

## **Malaria infections among pregnant women attending antenatal clinic at Bududa hospital, eastern Uganda**

Kalyetsi Rogers <sup>1,\*</sup>, Nafungo Gertrude <sup>2</sup>, Muwanguzi Enoch <sup>1</sup>

<sup>1</sup> Department of Medical Laboratory Sciences, Faculty of Medicine, Mbarara University of Science and Technology, P.O. Box 1410 Mbarara Uganda.

<sup>2</sup> Laboratory department, Bududa Hospital P.O Box 807, Uganda.

\*Corresponding author: Kalyetsi Rogers; E-mail: rkalyetsi@must.ac.ug

### **ABSTRACT**

Pregnancy-associated malaria is a major health concern in Bududa district. To assess the prevalence of malaria infection in pregnancy in Bududa District; a hospital-based, cross-sectional study was carried out. Two hundred fifty two participants were selected using consecutive simple non probability sampling on consenting. Capillary blood samples were collected. Thick and thin smears were made, stained using 3% Giemsa staining technique and examined under the light microscope for malaria parasites and species typing. Data was cleaned and entered using Epi information version 3.5.3, later converted by Microsoft access, excel and word and descriptive data analysed using SPSS. Prevalence of malaria was 8.73 % (22/252) (95% CI 3.8-13.7). Only *P. falciparum* species was identified and malaria infections were high in primigravid with 16.28% (14/86) than in multigravid (P-value < 0.001). Malaria infection still remains a health challenge among pregnant women with a prevalence of 8.73% (22/252); *P. falciparum* was the only species identified, primigravid pregnant women are most affected. Routine malaria screening in symptomatic and asymptomatic malaria infections in pregnancy for early diagnoses and prevent transmission is vital. It is crucial to intensify and sensitize mothers and communities about malaria control programmes.

**Keywords:** Malaria, prevalence, gravidae, pregnancy, Bududa

### **INTRODUCTION**

Malaria remains an important treat to global public health. According to the latest World malaria report, 2018, there were 219 million cases of malaria in 2017, up from 217 million cases in 2016. African Region continues to carry a disproportionately high share of the global malaria burden. Malaria is endemic in more than 90% parts of Uganda with a national prevalence of 27% (Colon-Gonzalez et al., 2016); prevalence of 9% in central Uganda (Namusoke et al., 2010) and at 32.70% (95% CI 9.3–56.2%) Northern Uganda (Maziarz et al., 2018) and 27% in Mbarara, South Western Uganda by De Beaudrap et al., (2013).

Globally, 125 million women are at risk of malaria every year (Conroy et al., 2012). In sub-Saharan Africa, the area most burdened by malaria, the disease is thought to cause as many as 10,000 cases of malaria-related deaths in pregnancy, mainly due to severe maternal anemia (Takem & D'Alessandro, 2013). Studies by Takem & D'Alessandro, (2013) in sub-Saharan Africa among pregnancy showed a malaria prevalence of 29.50% in East and Southern Africa and 35.10% in West and Central Africa. Malaria makes a large but unquantifiable contribution to low birth weight in infants in the developing world, a major cause of morbidity and mortality in infants (Desai et al., 2007).

Observations made in December 2015, antenatal records at Bududa Hospital, indicated that in the last six months, out of 1122 pregnant women who attended antenatal clinic 115 were found positive for malaria (Un published) and verbal expressions from the midwives at Bududa Hospital suggested that the problem could worsen (Personal communication). Therefore the knowledge of prevalence of malaria infections creates awareness to health authorities about the infection rate and dangers of the disease.

## **MATERIALS AND METHODS**

### **Study area and design**

A cross sectional descriptive laboratory based study to determine the prevalence of malaria infection among pregnant women attending antenatal clinic at Bududa hospital located in Eastern Uganda was used.

### **Sample size and study population.**

Two hundred fifty two (252) pregnant women who attended antenatal clinic during the study period were recruited into the study.

### **Sampling technique**

Consecutive non-probability sampling technique was used to recruit 252 pregnant women attending antenatal clinic upon consent.

### **Sample collection and processing**

Supplies or reagents and materials were purchased from Joint Medical Stores, Uganda. Capillary blood samples were obtained aseptically from 252 pregnant women by a finger prick using a spring loaded lancet, thick and thin smears were prepared on separate slides. Air dried and thin smears were fixed for three minutes using absolute methanol. Both dried thin and thick smears were stained using 3% Giemsa staining protocol and examined under a light microscope using an oil emersion objective lens. Thick smears were used to detect the parasites and thin smears for species typing and identification.

### **Data analysis and management.**

Data obtained was entered into MS Excel spreadsheets; Cross-checking and data cleaning was done. Statistical Package of Social Sciences was used for descriptive data analysis and outputs in form of frequency tables, figures and percentages presented. The

prevalence was calculated as the number of individuals with malaria divided by the total number of participants (n=252) multiplied by 100 using 95% confidence interval and distribution of cases by gravidae was considered significant with P. value less than 0.05.

### Ethical considerations

The study was approved by Research Ethics Committee of Mbarara University Science and Technology and participants' consent was obtained before recruitment. Participant's results were treated with strict confidentiality by using codes known only to the investigator.

## RESULTS

### Socio-demographic characteristics for study participants

Two hundred fifty two (252) study participants were recruited into the study and data collection guide was used to capture socio-demographic characteristics.

Study participant enrollment was grouped into four age group categories in years as follows; 18 – 27 years 67.46% (170/252), 28 – 37 years 29.37% (74/252), 38 – 47 years 3.18% (8/252), there were no participant from  $\geq 48$  age group. Majority of study participant were between 18 – 27 age group

Study participants enrollment was also categorized based on gravidity into two groups that is primigravid with 34.13% (86/252) and multigravid with 65.87% (166/252) of study participants. Majority of participants belonged to multigravid (Fig. 1).

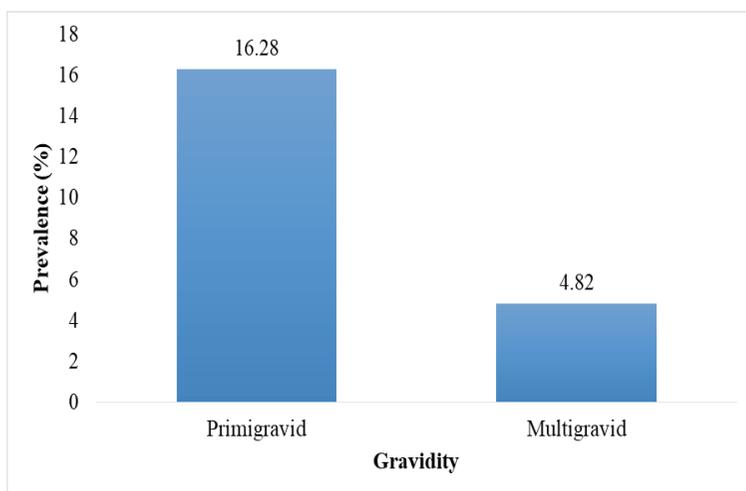
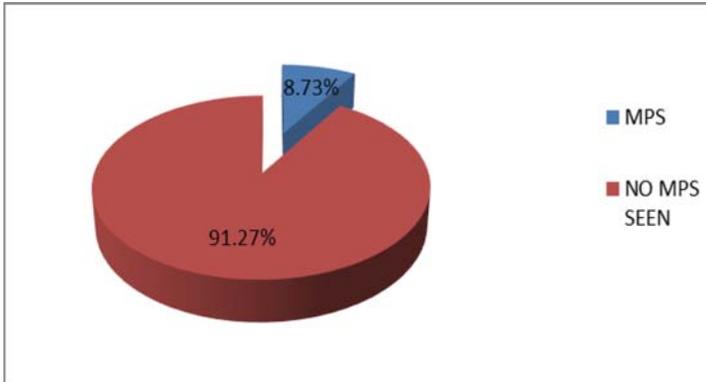


Fig 1. A bar graph showing the distribution malaria cases by gravidity

**General prevalence of malaria and isolated plasmodium species among pregnant women**

Malaria prevalence of 8.73% (22/252) (95% CI: 5.6 – 11.4) was obtained and *P. falciparum* was the only *Plasmodium* species found contributing to 100% (22/22) of the cases (Fig.2).



**Fig 2.** Laboratory findings for malaria parasites in peripheral blood smears

**Distribution of malaria cases among participants by age groups and gravidity**

In relation to gravidity, Percentage prevalence of malaria infections decline in the study population as gravidity increased; being highest in the primigravid with 16.28% (14/86) of infections and low in multigravid with 4.82% (8/166) of the infections (P-value < 0.001) (Table 1).

**Table 1.** A table showing the percentage distribution of malaria cases by gravidity and age group

Variable	No of pregnant women tested (n=252)	No of women infected (cases)	No of women tested negative	Prevalence (%)
<b>a) Age group (Years)</b>				
18 – 27	170	16	154	9.41
28 – 37	74	6	68	8.12
38 – 47	8	0.0	8	0.0
<b>Total</b>	<b>252</b>	<b>22</b>	<b>230</b>	<b>5.84</b>

b) Gravidity				
Primigravid	86	14	72	16.28
Multigravid	166	8	158	4.82
<b>Total</b>	<b>252</b>	<b>22</b>	<b>230</b>	<b>10.55</b>

## DISCUSSION

Malaria infection during pregnancy is a major public health problem in Bududa with a general prevalence of 8.73% (22/252) with primigravid having the highest malaria infections. This calls for improved efforts in controlling and management if the quality of life is improved in pregnancy.

The prevalence of malaria was 8.73% (22/252). The study results are in agreement with the study at Mulago National Referral Hospital, Uganda by Namusoke et al., (2010) that gave a prevalence of 9%. This could be due to the similarities in geographical location sharing similar climatic conditions, study design, diagnostic methods and control interventions. These study findings are contrary to those by Maziarz et al., (2018) from the study carried out in Northern Uganda with prevalence of 32.70% and 27% in Mbarara, South Western Uganda by De Beaudrap et al., (2013), Raimi O & Kanu C, (2010) and Falgunee et al., (2007) in Nigeria that gave a significantly higher prevalence.

The lower prevalence from this study could be attributed to the differences in climatic conditions in study areas where in Bududa the received intermittent rainfall patterns during the study period and surrounding districts which could have contributed to the reduction of breeding grounds for mosquitoes. High prevalence in Northern and south Western Uganda is attributed to hot climate and intermittent wet seasons could have been receiving too much rain and hence increased breeding grounds for mosquitoes and the differences in the sensitivities of the diagnostic methods used. The differences in the findings is attributed to the differences in study designs used in these studies where our study used a cross sectional study design whereas the study in South Western was a prospective study design. This is also attributed to differences in levels of implementation of preventive measures like use of insecticide treated mosquito nets used due to national wide malaria control campaigns to alleviate malaria burden and varied study site settings and diagnostic approaches used.

Malaria infections still remains a challenge in pregnancy in Bududa, therefore preventing and treating malaria in pregnancy can be a key intervention to improving maternal, foetal and child health and to minimize effects of malaria infection like maternal anaemia, abortions, still birth, intrauterine growth retardation, intrauterine foetal death need special measures to ensure their survival and improve birth outcome (Agomo et al., 2009).

This area is in rural setting with a higher incidence rate of malaria yet have little access to Health information and services than those living in urban areas (Yeka, 2012).

In this study, *P. falciparum* was the only species contributing 100% of all positive cases. This is in agreement with the study findings by Maziarz et al., (2018) in Northern Uganda and De Beaudrap et al., (2013) in Mbarara South Western Uganda. This is because *P. falciparum* is the most common species in tropical and subtropical Africa (Cheesbrough

M, 1994) and the absence of other plasmodium species could be attributed to their great rarity in the above parts of the world.

This study findings defers to the study by Falgunee et al., (2007) in a suburb of Lagos, Nigeria, where two Plasmodium species were *P. falciparum* and *P. malariae* were identified in different proportions. *P. falciparum* was evident to be more prevalent with a prevalence of 84.60% compared to 15.40% for *P. malariae*.

The study also revealed that malaria is more prevalent in primigravid with 16.28% (14/86) of the infections than in multigravid with 4.82% (8/166) (P value < 0.001). These findings are in agreement with those by Maziarz et al., (2018) in Northern Uganda. This observation is attributed to the partial pregnancy immunity or sensitization that develops due to frequent exposures to malaria infections in multigravidae unlike those in primigravidae, this immunity accumulates with successive pregnancies provided there is exposure to malaria infection and this is common in places where malaria is endemic

These study findings are not in line with the study by Brennan et al., (2005) that showed that there is no difference in the level of specific immunity to malaria, this could be support by the fact that even multigravida pregnant women without prior exposure to malaria in previous pregnancies, malaria treats them equally like the primigravidae since there is no immunity development unless exposed in previous pregnancies hence all are vulnerable to the infection.

## CONCLUSION

Malaria infection still remains a burden in pregnancy with *P. falciparum* species as the main cause of malaria infections in Bududa. This observation highlights the need to broaden and enhance control interventions to prevent malaria during pregnancy regardless of the gravidae. The study recommends routine malaria screening for symptomatic and asymptomatic malaria infections for early diagnoses and prevent transmission. The district health authority should intensify enlightenment campaigns to health educate women of child-bearing age and the community about the preventive and control measures of malaria.

## ACKNOWLEDGEMENTS

We acknowledge pregnant women who voluntarily participated into the study to make it a success, staff from department of Medical Laboratory Sciences for their skills and guidance and Mbarara University of Science and technology.

## CONFLICT OF INTEREST

All authors declare no conflict of interest in the study.

## SUBMISSION DECLARATION AND VERIFICATION

The authors declare that this manuscript is original, has not been published before and is not currently being considered for publication elsewhere.

## REFERENCES

- Agomo CO, Oyibo WA, Anorlu RI, Agomo PU. 2009. Prevalence of malaria in pregnant women in Lagos, South-West Nigeria. *Korean J Parasitol.* 47: 179-183.
- Brennan AK, Beeson JG, Tadesse E, Molyneux ME. 2005. Placental malaria induces variant-specific antibodies of the cytophilic subtypes immunoglobulin G1 (IgG1) and IgG3 that correlate with adhesion inhibitory activity. *Infect Immun.* 73: 5903-5907.
- Cheesbrough M. 1994. *Medical Laboratory manual for tropical countries, volume 1, second Edition*, Cambridge University Press.
- Colón-González FJ, Tompkins AM, Biondi R, Bizimana JP, Namanya DB. 2016. Assessing the effects of air temperature and Rain fall on malaria incidence: an epidemiological study across Rwanda and Uganda. *Geospat Health.* 11: 379.
- Conroy AL, McDonald CR, Kain KC. 2012. Malaria in pregnancy: diagnosing infection and identifying fetal risk. *Expert Rev Anti Infect Ther.* 10: 1331-1342.
- De Beaudrap P, Turyakira E, White LJ, Nabasumba C, Tumwebaze B, Muehlenbachs A, Guérin PJ, Boum Y, McGready R, Piola P. 2013. Impact of malaria during pregnancy on pregnancy outcomes in a Ugandan prospective cohort with intensive malaria screening and prompt treatment. *Malar J.* 12: 139.
- Desai M, Ter Kuile FO, Nosten F, McGready R, Asamoia K, Brabin B, Newman RD. 2007. Epidemiology and burden of malaria in pregnancy. *Lancet Infect Dis.* 7: 93-104.
- Falgunee KP, Jean NH, Donald JK, Casapia WM, Oralee HB. 2007. Prevalence and Risk of *Plasmodium falciparum* and *Plasmodium vivax* malaria among pregnant women living in the hypoendemic communities of the Peruvian Amazon. *Infection among pregnant women in Osogbo, Southwest, Nigeria. Americ-Eurj Scient Res.* 2: 43-45.
- Maziarz M, Nabalende H, Otim I, Legason ID, Kinyera T, Ogwang MD, Talisuna AO, Reynolds SJ, Kerchan P, Bhatia K, Biggar RJ, Goedert JJ, Pfeiffer RM, Mbulaiteye SM. 2018. A cross sectional study of asymptomatic *Plasmodium falciparum* infection burden and risk factors in general population children in 12 villages in northern Uganda. *Malar J.* 17: 240.
- Namusoke F, Rasti N, Kironde F, Wahlgren M, Mirembe F. 2010. Malaria burden in pregnancy at Mulago National Referral hospital in Kampala, Uganda. *Malar Res Treat.* 2010: 913857.
- Raimi O, Kanu C. 2010. The prevalence of malaria infection in pregnant women living in a suburb of Lagos, Nigeria. *African Journal of Biochemistry Research.* 4: 243-245.
- Takem EN and D'Alessandro U. 2013. Malaria in pregnancy. *Mediterranean journal of Haematology and infectious diseases.* 5. DOI <https://doi.org/10.4084/mjhid.2013.010>
- World Health Organization. 2018. *World malaria report*. World Health Organization. <https://apps.who.int/iris/handle/10665/275867>.
- Yeka A, Gasasira A, Mpimbaza A, Achan J, Nankabirwa J. 2012. Malaria in Uganda: challenges to control on the long road to elimination: I. Epidemiology and current control efforts. *Acta Trop.* 121: 184-195.