ASSESSMENT OF THE CO-EXISTENCE OF TYPHOIDAL ANTIBODIES AND MALARIA PARASITAEMIA AMONG PREGNANT WOMEN

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RESEARCH ARTICLE

Received: **18-06-2021**
Accepted: **24-06-2021**
Published: **25-06-2021**

Abstract: Malaria is a mosquito-borne infectious disease of humans and other animals caused by parasitic protozoans of the genus *Plasmodium*. Commonly, the disease is transmitted via a bite from an infected female *Anopheles* mosquito. Five species of *Plasmodium* can infect and be transmitted by humans. The vast majority of deaths are caused by *Plasmodium falciparum* and *Plasmodium vivax*, while *Plasmodium ovale* and *Plasmodium malariae* cause a generally milder form of malaria that is rarely fatal. The aim of this study is to evaluate the co-existence of typhoidal antibodies and malaria parasitaemia among pregnant women in Ekpoma, Edo state. A total of one hundred (100) individuals were recruited for this study which consists of eighty (80) pregnant women and twenty (20) non-pregnant women. The methods used in this study were the slide microscopy method for malaria parasites and the serological method for typhoidal antibodies. The result showed that the prevalence of malaria in all the trimesters (1st, 2nd, and 3rd trimester) are 7 (77.78%), 2(8.33%) and 14 (29.41%) respectively. The distribution of this result was statistically significant ($p<0.05$; $X^2=15.683$). The result showed that the prevalence of typhoid fever in all the trimesters (1st, 2nd, and 3rd trimester) are 2 (22.22%), 3(12.50%), and 4 (23.53%) respectively. The distribution of this result was not statistically significant ($p>0.05$; $X^2=0.953$). The result also showed that the prevalence of malaria and typhoid fever in all the trimesters (1st, 2nd, and 3rd trimester) are 2 (22.22%), 4(16.66%), and 0 (12.00%) respectively. The distribution of this result was not statistically significant ($p>0.05$; $X^2=3.704$). Conclusively, the results in this study showed that the prevalence of malaria and typhoid co-infections are low which means no association was found between malaria and typhoid fever infections within the study area. Hence one cannot actually say that malaria may predispose to typhoid fever. Also, cross-reacting antigens are widely distributed in the microbial world and since there will always be repeated exposures to Salmonella species in endemic regions, increased efforts should be made to find better, more rapid, sensitive, and specific clinical and cultural methods.

Keywords: Malaria, Typhoidal, Pregnant, Parasite, Fever

INTRODUCTION

Malaria is caused by obligate intracellular parasites, that lives in the erythrocytes of the host and remodel these cells to provide optimally for his or her own needs (Cecil, 1992). It is a serious public ill-health in tropical areas, and it's estimated that malaria is liable for 1 to three million deaths and 300 to 500 million infections annually (Pearson and Guerrant, 2000). On the opposite hand, typhoid is widely known as a serious public ill-health in most developing tropical countries. It is a systemic disease characterized by an acute illness, the first typical manifestations of which are fever, headache, abdominal pain, relative bradycardia, splenomegaly, and leucopenia (Pearson and Guerrant, 2000).

Malaria is caused by parasites of the genus Plasmodium with its initial symptoms varying particularly in children and should include irregular fever, malaise, headache, muscular pain, sweating, chills, nausea, vomiting, and some diarrhoea and most of these symptoms are induced by the release of cytokines by the host's immune system (Garg, 2000). About 207 million malaria cases and nearly 627 000 deaths are reported annually with more than 80% occurring in sub-Saharan Africa and affecting mostly children under five years of age and pregnant women (WHO, 2014). Like other sub-Saharan countries, it remains a major cause of morbidity and mortality in Nigeria (Atangana et al., 2009). About 31% of consultations in hospitals are due to malaria; and approximately 44% of these patients are hospitalized with a resulting 18% deaths (Ministère de la Santé Publique, 2012). On the opposite hand, typhoid may be a systemic infection characterized by a persistently high fever, headache, malaise, lethargy, skin rash, loss of appetite, constipation more often than diarrhoea, hepatosplenomegaly, and bradycardia. However, it is an important cause of morbidity in many regions of the world, with an estimated 22 million new cases and 600,000 deaths registered annually (Didelot *et al.*, 2009).

Although co-infection of malaria and typhoid fever have been reported in some parts of Nigeria (Mbuh *et al.*, 2003; Uneke, 2008; Opara *et al.*, 2011; Isibor *et al.*, 2011) and in many other countries such as Cameroon (Ammah *et al.*, 1999; Nsutebu *et al.*, 2003) and India (Snehanshu *et al.*, 2014; Kulkani *et al.*, 2015), continuous monitoring and epidemiologic enquiry is quite essential because disease

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Published online at http://gulfpublishers.com/journal/1

pattern or trend doesn't only vary with geographical location but seems to vary over time with changes in global climate. Both malaria and typhoid usually cause liver injury and this results in a rise in serum levels of intracellular enzymes like alanine aminotransferase (ALT) and aspartate aminotransferase (AST) above the normal ranges (Amamah *et al*., 1999). For decades, this relationship between malaria and salmonellae has been confirmed by additional studies from Africa that largely describe a way better incidence of non-typhoidal salmonella bacteremia among patients with malarial parasitaemia (Ammah *et al.,* 1999).

Malaria and typhoid are documented undifferentiated febrile illnesses which might be liable for varying degrees of morbidity and mortality in developing sub-Saharan countries, (Ammah *et al*., 1999; Nsutebu *et al.*, 2003; Atangana *et al.*, 2009; Ukaegbo *et al*., 2014). Despite the known clinical presentations of these infections and their response to treatment options, concomitant infections with malaria and typhoid or with other tropical diseases could affect the clinical course of the disease(s), leading to wrong diagnosis and treatment failures. Therefore, in a country like Nigeria where malaria and typhoid fever are considered endemic, individuals are at substantial risks of contracting both diseases either concurrently or as an acute infection superimposed on a chronic one. As such, malaria and typhoid fever continue to be of major public health importance (Ukaegbo *et al.*, 2014). The purpose of this study is to generate updated baseline data on the co-existence of typhoidal antibodies and malaria parasitaemia among pregnant women in Ekpoma and environs for clinico-epidemiologic purposes which will enhance better management and control; additionally to trying to know the implications of those co-infections in disease severity.

MATERIALS AND METHODS

The study was administered in Ekpoma, the Headquarter of Esan West government area of Edo State. Ekpoma is moderately populated with the peoples' occupations being farming and trading. The main sources of water within the locality are rainfall and well. The well is augmented by an irrigation scheme provided by the govt for public use. The study population of this study comprises pregnant women in Ekpoma environs which were randomly selected from different health centers in the locality. A total of one hundred (100) individuals were recruited for this study which consists of eighty (80) pregnant women and twenty (20) non-pregnant women. Subject data such as name, age, and trimester of pregnancy were also obtained. The sample size (N) is calculated from the formula below using prevalence from previous studies (Ekejindu *et al.,* 2002).

$$\text{Samples size } (\mathbf{N}) = \frac{Z^2 Pq}{d^2},$$

where
N = the desired size
Z = 1.96 (standard score)
P = Prevalence
q. = 1- P
d = sample error tolerated (0.05)

The prevalence used in calculating the sample size for this project was deducted from a similar work done by Isibor *et al.*, 2011 on co-infection of the malaria parasite and s. typhi in a patient in Benin City, Nigeria.

Prevalence = 5%

$1 - 0.05 = 0.95$

$$\frac{3.8416 \times 0.05 \times 0.95}{0.0025}$$

$$\frac{0.182476}{0.0025} = 72.9904$$

(Isibor *et al*., 2011)

Sample Collection: Blood samples (5mls) were collected by vene-puncture into accurately labeled EDTA containers for both subjects and control individuals. The blood samples were used to prepared thick film for the analysis of malaria to check for malaria parasite and centrifuged with a laboratory centrifuge at 4000rpm for 5minutes at room temperature and the serum used to analyze for typhoidal antibodies by carrying out a widal test. Samples collected were examined and analyzed in the Research Diagnostic Laboratory, of the Department of Medical Laboratory Science, College of Medicine, Ambrose Alli University, Ekpoma.

Determination of Malaria Parasite Density: The density of the malaria parasite was determined by examining a thick blood film stained by the Giemsa method (Cheesbrough, 1998). The blood was mixed by inversion. A clean grease-free slide was taken. A drop of the blood was placed on the slide using a pasture pipette and a thick film smear was made. It was allowed to dried. It was flooded with diluted Giemsa stain (1:10) and allow to stay for 45minutes. It was rinsed after 45 minutes with buffered distilled water pH 7.0. The back of the slide was wiped dried with cotton wool and allow to dried. It was then examined under the microscope using X10 and X40 objective with immersion oil.

Degree of Parasitaemia Classification: The malaria parasite density were graded as follows: 1 parasite/field: low density (+), 2-9 parasites/field: medium density (++), and More than 20 parasites/field: high density (Cheesbrough, 1998).

Serological Method for Typhoidal Antibodies: Tile agglutination test - One drop of the patient's serum was placed on a clean grease-free tile. A drop of the antigen was placed in their respective position. It was mixed using a spreader. It was rocked for about 1 minute and observed for agglutination in an open-air or transmitted light. The positive result showed agglutination. The negative result showed no agglutination. The agglutination observed on the patient's serum was tested further by the Tube agglutination test.

The Mean and Standard deviation of the results obtained was calculated. Chi-Square and Percentage was used for the

analysis using SPSS package version 18. Value with $p<0.05$ were considered statistically significant in this study.

RESULTS

The results in table 1 present the prevalence of malaria in the different trimesters of pregnancy. The result showed that the prevalence of malaria in the first, second, and third trimesters were 7 (77.78%) 2 (8.33%), and 5 (29.41%) respectively. The distribution of this result was statistically significant ($p<0.05$; $X^2=15.683$).

The results in table 2 present the prevalence of typhoid fever in pregnant women. The result showed that the prevalence of typhoid fever in the first, second, and third trimesters were 2 (22.22%) 3 (12.50%), and 4 (23.53%) respectively. The distribution of this result was not statistically significant ($p>0.05$; $X^2=0.953$).

The results in table 3 present the prevalence of typhoid fever and malaria co-infection in pregnant women. The result showed that the prevalence of malaria and typhoid fever in the first, second, and third trimesters were 2 (22.22%) 4 (16.66%) and 0 (0.00%) respectively. The distribution of this result was not statistically significant ($p<0.05$; $X^2=3.704$).

The results in table 4 present the prevalence of typhoid fever, malaria in pregnant women according to age. The distribution of this result was statistically significant (Malaria; $p>0.05$; $X^2=0.206$); (Typhoid fever; $p>0.05$; $X^2=0.946$); (Co-infection; $p>0.05$; $X^2=1.786$).

Table 1: Prevalence of Malaria in Trimester of pregnancy

Trimesters	No Examined	No Infected	Prevalence (%)	X^2 cal
1st Trimester	9	7	77.78	
2nd Trimester	24	2	8.33	
3rd Trimester	17	5	29.41	
TOTAL	50	14	28.00	15.683

(α = 0.05, p value = 0.0003; df =2)

Key: X^2cal = chi-square calculated; D.f. =Degree of freedom; No=Number

Table 2: Prevalence of typhoid fever in trimester of pregnancy

Trimesters	No Examined	No Infected	Prevalence (%)	X^2 cal
1st Trimester	9	2	22.22	
2nd Trimester	24	3	12.50	
3rd Trimester	17	4	23.53	
TOTAL	50	9	18.00	0.953

(α = 0.05, p value = 0.621; df =2)

Table 3: Prevalence of Malaria and Typhoid fever in trimesters of pregnancy

Trimesters	No Examined	No Infected	Prevalence (%)	X^2 cal
1st Trimester	9	2	22.22	
2nd Trimester	24	4	16.66	
3rd Trimester	17	0	0.00	
TOTAL	50	6	12.00	3.704

(α = 0.05, p value = 0.157; df =2)

Table 4: Prevalence of Malaria and Typhoid fever co-infection in according to age

Age	No	Malaria N(%)	Typhoid N(%)	Co-Infection N(%)
19-25 years	26	8(30.77%)	6(23.08%)	3(11.54%)
26 years	8	2(25.00%)	1(12.50%)	2(25.00%)
27-33 years	16	4(25.00%)	2(12.50%)	1(6.25%)
TOTAL	50	14(28.00%)	9(18.00%)	6(12.00%)
X^2 cal		0.206	0.946	1.786
P value		0.902	0.623	0.409

DISCUSSION

Malaria remains the only most vital infection-causing morbidity and mortality within the world and is second only to tubercle bacillus because of the single most vital infection agent (Greenwood, 1997). it's one among the most important impediments to progress in Africa and is that the biggest killer in Africa, with 90% of the worldwide malaria deaths occurring during this continent (Bulter, 1997). it's liable for one in four deaths below the age of 5 years and will most times cause miscarriage at the first stage of pregnancy (Bulter, 1997). within the endemic countries of Africa, children under the age of 5 and pregnant women bear the brunt of the burden of malaria disease, this is often because they need lower immunity to the disease compared to people within the same environment (Molyneux *et al*., 1989; Raimi *et al.*, 2004). Malaria in pregnancy is a continuous public health challenge.

In this study, out of the 50 pregnant women, 28% were positive to and show symptoms of malaria. The infection was found to flow from to Plasmodium falciparum. Furthermore, 12% of pregnant women were also infected with both malaria and typhoid . Also, the age distribution of pregnant women positive to malaria and people without malaria were also presented during this study. This result supports the prevailing knowledge that prime prevalence at lower ages and low prevalence at higher ages is thanks to the existence of innate immunity to communicable disease including malaria which the pregnant women acquires due to increasing in age (Oduola *et al.*, 1992; Rogerson *et al*., 2000; BouyouAkotet *et al.*, 2003). However, Lander et al., (2002) reported no significant association between malaria infection and maternal age (Lander *et al.*, 2002). Women within the trimester had the very best level of parasitemia which isn't in line with other studies where the very best level of parasitemia was recorded at the second and early trimester (Menendez, 1995; Nosten *et al*., 1991).

Furthermore, the results of this study show an overall infection rate of 18.00% among pregnant women. The results of this study agree thereupon of Woods et al., (2006) and Ochiai et al., (2005), but varies thereupon of (Crump *et al*., 2004). the very best rate of infection of typhoid recorded during the study in reference to age was among those within 19-25 years age bracket (23.08%), followed by those within 26 years age bracket who had 12.50%, while those within 27-33 years age bracket also had 12.50%. This can be attributed thanks to poor drug administration, poor personal hygiene and low standard of living. The infection rate in reference to the gestation of the pregnant women showed that the very best rate of infection amongst women was in their trimester (23.53%) and lowest within the women in their trimester (12.50%). this might flow from to the very fact that at this stage most girls tend to possess a high level of appetite for various sorts of food resulting in a high rate of infection. Also at this stage, infection is established which is that the most dangerous stage of infection for pregnant women (Ochiai *et al*., 2008). typhoid infection may be a dangerous infection amongst pregnant women and is common in Nigeria. this will be hazardous in pregnancy because it interferes with the immune process. this might flow from to poor personal drug administration and low standard of living. typhoid infection during pregnancy increases the likelihood of maternal anemia, abortion, stillbirth, premature birth low birth rate, and even death of mother and child.

CONCLUSION

The results in this study showed that the prevalence of malaria and typhoid are 28% and 18% respectively. Pregnancy is also one of the factors affecting the rate of malaria parasite infection and typhoid in women living in malaria-endemic communities. Malaria and typhoid fever should therefore be recognized as a global priority in health care more so in pregnancy. Based on the results obtained in this study, the following are hereby recommended; Researchers should develop vaccines that will be used to treat and monitor malaria and typhoid fever pregnant women, Health education is should be adopted to create public awareness on the preventive measures of typhoid and malaria and Methods for screening and monitoring of typhoid and malaria should be adopted in order to reduce morbidity and mortality.

CONFLICT OF INTEREST

The author declares no conflicts of interest. The author alone is responsible for the content and the writing of the paper.

FUNDING

This research did not receive any grant from funding agencies in the public, commercial, or not-for-profit sectors.

ACKNOWLEDGEMENTS

The authors would like to thank all the Laboratory and technical staff of the Department of Medical Laboratory Science, Ambrose Alli University Ekpoma, Edo State for their excellent assistance and St Kenny Research Consult, Ekpoma, Edo State for providing medical writing support/editorial support in accordance with Good Publication Practice (GPP3) guidelines.

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