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PREVALENCE OF MALARIA AND INTESTINAL HELMINTHS CO-INFECTION IN PREGNANT WOMEN

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Abstract

Malaria and intestinal helminth infections pose serious public health problems and the diseases are endemic especially in Sub-Saharan Africa. They are mainly related with poverty, poor environmental sanitation and personal hygiene. Co-infection of these parasites could be severe in pregnant women with complicated cases of anaemia, low birth weight, risk of miscarriage and stillbirth. Intestinal helminth infection could compromise the immunity of a pregnant woman and inform malaria severity. In this study, a cross-sectional survey was conducted, five (5) hospitals were randomly selected from fifteen (15) identified Hospitals and Maternity Centres within Kontagora town and of the about 3500 patients' records retrieved from these Hospitals, one thousand (1000) were selected. In this study, patients' records were retrieved from the Hospitals' Laboratories and Records Department and Questionnaire was adopted to obtain socio-demographic information. Five (5) species of Intestinal helminths were identified as P. falciparum was the cause of malaria at 69.3%. The overall prevalence of the helminths was 55.9% and co-infection was at 28%. Ascaris lumbricoides at 38.5% was the most abundant and Schistosoma spp (7.4%) was the least. There was a significant correlation between malaria and intestinal helminth. Results from this study shed light on the need for improvement of ongoing interventions as elimination strategies in line with grass root experiences must be adopted.

Keywords: Malaria, Intestinal helminths, Co-infection, Pregnant women, Anaemia

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INTRODUCTION

Malaria is the most highly prevalent tropical diseases with high morbidity and mortality rate with high economic and social impact with Africa bearing the heaviest burden, with about a total of 12 million incidences of gestational malaria (Lubinda *et al*., 2021). This culminated to a high impact approach to a national response strategy and elimination (WHO, 2020).

Globally, about 15 billion cases of infection from malaria and helminths pose a significant risk to the population including pregnant women and the fetus. It has been reported that about 2 billion people harbour this infection worldwide (WHO, 2019), of which 300 million suffer associated severe morbidity and even death. Intestinal parasitic infection, whose prevalence and intensity vary by geographic region, cause anaemia in women of reproductive age. Intestinal helminthes affect tens of millions of pregnant women worldwide and directly or indirectly lead to a spectrum of adverse maternal and fetal/placental effects (Eyo *et al*., 2020). Pregnant women with intestinal parasitic infection are at increased risk of maternal complications and adverse perinatal outcomes both for the mother and the unborn baby, such as severe anaemia, low birth weight, congestive heart failure, miscarriage and perinatal mortality.

The prevalence and intensity of infection are especially high in developing countries, among populations with feacal pollutions of soil and domestic water supply around homes due to poor environmental sanitation. Practices such as hand washing, disposal of refuse, personal hygiene, when not done properly may contribute to the infection or picking of infective forms of the worms from the environment. In women, pregnancy drains the body physically, physiologically and immunologically. This burden is often aggravated when combined with intestinal and malaria parasitic infection. Pregnant women suffer disproportionately from severe/different complications as a result of malaria and intestinal parasitic infection, thereby leading to high rate of mortality in comparison with their non-pregnant counterparts. There has been a considerable number of reports about the knowledge, attitudes and practices relating to malaria, intestinal helminthes and their controls from different parts of Africa. These report concluded that misconceptions concerning malaria and intestinal helminthes still exist and that practices for the control of malaria and intestinal helminthes have been

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unsatisfactory. Early diagnosis and prompt effective treatment of malaria has also been a cornerstone of malaria control (Ruizendaal *et al*., 2017)

Materials and Methods

Study Area and Population

This study was conducted in Kontagora, Kontagora Local Government Area of Niger State, Nigeria, on a cross-section of pregnant women aged 11-45years on antenatal in randomly selected Maternity and Child Health Centres including that of the General Hospital in Kontagora. A total of 1000 women were selected at random, of which 693 were positive for Malaria. Medical records of these women were studied as willingness and consent to participate with detailed medical and clinical information, with confirmed malaria episodes by the Medical personnel were considered.

Ethical consideration

Ethical consideration was sought and received from the Management of the Hospitals and Maternity Centres. Informed consent was obtained from the women in attendance for interview and information obtained were kept confidential.

Data Collection

Indirect method of collection was used in collecting medical history of women that attended antenatal care between 11 - 45 years of age. 210 structured questionnaire were administered to obtain information on socio-demographic data, medical history and risk factors of intestinal helminth infection such as age, occupation, knowledge, attitude and practices such as deworming, source of drinking water, method of defecation, waste disposal and sanitation.

Data Analysis

The data generated was analyzed using SPSS version 25.0 software package. The statistical significance of variables was estimated using mean, standard deviation and percentage. Pearson correlation was used to establish possible relationship of prevalence between malaria and intestinal helminthes infection. Assessment for all statistical significance between variables was set at $p<0.05$. Data on the demographic features, knowledge, attitude and practices were presented using descriptive analysis in the form of frequencies and percentages.

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Result

Plasmodium falciparum was the only species identified to cause malaria, which infected 693 (69.3%) of the study population (Table 1).

Table 1: shows the mean scores on the prevalence of malaria among the selected pregnant women in Kontagora across age groups.

Age group	Number examined for malaria	Number positive	Mean ± Standard Deviation
11-15	30	25	1.83 ± 0.379
16-20	326	219	3.33 ± 0.470
21-25	221	140	5.23 ± 0.422
26-30	195	148	7.24 ± 0.429
31-35	111	75	9.75 ± 0.436
36-40	90	68	11.23 ± 0.425
41-45	27	18	13.33 ± 0.480
Total	1000	693 (69.3%)	

Table 2: Prevalence of Intestinal helminth infection and Co-infections (Malaria and Intestinal helminth) in pregnant women according to age group

Age group	No examined for Intestinal helminth infection	No positive	Mean± Standard deviation	Co-infection	
				No positive	Mean ± Standard deviation
11-15	30	18	1.40 ± 0.498	13	1.57 ± 0.504
16-20	326	167	3.49 ± 0.501	137	3.5 ± 0.494
21-25	221	124	5.51 ± 0.501	70	5.68 ± 0.466
26-30	195	115	7.41 ± 0.493	33	7.83 ± 0.376
31-35	111	71	9.32 ± 0.467	16	9.86 ± 0.353
36-40	90	52	11.42 ± 0.497	09	11.90 ± 0.302
41-45	27	12	13.56 ± 0.506	02	13.93 ± 0.367

Total	1000	559 (55.9%)	280 (28%)

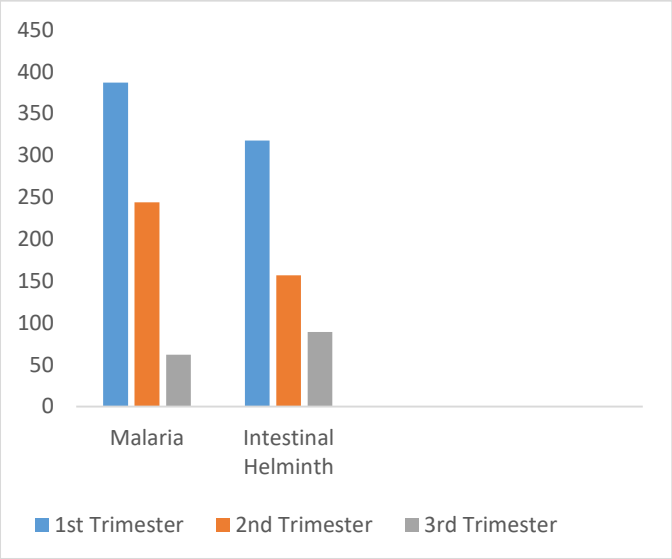

Figure 1: The prevalence of intestinal helminthes and malaria prevalence across gestational age.

Five (5) intestinal helminthes were identified and infected 55.9% of the study population, *Ascaris lumbricoides* was the most abundant and *Schistosoma spp* was the least across age groups (Table 3).

Table 3: Identified Intestinal helminths across age groups in the study population.

Age Group	No examined	*Ascaris lumbricoides*	*Trichuris trichura*	*Taenia saginata*	Hookworm	*Schistosoma spp*
11- 15	30	7 (233%)	3 (10.0%)	4 (13.3%)	3 (10.0%)	1 (3.3%)
16 - 20	326	66 (20.2%)	19 (5.8%)	43 (13.8%)	28 (8.6%)	11 (2.8%)
21 - 25	221	42 (19.0%)	16 (7.2%)	29 (13.1%)	24 (10.9%)	13 (5.9%)
26 - 30	195	44 (22.6%)	13 (6.7%)	27 (13.8%)	22 (11.3%)	9 (46%)
31 - 35	111	30 (27.0%)	8 (7.2%)	19 (17.1%)	14 (12.6%)	5 (4.5%)
36 - 40	90	23 (25.6%)	5 (5.6%)	13 (14.4%)	9 (10.0%)	2 (2.2%)
41 - 45	27	5 (18.5%)	2 (7.4%)	2 (7.4%)	2 (7.4%)	1(3.7%)
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Table 4: the association between the prevalence of malaria and intestinal helminthes infection among pregnant women in Kontagora by age groups.

Variable	N	r	significant (2 tailed)	r^2	% of r
Malaria	1000	.988	.000	0.976144	97.6

Table 5: Associated Risk factors of Intestinal helminth infection

Variables	**Responses**	**Frequency**
Location of residence	Rural	135 (64.3%)
	Urban	75 (35.7%)
Toilet facilities	Pit latrine	60 (28.6%)
	Water closet	25 (11.9%)
	Open defecation	125 (59.5%)
Usage of toilet facilities	Often	35 (16.7%)
	Seldom	50 (23.8%)
	Never	125 (59.5%)
Source of water	Sachet water	15 (7.1%)
	Borehole/Tap	63 (30%)
	Well	111 (52.9%)
	Stream/river	21 (10.0%)
Do you wash your fruits?	Always	168 (80%)
	Sometimes	39 (18.6%)
	Never	3 (1.4%)
Good sanitation and awareness on Intestinal helminth infection	Yes	92 (43.8%)
	No	118 (56.2%)

In this study, 64.3% reside at the rural parts of the locality and 35.7% were from the urban areas. 59.5% of the pregnant women do not have toilet facilities while their sources of water

was stated as; 7.1% take sachet water, 30% depend on borehole, 52.9% get water from well and 10% use the stream (Table 5).

Discussion

This study estimated the prevalence of Malaria and Intestinal helminth among pregnant women in Kontagora. *Plasmodium falciparum* is a known prevalent species that causes Malaria, infecting about 93% in Sub-Saharan Africa. Malaria among the pregnant women of this study population was 69.3%, which is higher than that of study reported from Cote d'ivoire (50.3%) (Etienne *et al*., 2018) and Ethiopia (18.3%) (Teklemariam *et al*., 2018). This might be due to the climatic and environmental variation. The climatic conditions (temperature) in this part of Niger state and level of sanitation encouraged the breed of Mosquitoes. Also, the poor knowledge, attitudes and practice (KAP) of individuals towards this disease cannot be undermined.

It was observed that women of 16-20 years were more at risk of at least one helminthic infection while 41-45 years were the least infected. Generally, infection decreased with age in this study (Table 2). This may be related to developed immunity due to repeated infections and knowledge on prevention and treatment during antenatal care. However, Accrombessi et al., (2019) and Fikru & Ero, (2015) stated that malaria in early stage of pregnancy could result to maternal anaemia at the latter stage.

The prevalence of Intestinal helminth in this study was 55.9%, which was higher than studies at Northwest Ethiopia (49%) (Fikru & Ero, 2015) and lower than that conducted in Southern Ethiopia (69%) (Etienne *et al*., 2018). This might be related to a relatively and minimal improved environmental sanitation and practices by some individuals resident in the urban parts of the study area. The prevalence of intestinal helminthes in this study is high due to some risk factors, amongst which, 59.5% practiced open defecation, which made them prone to adverse outcome in pregnancy. Eyo et al., 2020 opined that pregnant women who defecated in open space or bush are at higher risk of *Ascaris lumbricoides* and *T. trichura.*

Also, in this study, the analysis of the pooled data showed the prevalence of helminthic infection with malaria in pregnant women at 28%. This finding corroborated studies from Ethiopia (Teklemariam *et al*., 2018) and meta-analysis of results in Sub-Saharan Africa (20%) (Minyahil *et al*., 2022). It was speculated that Malaria and Ascaris *spp* and/or Hookworm co-infections heightened malaria parasiteamia than in patients with malaria

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parasite infection alone, though no significance was reached (Ntonifor *et al*., 2021). However, it was assumed that patients with malaria and infected with at least one species of intestinal helminth had a higher risk of coinfection. This claim was in line with report from Southern Ethiopia (Teklemariam *et al*., 2018).

The comorbidity has stirred a global concern as it puts pregnancy at high risk of anaemia, stillbirth, low birth weight neonates and maternal death. Studies show that they are at risk of nutritional deficiency such as loss of iron and other micronutrients as well as impaired appetite, thus suppressing the immunological state of the body to aid their activities and make the patient prone to *Plasmodium* infection and other complications such as anaemia (Getachew *et al*., 2013).

The prevalence of intestinal infection in this study is peculiar to developing countries, among population with poor environmental sanitation where some practices like hand washing, lack of access to portable water, disposal of refuse and feaces, washing of fruits and vegetables are not properly done. One of the common methods of transmission of these intestinal parasites is by ingestion of contaminated food or water and ingestion of improperly cooked vegetables. Studies show that pregnant women that eat vegetables not properly washed are prone to a higher risk of Ascariasis, Trichuriasis and Hookworm infection (Eyo *et al*., 2020).

Although, correlation of co-infection with location is positively low (r = 0.176), prevalence in this study as it was also reported in some Tropical areas could be dependent on socio-economic, environmental, and behavioral factors as well as poor adherence to basic preventive measures and treatment while poverty, poor sanitation and inadequate access to public health education attribute to high helminthic infection (Oyefabi *et al*., 2019).

The result of correlation (r=0.988) in this study shows that malaria and intestinal helminthes infection has a significant impact on women across age groups. This implies that the effects of malaria infection in pregnancy aggravate the effects of intestinal infection, which was also reported by Chessed *et al*., (2021), which provides an insight and further improves an understanding that malaria and intestinal helminthes infection, as one of the clinical factors, is responsible for anaemia in pregnancy.

Conclusion

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This study established the co-infection of malaria and Intestinal helminth during pregnancy. Pregnant women are susceptible owing to their level of immunity, endemicity of the infection and several risk factors including age, sanitation, behavioral factors and location. Malaria, if untreated (as it could be asymptomatic in endemic areas) with Intestinal helminth infection could lead to increased risk of low birth weight, contribute to anaemia, resulting to adverse perinatal outcome.

Efforts must be intensified in ensuring that existing integrated interventions such as mass drug administration are specific and intent. Advocacy on early detection, treatment, public health awareness, and initiation of effective environmental hygienic practices can ameliorate its consequences in pregnancy with great importance of antenatal attendance. Importantly, efforts should be made to develop possible means of communication channels on knowledge, attitude and preventive measures

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