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Co-Infection of Malaria and Typhoid Fever among Pregnant Women Attending Primary Health Care Centre, Ojo Local Government, Lagos, Nigeria

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Abstract

Background: Co-infection of malaria and typhoid can result in serious complications and conditions in pregnant women.

Objectives: This research was carried out to investigate the co-infection of malaria and typhoid fever among pregnant women attending antenatal clinic at Primary Health Care centre, Oto-Awori Local Council Development Area (LCDA) in Ojo Local Government, Lagos.

Methods: 170 blood samples of pregnant women were examined for the presence of malaria parasite and typhoid fever using standard methods and compared with equal number of non-pregnant women (170). Co-infection was characterized based on age group, trimester, gravidal, education status and employment status. Women's data were collected through questionnaires.

Results: Prevalence of co-infection of malaria and typhoid in pregnant women was high in age group 26-35 years 50 (63.3%), 50 (63.3%) of women in second trimester had co-infection, high prevalence of co-infection was observed in gravidal Co-infection of malaria and typhoid were high among the pregnant women of gravidal 1, 2 and 3. Also, co-infection of malaria and typhoid was high among women with secondary 41 (51.9%) and tertiary 31 (39.2%) education, semi-skilled women 37 (46.8%) and respondents had good knowledge of malaria and typhoid.

Conclusions: This study revealed the prevalence of co-infections among the pregnant women; hence more attention should be given to this group.

Keywords: Pregnant women; Non-pregnant women; Malaria parasite; Typhoid fever; Co-infection

Introduction

Infection is the major cause of maternal, fetal and neonatal mortality and morbidity worldwide. In the developing world, co infections among pregnant women such as malaria and typhoid fever that are maternal systemic infections are often functions of poverty, overcrowding, and malnutrition; impose health costs to the mother and risks to the fetus. These risks include spontaneous abortion, stillbirth, preterm labour and preterm birth, low birth weight, intrauterine growth restriction (IUGR), and infection [1].

Malaria is a major public health problem especially in tropical and sub-Saharan Africa; it assumed to be responsible for about 1 to 3 million deaths and 300-500 million clinical cases annually [2,3].

Typhoid fever, caused by *Salmonella typhi* conversely remains an important worldwide cause of morbidity and mortality, and continues to be a health problem in developing countries where there is poor sanitation, poor standard of personal hygiene and prevalence of contaminated food [4-6].

Co-infection of malaria and typhoid can result in serious complications and conditions such as maternal anemia, fever, fetal anemia, abortion, still-birth and even death of the child or mother before birth or soon after delivery [7].

Co-infection of malaria and typhoid fever leads to chronic anemia and placental malaria infection, reducing the birth weight and increasing the risk of neonatal death.

Severe maternal anemia has been associated with an increased risk of infant death in the prenatal and post neonatal periods [8]. However, as low birth weight is a major determinant of infant mortality. It has been assumed that malaria and anemia during pregnancy would increase infant mortality indirectly by lowering birth weight [8]. In areas of low malarial transmission, infants born to malaria-infected mothers have retarded growth rather than premature birth, and the premature birth are at much higher risk of dying in infancy than are the infants with retarded growth [9]. However, premature births are common where maternal malaria is associated with symptoms [10].

Malaria infection during pregnancy is a significant public health problem with substantial risk for the pregnant women; her weight is mostly the result of P. falciparum infection and occurs predominantly in Africa [11-13].

Malaria infection makes a large but unquantifiable contribution to low birth weight in infants in the developing world, severe maternal anemia and perinatal mortality. It is also a major cause of morbidity and mortality in infants and children [14,15].

Materials and Methods

Research design

Both experimental and descriptive approaches were used in the survey design. This involved the collection of blood samples and data from a defined population of pregnant women attending antenatal clinic at Oto-Awori LCDA Primary Health Care Centre in Ojo Local Government Area of Lagos State using the necessary medical laboratory apparatus and questionnaire.

Sample size and study site

The study was conducted on a sample size of three hundred and forty (340) patients of 170 pregnant women attending antenatal clinic at Oto-Awori LCDA Primary Health Care Centre in Ojo Local Government Area of Lagos State, and then compared with 170 non-pregnant women attending the same clinic. The survey covered between March and August, 2015.

Staining technique

The laboratory method employed for staining and identification of malaria parasites in collected blood samples [16]. Both thick and thin film smear were prepared.

Widal test for typhoid fever infection

Five milliliters of blood samples was obtained by vein puncture from the pregnant and non-pregnant women into EDTA bottle containing anticoagulant, this was spinned in an electric centrifuge for 2-5 minutes, the plasma obtained was subjected to widal test using Croma test Widal Kit by Omega Diagnostic Limited.

Non-experimental design or instrument

Questionnaire was designed to elicit information from the respondents which facilitated the analysis of data collected. The questionnaire was framed with the questions considered appropriate for the scope of the study and proper care was taken to avoid repetition. Personal data such as age, educational status and occupation of the respondent was captured in section "A" of the questionnaire while section "B" contains fifteen (15) items, to elicit information based on the research which required the respondent to express their opinion using four (4) point rating scale; Strongly Agree, Agree, Strongly Disagree and Disagree. A total of 340 questionnaires were sent out; all the questionnaires were returned and completely filled.

Data analysis

Data obtained were subjected to statistical analysis using Chi-square (X2) test to establish the relationship between malaria/typhoid in pregnant women with respect to age, occupation, educational, trimester and gravidal status.

Ethical consent

The ethical permit to carry out this research work was granted by Medical Officer of Health (MOH), Ojo Local Government Oto-Awori Local Council Development Area, Oto-Awori City Hall, Klm 28, Lagos Badagry Expressway, Ijankin and Lagos State.

Results

Prevalence of malaria and typhoid infection among pregnant women in the study

Prevalence of Malaria and Typhoid Infection among Pregnant Women in the study is shown in **Table 1**. The age groups of the pregnant women are 16-25, 26-35 and 36-45 years, most of the pregnant women tested are between age group 26-35 years 113 (66.5). The result of laboratory examination revealed that 112 pregnant women had malaria while 114 pregnant women had typhoid fever out of 170 women that were tested. Malaria 73 (65.18%) and typhoid 77 (67.18%) fever were more prevalent among pregnant women of the age group 26-35 years.

Table 1 Prevalence of malaria and typhoid infection among pregnant women in the study.

Age Group (year)	Infection status		
	Number of women tested	Malaria	Typhoid
16-25	34 (20.00)	25 (22.32%)	23 (20.18%)
26-35	113 (66.5)	73 (65.18%)	77 (67.18%)
36-45	23 (13.5)	14 (12.50%)	14 (12.28%)
Total	170	112	114

Relationship between the age and co-infection of malaria and typhoid fever among the pregnant women in the study area

Table 2 shows the relationship between age and co-infection of malaria and typhoid fever among the pregnant women in the study area. The number of women that were tested positive to malaria only and typhoid only are 33 and 35 respectively while 79 women had co-infection. Prevalence of co-infection of malaria and typhoid fever was high among the pregnant women in the age group 26-35 years 50 (63.3).

However, out of 170 pregnant women 23 women had neither malaria nor typhoid and there were no significant (P=0.434) relationship between age group and co-infection of malaria and typhoid fever among pregnant women.

Table 2 Relationship between age and co-infection (malaria and typhoid) among pregnant women in the study area.

Age group (years)	Infection status				
	Malaria Only (%)	Typhoid Only (%)	Malaria and typhoid (%)	None (%)	Total number of women examined (%)
16-25	7 (21.21)	5 (14.3)	18 (22.8)	4 (17.4)	34 (20.0)
26-35	23 (69.7)	27 (77.1)	50 (63.3)	33 (56.5)	113 (65.5)
36-45	3 (9.09)	3 (8.6)	11 (13.9)	6 (26.1)	23 (13.5)
Total	33 (100)	35 (100)	79 (100)	23 (100)	170 (100)

$\chi 2 = 5.901$, df = 6, P= 0.434 (not significant)

Relationship between age group and co-infection of malaria and typhoid among non-pregnant women

Table 3 shows the relationship between age group and co-infection of malaria and typhoid among non-pregnant women in the study area. A total number of 170 women were examined, the distribution of the women according to their age group are 16-25, 26-35, 36-45, 46-55, 56-65 and 66-75 years while the number of women are 21, 63, 47, 31, 4 and 4 women respectively. Among the non-pregnant women, malaria only (47 women) was more prevalent than typhoid only (8). Co-infection were more prevalent among women of age group 26-35 years 41 (39.0%) and 36-45 years 30 (28.6%). Out of 170 non-pregnant women tested, 10 women had neither typhoid nor malaria fever. There were no significant (P=0.435) relationship between age group and co-infection of malaria and typhoid fever among non-pregnant women.

Table 3 Relationship between age and co-infection (malaria and typhoid) among non-pregnant women in the study area.

Age group (years)	Infection status				
	Malaria Only (%)	Typhoid Only (%)	Malaria and typhoid (%)	None (%)	Total number of women examined (%)
16-25	7 (14.9)	2 (25.0)	12 (11.4)	0 (0)	21 (12.4)
26-35	16 (34.0)	4 (50.0)	41 (39.0)	2 (20.0)	63 (37.1)
36-45	10 (21.3)	2 (25.0)	30 (28.6)	5 (50.0)	47 (27.6)
46-55	13 (27.7)	0 (0)	16 (15.2)	2 (20.0)	31 (18.2)
56-65	0 (0)	0 (0)	3 (2.9)	1 (10.0)	4 (2.4)
66-75	1 (2.1)	0 (0)	3 (2.9)	0 (0)	4 (2.4)
Total	47 (100)	8 (100)	105 (100)	10 (100)	170 (100)

$\chi 2 = 15.236$, df = 15, P = 0.435 (not significant)

Relationship between trimester and co-infection (malaria and typhoid) among pregnant women in the study area

Table 4 revealed the relationship between trimester and co-infection of malaria among pregnant women, it was observed that out of 170 women examined, most women are in second trimester 107(62.9%). Co-infection of typhoid and malaria were more prevalent among women in first 20(25.3%) and second 50 (63.3%) trimester.

Table 4 Relationship between trimester and co-infection (malaria and typhoid) among pregnant women in the study area.

Trimester	Infection status				
	Malaria Only (%)	Typhoid Only (%)	Malaria and typhoid (%)	None (%)	Total number of women examined (%)
First	12 (36.4)	4 (11.4)	20 (25.3)	8 (34.8)	44 (25.9)
Second	18 (54.5)	27 (77.1)	50 (63.3)	12 (52.2)	107 (62.9)
Third	3 (9.1)	4 (11.4)	9 (11.4)	3 (13.0)	19 (11.2)
Total	33 (100)	35 (100)	79 (100)	23 (100)	170 (100)

$\chi 2 = 7.061$, df = 6, P = 0.315 (not significant)

Relationship between gravidal and co-infection (malaria and typhoid) among pregnant women in the study area

Relationship between gravidal and co-infection (malaria and typhoid) among pregnant women in the study area is shown in **Table 5**. Most of the pregnant women examined had gravidal 1, 2, 3 and 4 with 33 (19.4%), 53 (31.2%), 53 (31.2%) and 21 (12.4) women respectively. Prevalence of malaria only was high among the pregnant women that had gravidal 217 (51.5%) while typhoid only was prevalent among pregnant women that had gravidal 2 and 3, 11 (31.4%) and 12 (34.3%)

respectively. Co-infection of malaria and typhoid were high among the pregnant women of gravidal 1, 2 and 3.

Table 5 Relationship between gravidal and co-infection (malaria and typhoid) among pregnant women in the study area.

Gravidal	Infection status				
	Malaria Only (%)	Typhoid Only (%)	Malaria and typhoid (%)	None (%)	Total number of women examined (%)
1	5 (15.2)	7 (20.0)	17 (21.5)	4 (17.4)	33 (19.4)
2	17 (51.5)	11 (31.4)	20 (25.3)	5 (21.7)	53 (31.2)
3	5 (15.2)	12 (34.3)	25 (31.6)	11 (47.8)	53 (31.2)
4	6 (18.2)	3 (8.6)	10 (12.7)	2 (8.7)	21 (12.4)
5	0 (0)	2 (5.7)	6 (7.6)	1 (4.3)	9 (5.3)
6	0 (0)	0 (0)	1 (1.3)	0 (0)	1 (0.6)
Total	33 (100)	35 (100)	79 (100)	23 (100)	170 (100)

$\chi 2 = 16.635$, df = 15, P = 0.341 (not significant)

Relationship between educational status and co-infection (malaria and typhoid) among pregnant and non-pregnant women in the study area

Relationship between economic status and co-infection among pregnant and non-pregnant women in the study area are shown in **Table 6**, co-infection of malaria and typhoid was high among pregnant women with secondary 41 (51.9%) and tertiary 31 (39.2%) education however, co-infection of malaria and typhoid among non-pregnant women were high among women with primary, secondary, tertiary and none education.

Table 6 Relationship between educational status and co-infection (malaria and typhoid) among pregnant and non-pregnant women in the study area.

Educational status	Pregnant Infection status					Non-pregnant Infection status				
	Malaria only (%)	Typhoid only (%)	Malaria and typhoid (%)	None (%)	Total examined (%)	Malaria only (%)	Typhoid only (%)	Malaria and typhoid (%)	None (%)	Total examined (%)
Primary	2 (6.1)	5 (14.3)	5 (6.3)	3 (13.0)	15 (8.8)	3 (6.4)	0 (0)	12 (11.4)	0 (0)	15 (8.8)
Secondary	8 (24.2)	15 (42.9)	41 (51.9)	10 (43.5)	74 (43.5)	18 (38.3)	1 (12.5)	34 (32.4)	3 (30)	56 (32.9)
Tertiary	20 (60.6)	11 (31.4)	31 (39.2)	8 (34.8)	70 (41.2)	17 (36.2)	6 (75.0)	40 (38.1)	6 (60)	69 (40.6)
None	3 (9.1)	4 (11.4)	2 (2.5)	2 (8.7)	11 (6.5)	9 (19.1)	1 (12.5)	19 (18.1)	1 (10)	30 (17.6)
Total	33 (100)	35 (100)	79 (100)	23	170 (100)	47 (100)	8 (100)	105 (100)	10 (100)	170 (100)

$\chi 2 = 14.469$, df = 9, P = 0.107 (not significant)

$\chi 2 = 8.346$, df = 9, P = 0.500 (not significant)

Relationship between occupation and co-infection (malaria and typhoid) among pregnant and non-pregnant women in the study area

Table 7 revealed the relationship between occupation and co-infection of malaria and typhoid fever among pregnant and non-pregnant women in the study area, based on the occupation, co-infection of malaria and typhoid was prevalent in both pregnant and non-pregnant women that are skilled, semi-skilled and unemployed. In pregnant women, the highest co-infection was observed among semi-skilled women 37

(46.8%) out of 66 women examined. Also, in non-pregnant women the highest co-infection was observed among semi-skilled women 45 (42.9%) out of 71 women examined.

Table 7 Relationship between occupation and co-infection (malaria and typhoid) among pregnant and non-pregnant women in the study area.

Occupation	Pregnant Infection status					Non-pregnant Infection status				
	Malaria only (%)	Typhoid only (%)	Malaria and typhoid (%)	None (%)	Total examined (%)	Malaria only (%)	Typhoid only (%)	Malaria and typhoid (%)	None (%)	Total examined (%)
Skilled	17 (51.5)	14 (40.0)	19 (24.1)	8 (34.8)	58 (34.1)	15 (31.9)	2 (25.0)	28 (26.7)	4 (40.0)	49 (28.8)
Semi-skilled	6 (18.2)	13 (37.1)	37 (46.8)	10 (43.5)	66 (38.8)	21 (44.7)	1 (12.5)	45 (42.9)	4 (40.0)	71 (4.8)
Casual staff	2 (6.1)	2 (5.7)	3 (3.8)	0 (0)	7 (4.1)	1 (2.1)	0 (0)	1 (1.0)	0 (0)	2 (1.2)
Pensionable	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (12.5)	4 (3.8)	0 (0)	5 (2.9)
Unemployed	8 (24.2)	6 (17.1)	20 (25.3)	5 (21.7)	39 (22.9)	10 (21.3)	4 (50.0)	27 (25.7)	2 (20.0)	43 (25.3)
Total	33 (100)	35 (100)	79 (100)	23 (100)	170 (100)	47 (100)	8 (100)	105 (100)	10 (100)	170 (100)

$\chi2 = 12.946$, df = 9, P = 0.165 (not significant)

$\chi2 = 9.970$, df = 12, P = 0.619 (not significant)

Effect of knowledge of disease on the rate of infection in the study area

Effect of knowledge of malaria and typhoid on the rate of infection in the study area is presented in **Table 8**. High percentage of pregnant and non-pregnant agreed that malaria and typhoid are endemic, malaria and typhoid are public health problems, pregnancy triggered infection, malaria spread via mosquito bites alone, malaria and typhoid can effect both mother and unborn child and taking contaminated food and drinks may cause typhoid. However most of the pregnant 119 (70.0%) and non-pregnant 141 (82.9%) women disagreed that malaria and typhoid are higher during pregnancy.

Table 8 Effect of knowledge of disease on the rate of infection in the study area.

Factors	Status	Pregnant (%)	Non-pregnant (%)	Total examined (%)
Malaria and typhoid is endemic $\chi2 = 0.677$, df = 1, P = 0.411	Agreed	140 (82.4)	134 (78.8)	274 (80.6)
	Disagreed	30 (17.6)	36 (21.2)	66 (19.4)
Malaria and typhoid are public health problems $\chi2 = 1.262$, df = 1, P = 0.261	Agreed	143 (84.1)	135 (79.4)	278 (81.8)
	Disagreed	27 (15.9)	35 (20.6)	62 (18.2)
Pregnancy triggered infection $\chi2 = 1.506$, df = 1, P = 0.220	Agreed	141 (82.9)	132 (77.6)	273 (80.3)
	Disagreed	29 (17.1)	38 (22.4)	67 (19.7)
Malaria and typhoid are higher during pregnancy $\chi2 = 7.912$, df = 1, P = 0.005	Agreed	51 (30.0)	29 (17.1)	80 (23.5)
	Disagreed	119 (70.0)	141 (82.9)	260 (76.5)
Malaria spread via mosquito bites alone $\chi2 = 0.939$, df = 1, P = 0.333	Agreed	163 (95.9)	159 (93.5)	322 (94.7)
	Disagreed	7 (4.1)	11 (6.5)	18 (5.3)
Malaria and typhoid can affect both mother and unborn child $\chi2 = 2.012$, df = 1, P = 0.156	Agreed	170 (100)	168 (98.8)	338 (99.4)
	Disagreed	0 (0)	2 (1.2)	2 (0.6)
Taking contaminated food and drinks may cause typhoid $\chi2 = 2.894$, df = 1, P = 0.408	Agreed	168 (98.8)	170 (100)	338 (99.4)
	Disagreed	2 (1.2)	0 (0)	2 (0.6)

Effect of social economic status on the rate of infection in the study area

Effect of social economic status on the rate of infection in the study area is reported in **Table 9**. It was observed that more than 90% of the pregnant and non-pregnant women agreed that poor housing system may cause malaria, poor sanitary and sewage disposal cause typhoid and malaria, sleeping under unbroken net and use of insecticide prevent mosquito bites, healthy lifestyle will prevent malaria and typhoid, personal hygiene and healthy environment prevent infections and infections if untreated can result into complications while on 165 (97.1%) of pregnant and 168 (98.8%) of non-pregnant women disagreed to no update information about anti-malaria medicine during pregnancy.

Table 9 Effect of social economic status on the rate of infection in the study area.

Factors	Status	Pregnant (%)	Non-pregnant (%)	Total examined (%)
Poor housing system may cause malaria χ2 = 4.048, df=1, P=0.044	Agreed	166 (97.6)	170 (100)	336 (98.8)
	Disagreed	4 (2.4)	0 (0)	4 (1.2)
Poor sanitary and sewage disposal cause typhoid and malaria	Agreed	170 (100)	170 (100)	340 (100)
	Disagreed	0 (0)	0 (0)	0 (0)
Pregnant women should remain indoor to prevent mosquito bite χ2 = 0.432, df=1, P=0.511	Agreed	100 (58.8)	94 (55.3)	194 (57.1)
	Disagreed	70 (41.2)	76 (44.7)	146 (42.9)
No update information about anti-malaria medicine during pregnancy. χ2=1.313, df=1, P = 0.252	Agreed	5 (2.9)	2 (1.2)	7 (2.1)
	Disagreed	165 (97.1)	168 (98.8)	333 (97.9)
Sleeping under unbroken net and use of insecticide prevent mosquito bites χ2 = 0.512, df = 1, P = 0.474	Agreed	167 (98.2)	165 (97.1)	332 (97.6)
	Disagreed	3 (1.8)	5 (2.9)	8 (2.4)
Healthy lifestyle will prevent malaria and typhoid χ2 = 0.203, df = 1, P = 0.652	Agreed	168 (98.8)	167 (98.2)	335 (98.5)
	Disagreed	2 (1.2)	3 (1.8)	5 (1.5)
Personal hygiene and healthy environment prevent infections χ2 = 3.027, df = 1, P = 0.082	Agreed	167 (98.2)	170 (100)	337 (99.1)
	Disagreed	3 (1.8)	0 (0)	3 (0.9)
Infections if untreated can result into complications χ2 = 0.336, df = 1, P = 0.562	Agreed	169 (99.4)	168 (98.8)	337 (99.1)
	Disagreed	1 (0.6)	2 (1.2)	3 (0.9)

Comparative infectivity rate between pregnant and non-pregnant women

Malaria and typhoid co-infection among pregnant and non-pregnant women were compared and presented in **Table 10**. It was observed that the number of pregnant women that had typhoid only 35 (81.34%) was higher than number of non-pregnant women that had typhoid only 8 (18.60%). However, co-infection is more prevalent among non-pregnant women 105 (57.67%) compared to 79 (42.93%) in pregnant women.

Table 10 Comparative infectivity rate between pregnant and non-pregnant women.

Status	Infection status				
	Malaria only (%)	Typhoid only (%)	Malaria and typhoid (%)	None (%)	Total examined (%)
Pregnant	33 (41.25)	35 (81.34)	79 (42.93)	23 (69.70)	170 (100.0)
Non-pregnant	47 (58.75)	8 (18.60)	105 (57.67)	10 (30.30)	170 (100.0)
Total	80 (100.0)	43 (100.0)	184 (100.0)	33 (100.0)	340

Discussion

In this study, the high population of pregnant women between age group 26-35 years recorded in this study may be attributed to the fact that the women in this age group involved in active procreation than women of other age groups. The result of the frequency of malaria infection among pregnant women in the study area revealed that pregnant women between age group 26-35 years had highest incidence compared to other age groups. High malaria infection noticed in this age group could be attributed to the nature of their job which exposed them to bites of the vectors of malaria. Daily hustle and bustle involved in commercial activities might cause fatigue resulting in deep-sleep at night which favors the uninterrupted blood sucking tendency of vectors of malaria [17].

High incidence of malaria and typhoid co-infections recorded in age group 26-35 in this study was in agreement with the other findings, higher occurrence of malaria infection at higher age, [18] but contradict other observation that stated that high malaria prevalence in the pregnant women of age-group below 20 years [19].

The relationship between trimester and co-infection of malaria and typhoid among the pregnant women was examined, second trimester had higher infection rate than first and third trimesters. This result corroborates the work that got same result on malaria test carried out on pregnant women [18].

In the relationship between gravid and infection status, second gravida had higher infection rate than first and third gravida. This result also agrees with other study that an increase of plasmodial parasitaemia infection during pregnancy in primigravida and secundigravida compared to multi-gravida [20].

For the relationship between educational status where higher occurrence were recorded against women with secondary and tertiary education, this could be due to the fact that these groups visit ante-natal clinic more than the women with little or no education who were often very few in number. There are observations that women with very low education subscribe to herbs for the treatment of fevers may be as result of poverty being low income earners. However, it was observed during the blood sample collected that the secondary and tertiary education group often manage malaria at home, at the onset of the infection due to the nature of their job or tight schedule and visit the health care center when the condition fail to improve or get worse.

Occupation-wise, highest malaria infection occurrence was marked against semi-skilled group that comprises traders, artisans and small scale business women. This conforms to the recorded higher prevalence of Plasmodium infection in Aba and Umuahia is due to the nature of their job which exposes them to bites of the vectors of malaria [17]. Moreover, the daily activities involved in commercial activities might cause tiredness resulting in uncovered body, deep-sleep at nights which favors the uninterrupted blood-sucking tendency of vectors of malaria.

For co-infection of malaria and typhoid, very high incidence was noticed in both pregnant and non-pregnant women, the values which double each of the infections. This is an indication that all the infections; malaria, typhoid or co-infection of both cut across both pregnant and non-pregnant women as both are susceptible to contracting any of the infections. Although, the health effect on pregnant women may have more fatal consequence. Similar observation concluded that since high prevalence of co-infection of typhoid and malaria in the tropics are common, typhoid fever could cross-react with malaria during widal test and this may lead to over diagnosis of typhoid fever which might in turn lead to unnecessary exposure of the patient to antibiotics [21].

From the descriptive aspect of this work, the questionnaires administered showed the relationship between malaria and typhoid fever in pregnant women and the socio-demographic factors. Good number of pregnant and non-pregnant women agreed that malaria and typhoid are endemic in Lagos State and also in Nigeria as a whole. As it has been reported by several authors, both groups accepted that the two infections were public health problems that had grave effect on both mother and foetus especially when malaria and typhoid co-infect pregnant women of first and second trimesters [19]. Larger percentage of both pregnant and non-pregnant women accepted that malaria parasite is spread via mosquito bite alone while few others blamed malaria on daily exposure to sunlight. These few ones fall into the group of women with little education (primary school) and those with no education. Nevertheless, there is no specific proof yet that heat from sunlight could cause fever. The choice results of the two groups of women showed that sleeping under unbroken net and the use of insecticide, healthy lifestyle, personal hygiene and healthy environment will all reduce the transmission rate among the populace which had been recommended to check the transmission rate among the populace [22]. He also suggested that women and other care-givers should be empowered to treat malaria at home. Despite the fact that in endemic area, asymptomatic P. falciparum are common in adults, early report stated that malaria was the only main cause of fever during pregnancy [18]. Hence other factors including typhoid should be treated along. For the typhoid, pregnant and non-pregnant women jointly agreed that eating contaminated food and drinks could cause typhoid, so also poor sanitation system/sewage disposal system.

Like malaria, prevalent of typhoid was also high among pregnant women compared with non-pregnant women, the suppressed immunity of women during pregnancy may account for this.

Conclusion

It is recommended that malaria and typhoid tests should be included as routine tests for the pregnant women in their early pregnancies since most of the malaria and typhoid infections were asymptomatic. It was observed that knowledge of malaria and typhoid fever was high among pregnant women except among low education women, therefore, more attention should be given to this group.

Conflict of Interest

Author declared that there is no conflict of interest.

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