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Prevalence and Possible Risk Factors of Malaria among Pregnant Women Attending To Antenatal Care at Umtalha Health Centre in Gezira State -Sudan

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Abstract:*Malaria in pregnancy is one of the leading causes of maternal and child morbidity and mortality worldwide, mainly in high endemic areas. Our study aimed to estimate the prevalence of and to identify the possible risk factors associated with Malaria infection among pregnant women attending to antenatal care at health center in Umtalha village in Gezira State, Sudan. Methods: A cross- sectional facility based study was conducted. A total of 332 pregnant women were selected. A structured questionnaire was used to collect data on socio-demographic characteristics and possible risk factors. Blood was screened for malaria parasite. Results: 42 (12.7%)) of respondents were found to be Malaria positivity, 97.6% of cases infected with Plasmodium falciparum and 2.4% (1/42) of cases infected with plasmodium vivax. The analysis showed there was relationship between age group, educational level, family income, family size and sleeping under ITNs at night and malaria positivity. P values = (< 0.0001, 0.0001, 0.025, 0.007 and 0.036) respectively. The results indicated there was association between parity, past history and knowledge of malaria and malaria positivity. P values = (0.042, 0.011 and 0.0003) respectively. Conclusion: The study showed the prevalence of malaria among pregnant women was 12.7%. the result showed the P. falciparum malaria is common in pregnant women*

Keywords: *Malaria, pregnant women, , risk factor, Gezira State, Sudan.*

I. Introduction

Malaria in pregnancy is one of the leading causes of maternal and child morbidity and mortality worldwide, mainly in high endemic areas. About 125 million women are at risk of acquiring malaria infections during pregnancy, mainly in Africa where Plasmodium falciparum is the dominant malaria parasite in most parts of sub-Saharan Africa and hence responsible for most infections in pregnancy [1-3]. Plasmodium vivax is also a significant cause of maternal morbidity during pregnancy and of low birth weight in parts of Asia [2] and Latin America [4].Malaria in pregnancy can lead to miscarriage, premature delivery, low birth weight, congenital infection, and fetal as well as perinatal death [5].Malaria infection during pregnancy poses substantial risk to the mother, the foetus and the neonate; higher parasitaemia particularly in 2nd and 3rd trimesters, anaemia and altered placental integrity result in less nutritional support leading to low birth weight (LBW), abortion, still birth, premature birth and high infant morbidity/mortality [6]. In endemic areas, malaria in pregnancy is often asymptomatic, especially in cases of primigravidae; additionally the parasite may be undetectable in peripheral blood smears, causing the delay in disease treatment [7].

The prevalence and burden of malaria have declined markedly in the 21st century, primarily due to the dramatic increase in the coverage of malaria interventions, with the usage of insecticide-treated nets (ITNs) increasing from < 2% in 2000 to 55% in 2015 and the proportion of malaria cases adequately treated increasing from < 1% in 2005 to 16% in 2014 [8,9]. The prevalence of malaria among pregnant women in sub-Saharan Africa was 29.5% in East and Southern Africa and 35% in West and Central Africa [5]. In Gambia was 56.1% [3]. In Ghana 12.6% [10]. In Nigeria from 36.5% - 51.7% [11, 12]. In India 5.4% [13].

Malaria is a public health problem in Sudan where the annual cases are 3,073,966 and deaths are 1,125, *Plasmodium falciparum* is responsible for 90% of all infections being the species associated with most severe cases, especially young children and pregnant women [14]. May studies was conducted in Sudan recorded various rates of malaria among pregnant women. These include 26.2% among pregnant women in Khartoum state [15]. 38.1% among pregnant women in White Nile State in Ed-Duweim [16]. 13.7% among pregnant women in eastern Sudan [17]. The aim of this study is to determine the prevalence of malaria parasite infection and to identify the possible risk factors among pregnant women attending to health center at Umtalha village in Gezira State - Sudan.

II. Materials And Methods

Study design: A descriptive cross sectional facility based study was conducted among pregnant women attending health center at Umtalha village in Khartoum State, Sudan.

Study area: Umtalha is a large village located in El-Managil area in Gezira State, Central Sudan. The total population about ten thousand person, the main activities of population agricultural and breeding animals. Regarding public services there are four basic schools, two secondary schools, Khalwa for holly Quran, one dispensary and one health center.

Study population and sampling: The target study population including all pregnant women in their various trimesters seeking medication at antenatal care (ANC) in health center during study period from March to June 2016. The total number of pregnant women was (332).

Data collection: Data were collected from pregnant women by the following tools:

- Questionnaire: Informed consent from the selected participants was obtained. Pre tested structured direct administrated questionnaire was used to collect socio-demographic characteristics such as (Age group, educational status, employment, monthly income and family size), knowledge of malaria, family own ITN, using mosquito net, gestation period, parity, pregnancy gap and history of malaria. Questionnaire was designed in English and then translated into Arabic, the native language of respondents.
- Blood samples collection: Standard and careful laboratory procedure was adopted in collection of finger-prick blood samples by swabbing the area to be sampled with 70% alcohol and allowed to dry before collection. Thick and thin blood films were made on clean slides and labelled with corresponding number so the results would not be exchanged. Blood films were stained with Giemsa stain for 30 minutes as recommended by (WHO). Stained slides were examined under the light microscope using 100x oil immersion objective lens.

Data Analysis: Data were analyzed used SPSS (Statistical Package for Social Science) version 20. Chi-Square test was used to determine the significance differences between variables. Differences to be significant at level of p.value less than 0.05.

III. Results

Socio-demographic characteristics:

A total of three hundred and thirty two pregnant women were included in this study. 63.3% (210/332) of participants in age group 20 -29 years, 20.2% in age group 30-39 years, 9.6% less than 20 years old while 6.9% in age group 40-49 years. More than half of participants had secondary education level (51.2%), 32.8% had basic or/primary education, 10.8% were graduated and 5% were illiterates women. Regarding employment most of women unemployed 85.2% (283/332). 65.1% of participants their monthly family income was low, 25.9% had middle income and 9% their income high. Regarding to family members 57.2% of participants their family more than 6 member, 18.7% had 6 members and 24.1% less than 6 family members (Table 1).

Laboratory findings:

Among 332 pregnant women, the result shows 12.7% (42/332) of pregnant women were positive for malaria (Table 2). Regarding the malaria parasite species the laboratory findings show 97.6% (41/42) of cases infected with *Plasmodium* falciparum. While plasmodium vivax was seen in one case (1/42) 2.4%. *Plasmodium* malariae and plasmodium. Ovale were not seen (Table 3).

Relationship between characteristics of pregnant women and malaria positivity:

Table 4 shows the prevalence of malaria among pregnant women according their characteristics. Regarding to age groups, the results show the prevalence increasing in age increase, high prevalence in age group 40 -49 years 30.4% (7 out of 23) followed by 30 – 39 years 19.4% (13/67), by aged 20-29 years 9.5% (20/210) and 6.3% (2/32) in those less than 20 years old. The findings show there was statistical relationship between age group and malaria positivity ($P < 0.0001$ at $X^2 = 23.437$). In relation to education level, the results show high prevalence of malaria in illiterates women 41.2% (7/17) compared to 8.3% (3/36) in graduated women. The findings show there was statistical association between education level and malaria positivity ($P = 0.0001$ at $X^2 = 21.139$). The result show the malaria more prevalent among those have low monthly income 16.2% (35/216) compared to 7% and 3.3% in middle and high income respectively, the results show there was statistical significant ($P = 0.025$ at $X^2 = 7.33$). Regarding to family members (size) the findings show the prevalence of malaria was 21.3% (17/80) among pregnant women have more than 6 members in family, 16.1% (10/62) those their family members 6 and 7.9% (15/190) those their family members less than 6. The results show there was statistical association ($P = 0.007$ at $X^2 = 9.922$). Regarding to sleeping under ITNs at night. The results show the prevalence of malaria was 14.9% (37/249) among those sleeping under ITNs at night compared to 6% (5/83) among those don not sleep under ITNs at night, the results show there was statistical relationship between sleeping under ITNs at night and malaria positivity ($P = 0.036$ at $X^2 = 4.360$). The results show there was no relationship between employment and family owns ITNs and malaria positivity ($P > 0.05$).

Association between malaria positivity and some risk factors among pregnant women:

Table 5 demonstrates the association between malaria positivity and some risk factors. Regarding parity, the results show the malaria more prevalent in women those in primigravidae 24.2% (15/62) compared to 11.8% and 10.1% in those in secondigravidae and multigravidae respectively. The results show there was significant association (P = 0.043 at X^2 = 8.136). regarding to gestation period, the result show the prevalence in those in 2nd trimester 14.5% (25/172), 11.3% (12/106) among those in 1st trimester and 9.3% (5/54) among those in 3rd trimester. The results show there was no statistical association between gestation period and malaria positivity (P = 0.526 at X^2 = 1.284). Regarding to history of malaria, the result show the malaria was more prevalent among women have previous malaria 16.2% compared to 6.6% among those have no previous malaria, the findings show there was statistical association between history of malaria and malaria positivity (P = 0.011 at X^2 = 6.480). The knowledge of mode of malaria transmission play role in infection, the findings show the prevalence of malaria was high among women don't knew the mode of transmission 41.2% (7 out of 17) compared to 11.1% (35 out of 315) among those have knowledge of malaria transmission (P = 0.0003 at X^2 = 13.194). Regarding to pregnancy gap our findings show there was no statistical association between pregnancy gap and malaria positivity (P > 0.05).

Table 1: Characteristics of pregnant women attending to health center at Umtalha , Gezira Sate, Sudan

Variable	Frequency	%
Age group		
< 20	32	09.6
20 - 29	210	63.3
30 – 39	67	20.2
40 -49	23	06.9
Educational level		
Illiterate	17	05.0
Basic	109	32.8
Secondary	170	51,2
Graduate	36	10.8
Employment		
Employee	49	14.8
Unemployed	283	85.2
Monthly income		
Low	216	65.1
Middle	86	25,9
High	30	09.0
Family size		
< 6	190	57.2
6	62	18.7
> 6	80	24.1

Table 2: Prevalence of Malaria among respondents (pregnant women) attending to health center, Umtalha

Malaria infection	No	Percent %
Positive (+ve)	42	12.7
Negative (-ve)	290	87.3
Total	332	100.0

Table 3: Prevalence and frequency of malaria parasite with respect to species

Malaria parasite	No	Percent %
P. falciparum	41	97.6
P. vivax	01	2.4
P. malariae	00	00.0
P. ovale	00	00.0

Table 4: Relationship between characteristics of pregnant women and Malaria positivity

Variable	Malaria N(%)		Total N(%)	Chi-Square	P .value	
	Positive	Negative				
Age group						
< 20	02(0.6)	30(09.0)	32(09.6)			
20 - 29	20(06.0)	190(57.2)	210(63.3)	23.437	< 0.0001*	
30 – 39	13(03.9)	54(16.3)	67(20.2)			
40 -49	07(02.1)	16(04.6)	23(06.9)			
Educational level						
Illiterate	07(02.1)	10(03.0)	17(05.1)			
Basic	20(06.0)	89(26.8)	109(32.8)	21.139	0.0001*	
Secondary	12(03.6)	158(47.6)	170(51.2)			
Graduate	03(0.9)	33(09.9)	36(10.8)			

Employment						
Employee	05(01.5)	44(13.3)	49(14.8)	0.311	0.577	
Unemployed	37(11.1)	246(74.1)	283(85.2)			
Monthly income						
Low	35(10.4)	181(54.7)	216(65.1)			
Middle	06(01.8)	80(24.1)	86(25,9)	7.330	0.025*	
High	01(0.3)	29(08.7)	30(09.0)			
Family size						
< 6	15(04.5)	175(52.5)	190(57.2)			
6	10(03.0)	52(15.7)	62(18.7)	9.922	0.007*	
> 6	17(05.1)	63(19.0)	80(24.1)			
Family owns ITN						
Yes No	10(03.0) 32(09.6)	90(27.1) 200(60.3)	100(30.1) 232(69.9)	0.910	0.340	
Slept under ITN						
Yes	05(01.5)	77(23.5)	83(25.0)	4.360	0.036*	
No	37(11.1)	212(64.9)	249(75.0)			

*P-value < 0.05 considered significant at CI 95%

Table 5: Association between malaria positivity and some risk factors among pregnant women

Variable	Malaria N(%)		Total N(%)	Chi-square	P .value	
	Positive	Negative				
Parity						
Primgravidae	15(04.5)	47(14.2)	62(18.7)			
Secondigravidae	14(04.2)	105(31.6)	119(35.8)	8.136	0.0433*	
Thirdigravidae	08(02.4)	74(22.3)	82(24.7)			
Multigravidae	07(02.1)	62(18.7)	69(20.8)			
Gestation period						
1st trimester	12(03.6)	94(28.3)	106(31.9)			
2nd trimester	25(07.5)	147(44.3)	172(51.8)	1.284	0.526	
3rd trimester	05(01.5)	49(14.8)	54(16.3)			
Pregnancy gap						
2 years	31(09.3)	185(55.8)	216(65.1)			
3 years	08(02.4)	78(23.50	86(25,9)	1.698	0.4277	
> years	05(01.5)	25(07.5)	30(09.0)			
History of malaria						
Yes No	34(10.2) 08(02.4)	176(53.1) 114(34.3)	210(63.3) 122(36.7)	6.480	0.011*	
Knowledge of malaria transmission						
Knew	35(10.6)	280(84.3)	315(94.9)	13.194	0.0003*	
Don't Knew	07(02.1)	10(03.0)	17(05.1)			

*P-value < 0.05 considered significant at CI 95%

IV. Discussion

Malaria disease is dangerous especially an infection with *Plasmodium falciparum* is more hazardous during pregnancy. The present study attempted to estimate malaria prevalence and to identify the associated possible risk factors in pregnant women. The overall prevalence of malaria among pregnant women in this study was 12.7%%. This result similar with that reported among pregnant women in Eastern Sudan 13.7% [17]. In Ghana 12.6% [10]. Our result was lower than that found in Sudan; which is found 26.2% in Khartoum state [15], and 38.1% in White Nile state in Ed-Duweim [16]. Also lower than that found in Gambia was 56.1% [3]. In Nigeria from 36.5% - 51.7% [11,12]. Our finding was greater than that found in pregnant women in India 5.4% [13]. Regarding to malaria parasite species, our findings show the Plasmodium *falciparum* is more prevalence 97.6%. this result similar with that reported in Sudan in Ed-Duweim [16]. Also similar with reported by CDC; The most Plasmodium *falciparum* infection occur in sub Saharan Africa and the *P. falciparum* has been shown to be more common in pregnant than non pregnant women [18]. The results show that, the malaria more prevalent among pregnant women in age group 40-49 years followed women in age 30-39 years. There was strong statistical association between age and malaria positivity (P < 0.0001). this finding consist with that recorded in Nigeria [19]. In relation to education level, the study show high prevalence of malaria in illiterates women 41.2% compared to 8.3% in graduated women, the findings show there was statistical association between education level and malaria positivity (P = 0.0001). Our findings similar with that found among Pregnant Women in Nigeria; illiterates pregnant women had the highest prevalence rate of malaria[20]. Family income have contributing in malaria infection, our findings showed the prevalence was higher among those have low income 16.2% than high income 3.3%. The result show there was statistical association between malaria positivity and family income (P = 0.025 Regarding to family members, our result show the prevalence of

malaria increase with family members increasing, there statistical relationship between (P = 0.007). Sleeping under ITNs at night very important to protect person from mosquitoes' bites. The study show the prevalence of malaria was more prevalent among those sleeping under ITNs at night compared to those don not sleep under ITNs at night, the results show there was statistical relationship between sleeping under ITNs at night and malaria positivity (P = 0.036). The result similar with many studies shown that ITNs effective in controlling malaria in pregnant women and that the use of ITNs significantly reduce the prevalence and mean parasite load of malaria parasitameia [6]. In relation to parity, our findings show the malaria more prevalent among women those in primigravidae than those in secondigravidae and multigravidae. The results show there was significant association (P = 0.043). Our result agree with that found in Nigeria by Ivoke N et al, they mention that *falciparum* malaria parasitaemia was associated with the parity the prevalence decline with increase gravidity[21]. This results disagree with that found by Adam I et al in Eastern Sudan, no significant association between malaria and parity[17]. Regarding to previous infection of malaria, the result show the malaria was more prevalent among women have previous infection of malaria 16.2% compared to 6.6% among those have no previous infection of malaria, the findings show there was statistical association between history of malaria and malaria positivity (P = 0.011). Our study revealed that, there was no statistical association between employment, family owns ITNs gestation period and pregnancy gap and malaria positivity (P > 0.05).

V. Conclusion

The study showed the prevalence of malaria among pregnant women was 12.7%. the result showed the P. *falciparum* malaria is common in pregnant women at study area. The result show age group, educational level, family income, family size, sleeping under ITNs at night, parity history of malaria infection and knowledge of malaria transmission were considered factors associated with malaria positivity.

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Conflict of Interests

The authors hereby declare to have no conflict of interests.

Authors' contributions

Eltagi A.M. Abdalla conceived the research idea, designated the study, data collection and analysis. Logman A.M. Abdalla involved in laboratory investigation. Wigdan A.H. Eltayeb contributed in data collection and analysis.

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