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Original Research Article

THE PREVALENCE OF MALARIA AND HELMINTH CO-INFECTION IN PREGNANCY AND THEIR CORRELATION TO ANAEMIA AT BOOKING AT A TERTIARY HOSPITAL, SOUTHERN NIGERIA.

Abstract:-

Objectives: To determine the prevalence of malaria and helminth co-infection in pregnancy and their correlation with anaemia at booking at the University of Port Harcourt Teaching Hospital.

Materials and Methods: This was a cross sectional descriptive study of 192 pregnant women who booked for antenatal care at the University of Port Harcourt Teaching Hospital between August 1, 2015 and March 31, 2016. Socio-demographic data was collected through a structured questionnaire. Blood samples were collected and evaluated for malaria parasites, haemoglobin estimation and stool samples examined for ova of helminths. Data obtained was analyzed using Statistical Package for Social Sciences (SPSS) version 20.0. The results are presented in frequency tables.

Results: The prevalence of malaria, helminth, and their co-infection at booking were 24.5%, 0.5% and 0.5% respectively while the prevalence of anaemia at booking was 16.7%. Malaria and helminth co-infection accounted for 3.1% of the study population with anaemia while 75% of those with anaemia had malaria infection alone. There was a statistically significant relationship between malaria and helminth co-infection, and the area of residence (p= 0.036).

Conclusion: The prevalence of malaria and helminth co-infection was very low and had no statistically significant relationship with anaemia. Malaria infection was mainly associated with anaemia at booking.

Key words:- Pregnancy, Malaria, Helminth, Co-Infection, Southern Nigeria.

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1. INTRODUCTION

Parasitic infection during pregnancy is a major cause of anaemia in Africa [1]. Malaria and helminthiases are co-endemic especially in sub Saharan Africa, and there is an extensive overlap between the area of malaria and helminth infection in Africa [1,2]. Their co-infection is not uncommon, and its additive effect may lead to worsening anaemia and other morbidities, this could have dire consequences on pregnancy [1,2].

Malaria is an infectious disease caused by protists of the genus plasmodium, and it is transmitted by bite from an infected female Anopheles mosquito. According to the latest WHO estimate, there were about 207 million cases of malaria in 2012 and 627,000 deaths worldwide [3]. About 85% to 90% of all malaria morbidity and death occur in Sub-Saharan Africa [3]. Nigeria is one of the most endemic countries for malaria, and the susceptibility to this infection is increased by pregnancy [3,4]. Malaria infection in pregnancy is a major health challenge as it poses substantial risk to the mother, her fetus and the neonate. Many studies have demonstrated the relationship between malaria in pregnancy and maternal anaemia, miscarriage, placenta parasitaemia, low birth weight, congenital

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malaria, stillbirth, and maternal death depending on the level of transmission [5-8].

Helminths are parasitic worms. Helminth infections are more common in the developing countries and produce a global burden of disease greater than that of other known infectious diseases such as malaria or tuberculosis [9]. It is estimated that approximately one third of the 3 billion people in the developing region of Sub Saharan Africa, Asia and the Americas that live on less than 2 US dollar per day are infected with one or more helminths [1,10]. Helminth infection during pregnancy is associated with anaemia, prematurity, low birth weight, and increased maternal morbidity and mortality [11].

Although the distribution of plasmodium and helminths widely overlap on the African continent, reports on parasitic infections are usually solely made on malaria or helminths alone [12]. Malaria and helminth co-infection in pregnancy has not being widely reported especially in the south-south region of Nigeria, hence the need for this study.

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2. MATERIALS AND METHODS

2.1 Study Site

The study was done at the ante-natal clinic of the University of Port Harcourt Teaching Hospital. The hospital is located in Alakahia town in Obio Akpor Local Government Area of Rivers State. It is the apex health institution in Port Harcourt and provides specialized healthcare services for Port Harcourt and the entire Rivers State, as well as neighboring states.

2.2 Methods

This cross sectional descriptive study was conducted among pregnant women booking for ante-natal care at the University of Port Harcourt Teaching Hospital from August 1, 2015 to March 31, 2016. The sample size for this study was calculated using the formula for cross sectional studies, using a previous prevalence of malaria hookworm co-infection which was 13% [13].

Pregnant women who had antimalarial drugs either as chemoprophylaxis or for treatment prior to booking, those who had anti-helminthics prior to booking, those with Human immunodeficiency virus infection (HIV), and pregnant women

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with sickle cell disease and other haemoglobinopathies were all excluded from the study.

All pregnant women who satisfied the criteria and gave consent were recruited for the study. Socio-demographic data were collected using a structured questionnaire and included age, level of education, occupation, marital status, area of residence, religion and parity. The questionnaires were administered by the principal investigator and some trained assistants.

2.3 Blood and Stool sample collection

The blood samples were collected by aseptic technique from the ante cubital fossae. Five millilitres of blood were collected into an ethylene diamine tetra-acetic acid (EDTA) bottle with sterile hypodermic needle. Thick and thin blood films were made on a clean slide. The thick film was used to determine the parasite densities. Non-heparinized capillary tubes were filled with blood sample from the EDTA bottle. The tips of the capillary tubes were cleaned with cotton wool, sealed and arranged inside a haematocrit centrifuge. They were centrifuged for 5 minutes at 12,000 revolutions per minute. The Packed Cell Volume was determined by using a haematocrit reader.

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All patients were given clean labeled stool containers and instructed to bring small quantities of their stool specimen on their next visit within an hour of passing the stool to the laboratory. Wet mount was prepared from the stool specimen using direct smear method with normal saline and iodine preparation, and the concentration procedure using formol-ether for the identification of helminth eggs as well as protozoan cyst.

2.4 Statistical Analysis

Statistical package for Social Sciences SPSS version 20 was used for data analysis. The results are presented in means, standard deviation and frequency tables. Chi square was used to determine correlation between variables. Statistical significance was reported at $P<0.05$.

3. RESULTS

Of the 192 women recruited into the study, 160 (83.3%) were aged between 18-35 years, with a mean age at booking of 30.52 ± 4.75 years. The modal parity was para 1-4 with 53.1% of the study population in this group. Most (87%) of the women had tertiary education and majority (96.4%) of them resided in urban area while 3.6% resided in semi-urban area. Almost all (98.4%) of the women were Christians. These are shown in table 1.

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The prevalence of malaria infection was 24.5%. Majority (89.4%) had mild parasite density and 10.6 % had moderate parasite density while that of helminth infection was 0.5%, and the infection was of moderate parasite density. The age, marital status, educational level and other variable had no significant association with the prevalence of helminth infection at booking. The prevalence of malaria and helminth co-infection in the study population was 0.5%. The mean Packed Cell Volume was 32.67 ± 3.33 %. The prevalence of anaemia at booking was 16.7%. Majority 28 (87.5%) of the study population with anaemia had mild anaemia while 12.5% (4) had moderate anaemia. These are all shown in table 2. Those who resided in semi-urban areas had the highest prevalence of malaria infection at 42.9%, however this was not statistically significant ($p>0.05$). The prevalence of malaria by parity was 29.3% in para 0, 21.6% in para 1-4, and 12.5% in ≥ para 5. The distribution of malaria parasitaemia among other co variates were as shown in table 3.

Of the 192 women, only 1 had malaria and helminth co-infection, the malaria parasite and helminth infection density were both moderate in this participant who resided in a semi-urban area. There was a statistically significant relationship between malaria and helminth co-infection, and the area of residence ($p= 0.036$). Other variables such as age, parity, marital status, level of education and religion

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134 had no statistically significant relationship with malaria and helminth co-infection
135 (p>0.05). Table 4 shows a cross tabulation of the results of malaria and helminth
136 infection.

137 Most (71.4%) of the women with mild anaemia tested positive for malaria
138 parasite while 28.6% (8) with mild anaemia were negative for malaria parasite. All
139 the women with moderate anaemia tested positive for malaria parasite as shown
140 in table 5. There was a very low negative correlation (r= -0.13) between malaria
141 and helminth co-infection, and anaemia in this study.

142 **TABLES**

VARIABLE	NUMBER	PERCENTAGES
AGE (years)		
<18	0	0%
18-35	160	83.3%
>36	32	16.7%
MARRITAL STATUS		
Married	192	100%
Single	0	0%
Divorced	0	0%
Separated	0	0%
LEVEL OF EDUCATION		
Tertiary	167	87.0%
Secondary	24	12.5%
Primary	1	0.5%

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PARITY		
0	82	42.7%
1-4	102	53.1%
>4	8	4.2%
AREA OF RESIDENCE		
Urban	185	96.4%
Semi-urban	7	3.6%
Rural	0	0%
RELIGION		
Christianity	189	98.4%
Islam	3	1.6%
Others	0	0%

TABLE 1: Socio-demographic characteristics

TABLE 2: Laboratory results

VARIABLE	FREQUENCY	PERCENTAGE
RESULTS FOR MALARIA INFECTION		
Positive for malaria parasite		
No	**145**	**75.5%**
Yes	**47**	**24.5%**
Parasite density		
+	**42**	**89.4%**
++	**5**	**10.6%**
+++	**0**	**0%**
RESULTS FOR HELMINTH INFECTION		
Stool microscopy positive		
No	**191**	**99.5%**
Yes	**1**	**0.5%**
Density of infection		
Mild	**0**	**0%**
Moderate	**1**	**100%**
Severe	**0**	**0%**

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MALARIA HELMINTH CO-INFECTION **No** **Yes**	**191** **1**	**99.5%** **0.5%**
HAEMATOLOGICAL RESULT **Normal PCV** **Anaemia**	**160** **32**	**83.3%** **16.7%**
DEGREE OF ANAEMIA **Mild** **Moderate** **Severe**	**28** **4** **0**	**87.5%** **12.5%** **0%**

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147 **TABLE 3: Distribution of malaria parasite infection among variables**

VARIABLE	**MALARIA PARASITE**		**TOTAL**
	YES	**NO**	
AGE			
18-35	42 (26.25%)	118 (73.75%)	160 (100%)
>3	5 (15.62%)	27 (84.38%)	32 (100%)
TOTAL	47	145	192
LEVEL OF EDUCATION			
TERTIARY	41 (24.55%)	126 (75.45%)	167 (100%)
SECONDARY	6 (25.00%)	18 (75.00%)	24 (100%)
PRIMARY	0 (0%)	1 (0%)	1 (100%)
TOTAL	47	145	192
PARITY			
PARA 0	24 (29.27%)	58 (70.73%)	82 (100%)
PARA 1-4	22 (21.57%)	80 (78.43%)	102 (100%)
>PARA 4	1 (12.50%)	7 (87.50%)	8 (100%)

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TOTAL	47	145	192
AREA OF RESIDENCE			
URBAN	44 (23.78%)	141 (76.22%)	185 (100%)
SEMI-URBAN	3 (42.86%)	4 (57.14%)	7 (100%)
TOTAL	47	145	192

TABLE 4: Cross tabulation for malaria and helminth infection

	POSITIVE FOR MALARIA INFECTION	NEGATIVE FOR MALARIA INFECTION	TOTAL
POSITIVE FOR HELMINT INFECTION	1	0	1
NEGATIVE FOR HELMINTH INFECTION	46	145	191
TOTAL	47	145	192

TABLE 5: Cross tabulation showing the of degree of anaemia and malaria infection

MALARIA PARASITE	MALARIA PARASITE POSITIVE	MALARIA PARASITE NEGATIVE	TOTAL

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ANAEMIA			
MILD ANAEMIA	20 (71.4%)	8 (28.6%)	28 (100%)
MODERATE ANAEMIA	4 (100%)	0 (0%)	4 (100%)
TOTAL	24	8	32

4. DISCUSSION

The findings from this study suggest that pregnant women were more susceptible to malaria than helminth infection at booking at the University of Port Harcourt Teaching Hospital. This was similar to reports from previous studies [13,14]. The prevalence of malaria was similar to that obtained in Gabon [15]. This may be because the study population were similar, although the sample size of this study was approximately half that of the one conducted in Gabon. It was however lower than that reported in some other studies [13, 14, 16]. The higher prevalence in these studies could be as a result of the study location, since all the study participants resided in semi-urban areas with a lot of bushy surroundings, poor sanitation and waste disposal facility while majority of the participants in our study resided in urban areas. In this study, those residing in semi-urban areas had

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the highest prevalence of malaria compared to those who resided in urban areas. It can therefore be deduced that residence in a semi-urban area was associated with a higher prevalence of malaria. The study further reaffirms a higher prevalence of malaria infection among primigravidae when compared to multigravidae which was also reported in earlier studies [13,15,16].

The prevalence of helminth infection in this study was 0.5%, which was very low when compared to reports from other studies [13,15,17]. This very high prevalence can be attributed to the methodology used in those studies, the sample population and their area of residence. In the study done in Gabon, stool samples were tested a minimum of three times for helminth infection at monthly interval if the initial stool sample tested was negative unlike in this study where the stool samples of participants were tested only once. The high prevalence of helminth infection as reported in Enugu and Anambra when compared to this study could be attributed to the fact that the studies were done in a semi-urban and rural areas respectively, which were surrounded by thick forest with no modern toilet and water drainage facilities. In contrast, majority of participants in this study were well educated, and resided in urban area with modern toilet and water drainage facilities, which may have accounted for the low prevalence of helminth infection in the study.

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Malaria and helminth co-infection in this study was rather low when compared to previous reports [13-16]. The high prevalence of malaria and helminth co-infection in these studies could be attributed to the methodology used, socio-demographic variables such as residence in rural area or semi-urban area, parity and low socio-economic status. Participants in this study were highly educated and resided mainly in urban area, which could account for the low prevalence of malaria and helminth co-infection. However, there was a statistically significant relationship between malaria and helminth co-infection and area of residence, which showed an association between those residing in semi-urban area and malaria and helminth co-infection.

The prevalence of anaemia in this study was lower than the findings from other reports [13,17,18]. However, there was no statistically significant association between malaria and helminth co-infection with anaemia. Majority of the women with anaemia had malaria, this suggested that malaria infection was a more common cause of anaemia than helminth infection or their co-infection in our centre. A similar finding was also reported in other studies [18,19].

5. LIMITATION

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This study was carried out at a tertiary centre located in an urban area, therefore it may not reflect the true picture of malaria and helminth co-infection and their effect on anaemia in the rural communities of Rivers State.

6. CONCLUSION

There was a very low prevalence of malaria and helminth co-infection at booking at the University of Port Harcourt Teaching Hospital. Larger studies and rural community-based studies are warranted.

CONSENT

A written informed consent was given by the patients to participate in the study and a verbal informed consent was obtained from them for the publication of this work.

ETHICAL APPROVAL

The authors hereby declare that the research was approved by the hospital ethics committee. The ethical approval protocol number is UPTH/ADM/90/S.II/VOL.X/500.

COMPETING INTERESTS

The authors have declared that no competing interests exist.

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