant level of anaemia and high level of eosinophilia.

Conclusively, Deworming should be recommended for the pregnant women in the endemic soil transmitted helminthes areas in the bid to reduce anaemia and mortality.

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