PREVALENCE OF *PLASMODIUM FALCIPARUM* AMONG PREGNANT WOMEN IN YAQSHID DISTRICT OF SOMALIA

***Faisal Muhammad[1], Abdimalik Mohamed Yarow[1], Md. Akram Hossain[2] Golam Sattar Chowdhury[3], Golam Kibria Ferdous[4]**

[1]Department of Public Health, Daffodil International University, Dhaka, Bangladesh.
[2]Chakaria Health Complex, Cox's Bazar, Bangladesh.
[3]Education and Development Foundation - EDUCO, Dhaka, Bangladesh.
[4]Department of Social Work, University of Rajshahi, Bangladesh.

Abstract: *Malaria caused by Plasmodium falciparum predominates in Africa where the mortality attributed to its approaches 1 million annually, and accounts for 90% of the global malaria burden. The main purpose was to explore the prevalence of Plasmodium falciparum among pregnant women in Yaqshid district, Mogadishu-Somalia. In this cross-sectional study, data was collected using semi-structured questionnaire. Data were analyzed using SPSS. More than one-fifth (26.7%) of the respondents currently has Plasmodium falciparum and about 82% of them suffered Plasmodium falciparum during their pregnancy. Slightly above three-fourths of the respondents were housewife (77.3%), followed by less than one-tenth health staff (8.7%) and nearly half of the respondents had Bachelor degree (46.7%). The use of routine, nationwide surveillance of infection prevalence is the key to monitoring the changing epidemiology of malaria in all countries scaling up coverage of malaria preventative strategies. Somalia has a range of political and economic barriers that might limit the success of a strategic, epidemiologically driven malaria control programmer. It has been possible to demonstrate, however, that the foci of greatest disease risk are predominantly concentrated in one area in the south and that infection risks are very low in the northern reaches of the country.*

Keywords: *Malaria, Plasmodium falciparum, Somalia, mosquito, bed-net.*

Introduction

Malaria affects an estimated 250 million people each year worldwide and is the most wide-spread parasitic disease encountered[1]. The disease has a worldwide distribution and is found throughout the tropics, sub-Saharan Africa, South East Asia, the Pacific islands, India, Central and South America[2]. Malaria caused by *Plasmodium falciparum* predominates in Africa where the mortality attributed to its approaches 1 million annually, and accounts for 90% of the global malaria burden[3]. The majority of these deaths are children under the age of 5 years. Thus, one child dies of malaria in Africa every 30 seconds, which translates into a tragic 3000 children each day[4,1]. Many of the children who survive an episode of severe malaria suffer from brain damage and cognitive disability, consequently crippling these families with its debilitating aftermath [5].

In areas where malaria is highly endemic, a protective semi-immunity against *Plasmodium falciparum* is acquired during the first 10–15 years of life, and the majority of malaria-related morbidity and mortality happens in young children[6]. However, in contrast with low malaria prevalence in adults, pregnant women in endemic areas are highly susceptible to malaria, and both the

***Corresponding Author :** Faisal Muhammad, Department of Public Health, Daffodil International University (DIU), Dhaka-1207, Bangladesh, Email: fokkanya@yahoo.com

frequency and the severity of disease are higher in pregnant than non-pregnant women[7]. In pregnancy, there is a transient depression of cell-mediated immunity that allows foetal allograft retention but also interferes with resistance to various infectious diseases[8]. Cellular immune responses to *P. falciparum* antigens are depressed in pregnant women in comparison with non-pregnant control women[9, 10]. Anti-adhesion antibodies against chondroitin sulphate A-binding parasites are associated with protection from maternal malaria, but these antibodies develop only over successive pregnancies, accounting for the susceptibility of primigravidae to infection[11]. Indeed, women in first and second pregnancies are the most affected, with both gravidity and premunition influencing susceptibility to malaria infection[12-15]. Numerous epidemiological studies have reported a broad range of conditions during pregnancy which are a result of malaria[16-20]. As with peripheral parasitaemia, placental infection is also most frequent and heaviest in primigravidae[21]. Furthermore, malaria reduces birth-weight most in this group[21]. It has been reported in many African countries, Somalia is one of the countries where *P. falciparum* malaria is endemic.

Materials and methods

This cross-sectional study conducted among 150 pregnant women in Yaqshid District which is one of the biggest districts located in Mogadishu. Mogadishu is the capital and most populous city of Somalia which is located in the coastal Banaadir region on the Indian Ocean. Participants were selected from the district hospital, one health centre and two clinics. These health facilities were purposely selected because they had a bigger number of *Plasmodium falciparum* (PF) patients. The data were collected using semi-structured questionnaire. Inclusion criteria were inhabitants of Yaqshid district, residence who willingly participated the study only. Data were analyzed using SPSS version 16.0.

Results

Socio-demographic factors of the respondents

Regarding the socio-demographic factors of the respondents, more than one-third of the respondents (38%) were found in the age group of 31-36 years, followed by the age group of ≤ 24 years (16.7%). Nearly four-fifths of the respondents were Housewife (77.3%), followed by less than one-tenth Health staff (8.7%). Slightly higher than two-thirds (66.7%) respondents were from urban area. Nearly half (46.7%) of the respondents had Bachelor degree and less than one-tenth (9.3%) had Master degree (Table 1).

Table 1: Distribution of Socio-demographic factors of the respondents (n=150)

Factors	Frequency	Percentage
Age group		
Less than 24	25	16.7
25-30	23	15.3
31-36	57	38
37-42	24	16
43-48	20	13.3
49 above	1	0.7
Mean ±SD	31.5±11.9	
Occupation		
Housewife	116	77.3
Civil servant	8	5.3
NGO	8	5.3
Business	5	3.3
Health staff	13	8.7
Residence		
Urban	100	66.7
Rural	33	22
Slum	17	11.3
Education		
No formal Education	6	4
Vocational	10	6.7
Secondary	50	33.3
Bachelor	70	46.7
Masters	14	9.3

Respondents view on *Plasmodium Falciparum* among Pregnant Women

More than four-fifths (82%) of the respondents suffered *Plasmodium falciparum* during their pregnancy. Two-thirds of the respondents (66.7%) used bed nets as a prevention measure, more than a quarter (26%) of the respondents used insecticide. A little higher than one-fifth of the respondents (21.3%) used bed net always during the sleeping time and slightly higher than one-tenth (12%) never used bed net. Most of the respondent's source of knowledge on *Plasmodium falciparum* were from friends (33.3%) and Radio (33.3%), followed by Television (16%). Majority of the respondents (46.7%) said poor environment is what makes malaria common in Yaqshid district, 33.3% noticed sewage disposal as their reason. 70% of the respondent said that eradication of *Plasmodium falciparum* is not possible while nearly half of the respondents (46.7%) they said that eradication of *Plasmodium falciparum* is possible by reducing sewage disposal (Table 2).

Table 2: Respondents view on *Plasmodium Falciparum* among Pregnant Women (n=150)

Variables	Frequency	Percentage
Suffer *Plasmodium Falciparum* during your pregnancy period		
Yes	123	82
No	20	13.3
Don't know	7	4.7
Measure used to prevent malaria		
Bed net	100	66.7
Drug	11	7.3
Insecticide	39	26
Slept under bed net		
Always	32	21.3
Sometimes	100	66.7
Never	18	12
Source of knowledge		
School	20	13.3
Television	24	16
Radio	50	33.3
Newspaper	3	2
Friends	50	33.3
Internet	3	2
Reason that makes malaria common in Yaqshid		
Poor environment	70	46.7
Sewage disposal	50	33.3
Government problem	10	6.7
Literacy problem	20	13.3
Possibility of eradicating *Plasmodium Falciparum*		
Yes	35	23.3
No	105	70
Don't know	10	6.7
Possible ways to eradicate *Plasmodium Falciparum*		
Reduce sewage disposal	70	46.7
Government help	20	13.3
Education on PF	20	13.3
Good environment	40	26.7

Sufficient/enough knowledge on *Plasmodium Falciparum*

Exactly half of the respondents had sufficient knowledge on *Plasmodium Falciparum* (50%), and more than one-fifth of them didn't have sufficient knowledge on *Plasmodium falciparum* (Figure 1).

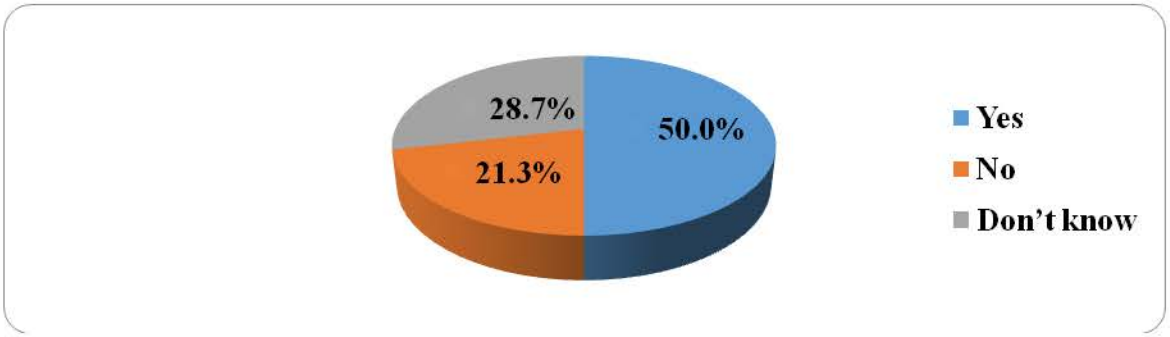

Figure 1: Sufficient/enough knowledge on *Plasmodium Falciparum* (n=150)

Current status of *Plasmodium Falciparum*

More than one-tenths of the respondents currently have *Plasmodium Falciparum* (26.7%) and only 6.7% they don't know about their status regarding *Plasmodium Falciparum* (Figure 2).

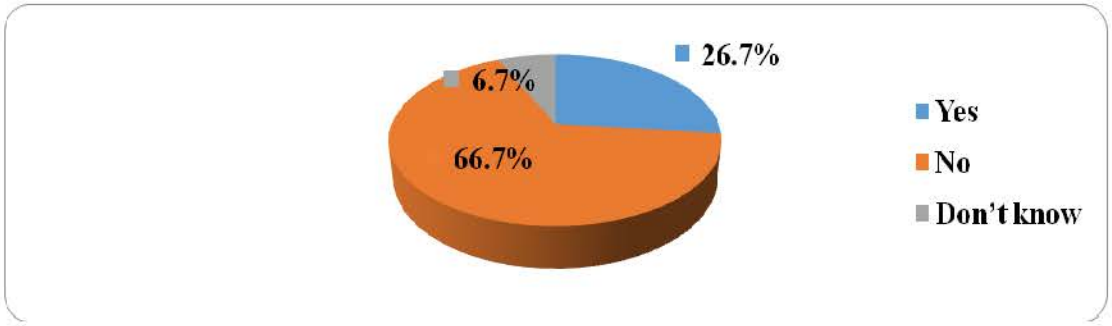

Figure 2: *Plasmodium Falciparum* currently (n=150)

Association between currently having *Plasmodium Falciparum* and Other variables

In this study it has been seen that there was association between currently having *Plasmodium Falciparum* and using bed net ($p \leq 0.001$). There was also significant association found between currently having *Plasmodium Falciparum* and residence type of participants ($p \leq 0.001$) (Table 3).

Table 3: Association between currently having *Plasmodium Falciparum* and Other variables (n=150)

Variables	Currently having PF		Total	χ^2	p-value
	Yes	No			
Slept under bed net					
Always	0	32	32		
Sometimes	32	68	100	1.024	0.000
Never	8	10	18		
Residence					
Urban	0	100	100		
Rural	32	1	33	2.024	0.000
Slum	8	9	17		

Discussion

The pregnant women susceptibility to malaria is well-established[1]. However there was no epidemiological data recorded in this area "Yaqshid", this study was aimed to find out the prevalence of *Plasmodium Falciparum* among pregnant women in Yaqshid district, Mogadishu Somalia. In this study 150 respondents were participated. Regarding the distribution of respondents based on age group, about 38 percent were in the age group 31-36 years, followed by the age group 24 and below (16.7%). While older age group i.e. above 49 years of age were found to be the least according to the number of participants within that range. Nearly four-fifth respondents were House wife (77.3%), followed by less than one tenths (8.7%) Health staffs and only 3.3 percent were doing Business. Slightly higher than two-thirds (66.7%) respondents were from urban area, followed by rural area 22 percent and respondents from slum area were only 11.3 percent. Pregnant women living in rural areas usually have a higher level of malaria infection compared with women living in urban areas.[22] Most of the participants were educated. Lack of formal education was a risk factor for *P. falciparum* malaria, it has been seen in previous findings in India[23]. Nearly half (46.7%) of the respondents had Bachelor degree, followed by those that had Secondary School (32.7%), and less than one tenths had Master degree (9.3%) (Table 1).

Pregnant women are 3 times more likely to suffer from severe disease as a result of malarial infection compared with their non-pregnant counterparts, and have a mortality rate from severe disease that approaches 50%[24, 25]. Malaria infection during pregnancy is a significant public health problem with substantial risks for the pregnant woman, her fetus, and the newborn child. Malaria-associated maternal illness and low birth weight is mostly the result of *Plasmodium falciparum* infection and occurs predominantly in Africa[26]. In this study more than four-fifths (82%) of the respondents suffered *Plasmodium Falciparum* during their pregnancy. This is similarly closed to the findings of the study done in Nigeria[27-29]. In Africa generally most of the people are using bed net provided by Non-governmental Organizations (NGOs) and some by Governments. Two-thirds (66.7%) of the respondents used bed nets as a prevention measure, more than a quarter (26%) of the respondents used Insecticide. Little higher than one-fifths (21.3%) of the respondents always used bed net during their sleeping time, however few (12%) of them never used bed net. Media plays a huge role in spreading information regarding the knowledge on *Plasmodium falciparum.* Most of the respondents sourced their knowledge on *Plasmodium falciparum* through Radio. Friendship is also a medium of spreading information easily in the community, 33.3 percent got the information from friends (Table 2). Environmental factors are a root cause of a significant disease burden, particularly in developing countries. An estimated 25% of death and disease globally, and nearly 35% in regions such as sub-Saharan Africa, is linked to environmental hazards[30]. Majority of the respondents (46.7%) said poor environment is what makes malaria common in Yaqshid district, 33.3 percent chose sewage disposal as their reason. It has been seen that 70 percent of the respondent says that eradication of *Plasmodium Falciparum* is not possible. Nearly half of the respondents they said eradication of *Plasmodium Falciparum* is possible by reducing sewage disposal (Table 2). Almost half of them had sufficient knowledge on *Plasmodium falciparum* (Figure 1). More than one-fifth (26.7%) of the respondents currently has *Plasmodium falciparum* (Figure 2). More than half (56.7%) of the respondents says its life treating disease. In this study it has been seen that there was association between currently having *Plasmodium Falciparum* and using bed net ($p<0.000$). There was also significant association between currently having *Plasmodium Falciparum* and residence type of participant. This is consistent to the findings in a study done by Silver, where he found that Pregnant women living in rural areas usually have a higher level of malaria infection compared with women in urban areas because of increased exposure to Anopheles mosquitoes.[22] *Plasmodium falciparum* is preventable and treatable when recommended interventions are properly implemented.

Conclusion

The use of routine, nationwide surveillance of infection prevalence is key to monitoring the changing epidemiology of malaria in all countries scaling up coverage of malaria preventative strategies. This study revealed that half of the respondents has sufficient knowledge on *Plasmodium falciparum*. It also revealed that there was significant association between currently having *Plasmodium Falciparum* and using bed net.

Recommendations

- For pregnant women living in malaria endemic area, eat iron and floated supplements to prevent anemia, Get a curative dose of an antimalarial drug at least twice during pregnancy (starting from the second trimester), Sleep under an insecticide-treated bed net.
- The number of mosquitoes has to be controlled by eliminating mosquito larvae before they reach adulthood. Rainfall forms water puddles where mosquitoes lay their eggs and aquatic larvae develop into adults in a few days. Draining or removal of small puddles can reduce the number of mosquitoes near populations.
- Chemical insecticides has to be applied but it might harm the environment. Other methods applied to water: insect growth regulators, oil that suffocates the aquatic larvae, toxins from the bacterium *Bacillus thuringiensis* var. *israelensis* (Bti).
- Effective surveillance is required at all points on the path to malaria elimination. Strong malaria surveillance enables programmers to optimize their operations, by empowering program.
- Government has to improve early diagnosis and treatment of malaria in order to reduce disease and prevents deaths.
- Vector has to be control because is the main way to prevent and reduce malaria transmission. If coverage of vector control interventions within a specific area is high enough, then a measure of protection will be conferred across the community.

Acknowledgement

We would like to express our deep gratitude to Dr ABM Alauddin Chowdhury, the supervisor, for conceding the study, for his invaluable advices and support throughout the study.

References

1. *Grimberg and Mehlotra. Pharmaceuticals (Basel). 2011 May 1; 4(5):681-712.*
2. *Elizabeth A, Rose Mc., Stephane P and François N. Travel Medicine and Infectious Disease. 2006; Volume 14(2):69-172.*
3. *Breman JG., Alilio MS and Mills A. Conquering the Intolerable Burden of Malaria: What's New, What's Needed: A Summary. Am. J. Trop. Med. Hyg. 2004; 71: 1–15.*
4. *WHO: Global strategic plan. Roll Back Malaria. 2005-2015. Geneva: World Health Organization; 2005.*
5. *Oh S. S. and Chishti A. H. Host Receptors in Malaria Merozoite Invasion, Malaria: Drugs, Disease and Post-genomic Biology series; Current Topics in Microbiology and Immunology 2005; 295:203-232.*
6. *Riley EM, Hviid L, and Theander TG: Malaria. In Parasitic Infections and the Immune System. Edited by: Kierszenbaum F. 1994, Academic Press, New York, 119-43.*
7. *Brabin B: An analysis of malaria in pregnancy in Africa. Bull World Health Organ. 1983, 61: 1005-16.*
8. *Meeusen EN, Bischof RJ, and Lee CS: Comparative T-cell responses during pregnancy in large animals and humans. Am J Reprod Immunol. 2001, 46: 169-79.*
9. *Riley EM, Schneider G, Sambou I, Greenwood BM: Suppression of cell-mediated immune responses to malaria antigens in pregnant Gambian women. Am J Trop Med Hyg. 1989, 40: 141-4.*

10. *Fievet N, Cot M, Chougnet C, Maubert B, Bickii J, Dubois B, Lehesran JY, Frobert Y, Migot F, Romain F, Verhave JP, Louis F, and Deloron P: Malaria and pregnancy in Cameroonian primigravidae-humoral and cellular immune responses to Plasmodium falciparum blood-stage antigens. Am J Trop Med Hyg. 1995, 53: 612-7.*
11. *Duffy PE, and Fried M: Malaria during pregnancy: parasites, antibodies and chondroitin sulfate A. Biochem Soc Trans. 1999, 27: 478-82.*
12. *Bouvier P, Breslow N, and Doumbo O: Seasonality malaria and impact of prophylaxis in an African village II. Effect on birth weight. Am J Trop Med Hyg. 1997, 56: 384-9.*
13. *Cot M, Breart G, and Esveld M: Increase of birth weight following chloroquine chemoprophylaxis during pregnancy: results of a randomized trial in Cameroon. Am J Trop Med Hyg. 1995, 53: 581-85.*
14. *Deloron P, and Maubert B: Interactions immunologiques entre paludisme et grossesse. Méd Trop. 1995, 55: 67S-68S.*
15. *Mutabingwa TK, Malle LN, and Verhave JP: Malaria chemosuppression during pregnancy IV. Its effects on the newborn's passive malaria immunity. Trop Geog Med. 1993, 45: 150-6.*
16. *Salihu HM, Naik EG, and Tchuinguem G: Weekly chloroquine prophylaxis and the effect on maternal haemoglobin status at delivery. Trop Med Int Health. 2002, 7: 29-34.*
17. *Mockenhaupt FP, Ulmen U, and Von Gaertner C: Diagnosis of placental malaria. J Clin Microbiol. 2002, 40: 306-8.*
18. *Shulman CE, Marshall T, and Dorman EK: Malaria in pregnancy: adverse effects on haemoglobin levels and birth weight in primigravidae and multigravidae. Trop Med Int Health. 2001, 6: 770-8.*
19. *Carles G, Bousquet F, Raynal P, Peneau C, Mignot V, and Arbeile P: Pregnancy and malaria. Study of 143 cases in French Guyana. J Gynecol Obstet Biol Reprod (Paris). 1998, 27: 798-805.*
20. *Greenwood AM, Armstrong JRM, Byass P, Snow RW, and Greenwood BM: Malaria chemoprophylaxis, birth weight and child survival. Trans R Soc Trop Med Hyg. 1992, 86: 483-5.*
21. *McGregor IA, Wilson ME, and Billewicz WZ: Malaria infection of the placenta in The Gambia, West Africa: its incidence and relationship to still birth, birth weight and placental weight. Trans R Soc Trop Med Hyg. 1983, 77: 232-44.*
22. *Silver HM. Malarial infection during pregnancy. Infect Obstet 1997. 11:99–107.*
23. *Singh N, Singh MP, Wylie BJ, Hussain M, Kojo YA, Shekhar C, Sabin L, and Desai M. Malaria prevalence among pregnant women in two districts with differing endemicity in Chhattisgarh, India Neeru. Malar J.2012; 11:274. DOI: 10.1186/1475-2875-11-274.*
24. *Monif GRG, and Baker DA, editors. Infectious Disease in Obstetrics and Gynecology. 6th ed. New York: Parthenon; 2004. pp. 280–286.*
25. *World Health Organization, authors. Guidelines for the Treatment of Malaria. Geneva: World Health Organization; 2006.*
26. *World Health Organization "Malaria in Pregnant Women" World Malaria Report: Geneva April 2016. Available from: http://www.who.int/malaria/areas/high_risk_groups/pregnancy/en/*
27. *Anorlu RI, Odum CU, and Essien EE. Asymptomatic malaria parasitaemia in pregnant women at booking in a primary health care facility in a peri urban community in Lagos, Nigeria. Afr J Med Med Sci. 2001;30:39–41*
28. *Okwa OO. The status of malaria among pregnant women: a study in Lagos, Nigeria. Afr J Reprod Health. 2003;7:77–83*
29. *Adefioye OA, Adeyeba OA, Hassan WO, and Oyeniran OA. Prevalence of malaria parasite infection among pregnant women in Osogbo, southwest, Nigeria. American-Eurasian J Sci Res.2007;2:43–45*
30. *World Health Organization "Priority environments and health risks" The Health and environments linkages initiatives: Geneva 2016. Available from: http://www.who.int/heli/risks/en/*