EURASIAN EXPERIMENT JOURNAL OF BIOLOGICAL SCIENCES (EEJBS)
ISSN: 2992-4138 ©EEJBS Publications
Volume 5 Issue 1 2024

Assessing the Prevalence and Socio-Demographic Determinants of Malaria in Pregnant Women: A Study at Fort Portal Regional Referral Hospital, Uganda

Godwinnie Twinamazima
Faculty of Clinical Medicine and Medicine and Surgery, Kampala International University, Uganda.

ABSTRACT

Malaria is the world's most important tropical disease, killing more people than any other communicable disease Plasmodium falciparum, the most dangerous parasite, causes malaria in the sub-Saharan African region. In the tropics, malaria is more common in pregnant women than in any other adult group because of the hormonal and immunological changes that take place in the pregnant woman's body. We admitted two men to Fort Portal Regional Referral Hospital to determine the prevalence and risk factors associated with malaria in pregnancy. We used a cross-sectional descriptive study design to collect both quantitative and qualitative data on the prevalence and risk factors of malaria among pregnant women admitted to Fort portal Regional Referral Hospital. The study found that the prevalence of malaria in pregnancy was 22 (19.2%) in the mothers recruited in the study. The study also found that being unemployed (59.1%; p-value 0.041) and having a having a rural residence (72.7%; p-value 0.028) were significant factors that led to malaria in pregnancy. Additionally, being in the first or second trimester, 14 (63.6%); p-value 0.042, and not using an insecticide-treated mosquito net, 12 (54.5%); p-value 0.033, were predisposing factors to malaria in pregnancy. The prevalence of malaria remains high, at 19.3%, necessitating significant efforts to mitigate its morbidity effects. Increased awareness about malaria preventive measures and early attendance at antenatal care services will help reduce malaria in pregnancy and its associated morbidities.

Keywords: Risk Factors, Malaria, Pregnant, Women, Fort Portal Regional Referral Hospital, Kabale District.

INTRODUCTION

Malaria still remains a key public health issue globally. In 2013, about 3.3 billion people were at risk of malaria infection[1–3]. According to the World Malaria Report, Africa bears the heaviest burden and has the highest risk of malaria infection. Hence, about 82% of the reported malaria cases and about 90% of the reported deaths occur in Africa; the majority was children below five years and pregnant women living in malaria-endemic regions [4]. In 2013, there were approximately 198 million cases and 584,000 deaths. Malaria is a life-threatening public health parasitic disease[3]. Maternal anaemia: between 75,000 and 200,000 infants (children under the age of 12 months) are estimated to die annually as a result of malaria infection during pregnancy[5]. Approximately 11% (100,000) of neonatal deaths are due to low birth weight caused by P. falciparum infections during pregnancy.[6]. The principal impact of malaria infection during pregnancy is due to the presence of parasites in the placenta, which causes maternal malaria and low birth weight. [7]. Beyond the post-partum period, the long-term consequences of malaria during pregnancy on the infant include poor development, behavioral problems, short stature, and neurological deficits [8]). Protection of pregnant women living in malaria-endemic countries has been of particular interest to many malaria control programmes because of this group's higher susceptibility and reduced immunity [9]. Pregnant women (especially primi gravidae) are at risk even in highly endemic areas where adults have some level of acquired immunity, as they have never exposed their placental tissue to malaria parasites. In fact, a pregnant woman may be an asymptomatic carrier of placental malaria parasites, which are none-the-less harmful to the foetus and result in intrauterine rowth retardation, low birth weight, miscarriage, still birth, Risk for malaria-associated anemia. Anaemia, in turn, can adversely affect a mother's ability to survive complications related to postpartum haemorrhage and is therefore a serious concern.[10]. There is considerable malaria morbidity due to repeated low-level and mostly non-febrile infections with the parasites, resulting in chronic anaemia in children and pregnant women, particularly primigravidae. Severe malarial anaemia is responsible for a case fatality rate of 8–25 percent among paediatric admissions. It is responsible for nearly 60 percent of abortions or miscarriages. High levels of resistance to classical malaria drugs have resulted in increased malaria morbidity in sub-Saharan Africa, especially among pregnant women and children [11]. The lack of data on malaria in pregnant women in Uganda and other countries necessitates this study to fill this gap.

Malaria in pregnancy has been identified in many studies to worsen certain pregnancy outcomes, leading to an increase in morbidity and mortality. Pregnant women are susceptible to malaria as pregnancy decreases a woman's immunity to malaria, making them more vulnerable to anaemia, placental parasitic infestation, and increasing the risk of illness leading to death. For unborn babies, maternal malaria increases the risk of spontaneous abortion, stillbirth, premature delivery, and low birth weight. Hence, it is a leading cause of child and maternal mortality [12]. Pregnant women may be more susceptible to malarial infection due to factors such as illiteracy, low educational status, unemployment, low income, and gravidity [13]. In endemic areas, approximately 25 million pregnancies are at risk of P. falciparum. Infection every year, and 25% of these women have evidence of placental infection at the time of delivery [14]. The clinical features of infection during pregnancy vary depending on the degree of preexisting immunity and, consequently, the epidemiological setting. In high-transmission areas, maternal anaemia and low birth weight (LBW), as a result of prematurity and/or intrauterine growth restriction (IUGR), are the main adverse outcomes of placental infection and tend to be more severe in first pregnancies and in younger mothers [15]. Plasmodium species, including P. falciparum and P. knowles, infect humans worldwide, primarily in tropical and subtropical areas. P. falciparum kills approximately 1 million people annually, primarily in Africa, Asia, Latin America, and some parts of Africa. P. ovale is found throughout Southeast Asia as a natural pathogen of long-tailed and pig-tailed macaques. Pregnant women are at higher risk of malaria infection due to factors such as illiteracy, low education, unemployment, low income, and poverty. Anopheles mosquito larvae thrive in tropical and subtropical regions, with malaria being considered endemic in 106 countries worldwide. Transmission is stable in 90-95% of Uganda, but unstable areas with potential for epidemics exist. Malaria is a global disease with 300-600 million cases annually, with an estimated 2.2 billion people at risk. It is responsible for at least 750,000 deaths a year, mostly in young children in Africa. Over half of the world's population is at risk of catching malaria. Pregnancy-associated malaria is a cause of morbidity and mortality for mothers and their developing foetuses in sub-Saharan Africa. Key malaria interventions include vector control using insecticide-treated nets (ITNs), indoor residual spraying (IRS), intermittent preventive treatment of malaria in pregnancy (IPTp), and effective treatment with Artemisinin-based combination therapy (ACT). Pregnant women are more susceptible to P. falciparum infection due to physiological alterations in immunity and specific strains that adhere to chondroitin sulphate A in the placenta. The study aims to determine malaria prevalence in pregnant women admitted to FFPRRH, evaluate socio-demographic factors associated with malaria, and analyze maternal factors associated with malaria in these women.

METHODOLOGY

Study Design

This study adopted a cross-sectional descriptive study design for collecting both quantitative and qualitative data.

Study Area

This study was conducted at Fort Portal Regional Referral Hospital, located in the western region of Uganda. And it is about 294 km west of Mulago National Referral Hospital in Kampala, the capital city of Uganda, and is about 4-5 hours' drive by public transport (bus).

Study Population

The study population included all the pregnant women admitted to Fort Portal Regional Referral Hospital.

Target Population

The target population was all pregnant women admitted to Fort Portal Regional Referral Hospital in Kabaroli District during the time of data collection.

Inclusion Criteria

This study included pregnant mothers admitted to Fort Portal Regional Referral Hospital who had consented at the time of data collection.

Exclusion Criteria

The research excluded pregnant women admitted to FPRRH who did not consent. It also excludes nonpregnant women from visiting Goradmitted at FPRRH.

Sample Size Determination

The sample size was determined by using the Kish and Leslie formula [16].

$n=z^2p(1-p)/E^2$

Where n is the estimated minimum sample size required.

P is the prevalence of malaria among pregnant women, which is 8.1%. (estimated from the Uganda Study by Mutagonda et al., 2016)

Z = 1.96 (for 95% confidence interval) e= margin of errors at 5%

n = 1.96 x 0.081 (1-0.081)/0.05 = 114.

Therefore, the sample size would be 114 participants.

Sampling Technique

This study population employed a simple random sampling technique. Here, every participant was to have an equal chance of participating in the study. Meanwhile, purposive sampling was used to acquire information through interviews with knowledgeable staff and administrators.

Data Collection Method and Management

Questionnaires with both open-ended and closed-ended questions were used with both the binomial and linker systems.

Data Analysis

Data was analyzed using the statistical package of social science (SPSS) version 24.0. The results were tabulated with a relationship between the univariate, bivariate, and multivariate comparisons. The qualitative results from the interview were quoted and used together with the quantitative results obtained from the study.

Quality Control

A data collection team with prior experience in research and familiarity with the local culture was trained on how to collect data in order to minimise errors. The questionnaires were translated into the local dialect and pretested in FPRRH, and necessary corrections were made prior to data collection. Both the translated and English versions of the questionnaires were used for data collection.

Ethical Considerations

The research proposal was first submitted to the IREC of KIUWC for ethical clearance. A letter of introduction was obtained from the dean of the school of clinical medicine and dentistry, which was then presented to the hospital management of FRRRH to seek permission to conduct the study. A formal informed consent was obtained from each study participant before data collection started. For all patients', informed consent was obtained from them and documented in a prepared format. Before starting the study, the protocol, including the consent, will be approved by the ethical review board of KIUWC. The information obtained from the patients was kept confidential. All respondents were treated equally with the utmost respect. No respondent was discriminated against or victimised using the information obtained.

RESULTS

Data Presentation and Analysis

Table 1: Malaria prevalence

Malaria assessment	Frequency	Percentage
Malaria positive	22	19.3
Malaria negative	92	80.7

From the study, 22(19.3%) of the total 114 of them others were malaria positive from assessment test, while 92 (80.7) were negative.

Table 2: Showing socio demographics association with malaria in pregnancy

Variables	**Malaria Negative (N=92) Malaria Positive (22) P-value**				
	Frequency	**%age**	**Frequency**	**%age**	
Age					
18-30 years	66	71.7	14	63.6	0.978
Above 30 years	26	28.3	08	36.4	
Education level					
Primary Post	59	64.1	17	77.3	1.255
Primary	33	35.9	05	22.7	
Occupation					
Employed	49	53.3	09	40.9	
Unemployed	43	46.7	13	59.1	0.041
Residence					
Urban residence	55	59.8	06	27.3	
Rural resident	37	40.2	16	72.7	0.028

The study assessed an association between social demographic factors and malaria in pregnancy. The study found that being aged between 18 and 30 years was not a significant factor (p-value 0.978) towards malaria in pregnancy. This was seen by the majority of 14 (63.6%) being aged between 18 and 30 years who tested positive for malaria,

while the least of 8 (36.4%) being above 30 years who tested positive for malaria. The study also discovered that the majority (17,77.3%) of those who tested positive for malaria had completed the primary level, and the majority (59,64.1%) of those who tested negative for malaria had completed the same level. The study also discovered that employment status significantly predicted the risk of malaria in pregnancy (p-value 0.041), as shown by the fact that the majority of respondents (13, 59.1%) who tested positive for malaria were unemployed, while the least number of respondents (40.9%) were employed. The study found that the association between residence and malaria in pregnancy was significant. The majority (16,72.7%) who tested positive for malaria were from rural settings, while the least (6,27.3%) were from urban settings.

Table 3: Maternal factors and their association with Malaria in pregnancy

	Frequency	%age	Frequency	%age	
Gravidity					
Prime gravida	18	19.6	04	18.2	0.778
Multi gravida	74	80.4	18	81.8	
Gestation age					
1st and 2nd trimester	37	40.2	14	63.6	0.042
3rd trimester	55	59.8	08	36.4	
ITN					
Using ITN	78	84.8	10	45.5	
Not using ITN	14	15.2	12	54.5	0.033

The study assessed for the association between maternal factors and malaria in pregnancy, it found out that being a multipara was a not significant factor (p-value at 0.778) towards malaria in pregnancy. This was also reflected with majority 18(81.8%) of those who tested positive of malaria being multiparous as while as majority who tested negative where still multiparous. The study assessed for association between gestational period and malaria in pregnancy, it found out that 1st and 2nd trimester was a significant factor (p-value at 0.042) towards malaria in pregnancy. This was seen by majority 14(63.6%) of those who tested positive being in the 1st and 2ndtrimester while majority who tested negative of malaria where in their 3rd trimester. The study found out that using insecticide treated mosquito net was a significant factor (p-value 0.033), evidenced by the majority 12(54.5%) of those who tested positive said were not using treated mosquito net while the least 10(45.5%) of those who tested positive of malaria said they were using treated mosquito on et.

DISCUSSION

According to the study, 22 (19.3%) of the total 114 mothers were malaria positive in the assessment test, while 92 (80.7%) were negative. This study shows that the majority of the pregnant mothers were not having malaria; however, the 22 (19.3%) of those who had malaria are still of public health significance in comparison with other studies. This study is different from a study by [17], which showed a much higher prevalence, in which a study in Khartoum, Sudan, found that the prevalence of malaria among pregnant women was 26.2%. Association between social demographic characteristics and malaria occurrence. The study assessed for an association between social demographic factors and malaria in pregnancy. The study found out that being aged between 18 to 30 years was not a significant factor. The majority of 14 (63.6%) women aged between 18 and 30 years tested positive for malaria in pregnancy, with a p-value of 0.978. Conversely, only eight (36.4%) women aged over 30 tested positive for malaria. The study revealed that age was not a significant factor in malaria infection, as malaria can affect any mother who does not follow malaria preventive measures, regardless of age. When compared with other studies, this study differs from a study by [18] in which they observed that pregnant women < 26 years of age were found to have a lower risk of malaria infection. The study also found out that education was not a significant factor (p-value at 1.255) towards malaria in pregnancy, this was also reflected at majority 17(77.3%) of those who tested positive had attained primary level and those testing negative of malaria being the majority at 59(64.1%)had had the same level, education provides information to pregnant mothers regarding malaria preventive measures, however this study shows a discrepancy in which education showed no significance on malaria infestation among pregnant mothers, when compared with other studies, this study shows a difference from a study by [19] , in which they showed that women with primary education recorded the highest prevalence (23.1%) of placental malaria compared with women with secondary (16.9%) and tertiary (18.9%) education although this was not significant. The study also found that employment status was a significant factor (p-value 0.041) in relation to malaria in pregnancy, as evidenced by the majority of 13 (59.1%) unemployed respondents who tested positive for

malaria and the lowest number of 09 (40.9%) employed respondents who tested positive. This could be because being unemployed makes one lack baseline requirements for obtaining basic necessities to obtain preventive measures against malaria, such as IPT and IT. This study, like others, shows a correlation with a study by [20], in which they indicated that unemployment was an important risk factor for malaria in pregnancy, when compared with other studies.

The study found that the association between residence and malaria in pregnancy was significant. The majority (16.7%) from rural settings tested positive for malaria, while the least (6.7%) also tested positive. In an urban setting, being from a rural area makes mothers reluctant to obtain services from health facilities, which predisposes them to malaria infection. When compared with other studies, this study shows a similarity with a study by [21], in which they tested positive for malaria. In an urban setting, being from a rural area makes mothers reluctant to obtain services from health facilities, which predisposes them to malaria infection. The study found that parity was not a significant factor (p-value at 0.778) in malaria in pregnancy. The majority (18.8%) of those who tested positive for malaria was also multiparous; the majority of those who tested negative for malaria were still multiparous. This could be because malaria can affect any mother, regardless of parity, if they don't take preventive measures against it. Compared to other studies, this one showed a difference from a study by Maniga et al. [22], which found that the number of malaria parasites decreased with increasing age and parity. This supports the idea that controlling malaria parasitemia depends on parity and/or age. The study assessed the association between gestational period and malaria in pregnancy and found that the 1st and 2nd trimesters were significant factors (p-value at 0.042) towards malaria in pregnancy. Most of the 14 (63.6%) women who tested positive for malaria in the 1st and 2nd trimesters also tested negative in their 3rd trimester. This could be because by the first and second trimesters, most of the mothers will not have received intermittent preventive therapy against malaria, since most of them start going to health facilities for those services in the second trimester [23-26]. When compared with other studies, this study shows a difference from a study by [23], in which they found out that malaria was more frequent during the second trimester, which probably points to the time of maximum malaria risk during pregnancy. The study found that using insecticide-treated mosquito nets was a significant factor (p-value 0.033), as evidenced by the fact that the majority (12,54.5%) of those who tested positive said they were not using treated mosquito nets, while the least number (10,45.5%) of those who tested positive for malaria said they were using treated mosquito nets. This could be because mothers who don't have mosquitoes are prone to mosquito bites, which makes them prone to malaria.

CONCLUSION

The study discovered a strong correlation between pregnancy-related malaria and unemployment in rural areas. First and second trimester ages of gestation, as well as the use of insecticide-treated mosquito nets, were strongly associated with the prevalence of malaria in pregnant women admitted to FPRH.

REFERENCES

1. Mawson, A.R.: The pathogenesis of malaria: a new perspective. Pathog. Glob. Health. 107, 122–129 (2013). https://doi.org/10.1179/2047773213Y.0000000084
2. Egwu, C.O., Aloke, C., Chukwu, J., Nwankwo, J.C., Irem, C., Nwagu, K.E., Nwite, F., Agwu, A.O., Alum, E., Offor, C.E., Obasi, N.A.: Assessment of the Antimalarial Treatment Failure in Ebonyi State, Southeast Nigeria. J. Xenobiotics. 13, 16–26 (2023). https://doi.org/10.3390/jox13010003
3. Egwu, C.O., Aloke, C., Chukwu, J., Agwu, A., Alum, E., Tsamesidis, I., Aja, P.M., Offor, C.E., Obasi, N.A.: A world free of malaria: It is time for Africa to actively champion and take leadership of elimination and eradication strategies. Afr. Health Sci. 22, 627–640 (2022). https://doi.org/10.4314/ahs.v22i4.68
4. Fact sheet about malaria, https://www.who.int/news-room/fact-sheets/detail/malaria
5. Arnaldo, P., Rovira-Vallbona, E., Langa, J.S., Salvador, C., Guetens, P., Chiheb, D., Xavier, B., Kestens, L., Enosse, S.M., Rosanas-Urgell, A.: Uptake of intermittent preventive treatment and pregnancy outcomes: health facilities and community surveys in Chókwè district, southern Mozambique. Malar. J. 17, 109 (2018). https://doi.org/10.1186/s12936-018-2255-z
6. Anabire, N.G., Aryee, P.A., Abdul-Karim, A., Quaye, O., Awandare, G.A., Helegbe, G.K.: Impact of malaria and hepatitis B co-infection on clinical and cytokine profiles among pregnant women. PLOS ONE. 14, e0215550 (2019). https://doi.org/10.1371/journal.pone.0215550
7. Atieli, H.E., Zhou, G., Afrane, Y., Lee, M.-C., Mwanzo, I., Githeko, A.K., Yan, G.: Insecticide-treated net (ITN) ownership, usage, and malaria transmission in the highlands of western Kenya. Parasit. Vectors. 4, 113 (2011). https://doi.org/10.1186/1756-3305-4-113
8. Bahizire, E., Tugirimana, P.L., Dramaix, M., Zozo, D., Bahati, M., Mwale, A., Meuris, S., Donnen, P.: Malaria Is More Prevalent Than Iron Deficiency among Anemic Pregnant Women at the First Antenatal Visit in Rural South Kivu. Am. J. Trop. Med. Hyg. 97, 1551–1560 (2017). https://doi.org/10.4269/ajtmh.17-0267

9. Kajoba, D., Ivan Egesa, W., Jean Petit, H., Omar Matan, M., Laker, G., Mugowa Waibi, W., Asiimwe, D.: Congenital Malaria in a 2-Day-Old Neonate: A Case Report and Literature Review. Case Rep. Infect. Dis. 2021, e9960006 (2021). https://doi.org/10.1155/2021/9960006
10. Maternal anaemia and the risk of postpartum haemorrhage: a cohort analysis of data from the WOMAN-2 trial. Lancet Glob. Health. 11, e1249–e1259 (2023). https://doi.org/10.1016/S2214-109X(23)00245-0
11. Ifeanyi Obeagu, E., Chimezie Didia, B., Uzoma Obeagu, G., Azuonwu, O.: Evaluation of Changes in Haematological Profile of Cerebral Malaria Patients in Enugu State, Southeast, Nigeria. Ann. Clin. Lab. Res. 05, (2017). https://doi.org/10.21767/2386-5180.1000202
12. Nyabayo Maniga, J., Aliero, A.A., Ntulume, I., Okech, M.A., Claire Mack, M.: Plasmodium falciparum Malaria Clinical and Parasitological Outcomes after In-vivo Artemether- Lumefantrine (AL) Treatment at Bushenyi District Uganda. (2018). https://doi.org/10.9734/IJTDH/2018/39642
13. Hempelmann, E., Krafts, K.: Bad air, amulets and mosquitoes: 2,000 years of changing perspectives on malaria. Malar. J. 12, 232 (2013). https://doi.org/10.1186/1475-2875-12-232
14. Lufele, E., Umbers, A., Ordi, J., Ome-Kaius, M., Wangnapi, R., Unger, H., Tarongka, N., Siba, P., Mueller, I., Robinson, L., Rogerson, S.: Risk factors and pregnancy outcomes associated with placental malaria in a prospective cohort of Papua New Guinean women. Malar. J. 16, 427 (2017). https://doi.org/10.1186/s12936-017-2077-4
15. Kamga, S.L.S., Ali, I.M., Ngangnang, G.R., Ulucesme, M.C., Keptcheu, L.T.D., Keming, E.M., Tchuenkam, V.-P.K., Foyet, J.V., Aktas, M., Noubom, M., Payne, V.K.: Uptake of intermittent preventive treatment of malaria in pregnancy and risk factors for maternal anaemia and low birthweight among HIV-negative mothers in Dschang, West region of Cameroon: a cross sectional study. Malar. J. 23, 6 (2024). https://doi.org/10.1186/s12936-023-04816-8
16. Wiegand, H.: Kish, L.: Survey Sampling. John Wiley & Sons, Inc., New York, London 1965, IX + 643 S., 31 Abb., 56 Tab., Preis 83 s. Biom. Z. 10, 88–89 (1968). https://doi.org/10.1002/bimj.19680100122
17. Rouamba, T., Samadoulougou, S., Ouédraogo, M., Hien, H., Tinto, H., Kirakoya-Samadoulougou, F.: Asymptomatic malaria and anaemia among pregnant women during high and low malaria transmission seasons in Burkina Faso: household-based cross-sectional surveys in Burkina Faso, 2013 and 2017. Malar. J. 20, 211 (2021). https://doi.org/10.1186/s12936-021-03703-4
18. Mangusho, C., Mwebesa, E., Izudi, J., Aleni, M., Dricile, R., Ayiasi, R.M., Legason, I.D.: High prevalence of malaria in pregnancy among women attending antenatal care at a large referral hospital in northwestern Uganda: A cross-sectional study. PLOS ONE. 18, e0283755 (2023). https://doi.org/10.1371/journal.pone.0283755
19. Babalola, A.S., Idowu, O.A., Sam, S.O., Fabusoro, E.: Risk factors associated with occurrence of placental malaria in a population of parturients in Abeokuta, Ogun State, Nigeria. 6, (2015)
20. Okiring, J., Olwoch, P., Kakuru, A., Okou, J., Ochokoru, H., Ochieng, T.A., Kajubi, R., Kamya, M.R., Dorsey, G., Tusting, L.S.: Household and maternal risk factors for malaria in pregnancy in a highly endemic area of Uganda: a prospective cohort study. Malar. J. 18, 144 (2019). https://doi.org/10.1186/s12936-019-2779-x
21. Ronald, M., Humphrey, W., Adoke, Y., Jean-Pierre, V.G.: Impact of population based indoor residual spraying in combination with mass drug administration on malaria incidence and test positivity in a high transmission setting in north eastern Uganda. Malar. J. 22, 378 (2023). https://doi.org/10.1186/s12936-023-04799-6
22. Maniga, J., Rael, M., Bwogo, P., Ntulume, I., Tibyangye, J., Atiku, S., Bella, V., Mong'are, S., Masai, R.: In-vivo Efficacy Profiles of Plasmodium falciparum to Artemether-Lumefantrine, the Recommended First-Line Treatment of Uncomplicated Malaria in Kisii County Kenya. 114–128 (2021)
23. van Eijk, A.M., Hill, J., Noor, A.M., Snow, R.W., ter Kuile, F.O.: Prevalence of malaria infection in pregnant women compared with children for tracking malaria transmission in sub-Saharan Africa: a systematic review and meta-analysis. Lancet Glob. Health. 3, e617–e628 (2015). https://doi.org/10.1016/S2214-109X(15)00049-2
24. Nwaka AC, MC Ikechi-Agba, PC Ugwu Okechukwu, IO Igwenyi, KN Agbafor, OU Orji, AL Ezugwu (2015). The effects of ethanol extracts of Jatropha curcas on some hematological parameters of chloroform intoxicated rats. American-Eurasian Journal of Scientific Research,10(1): 45-49.
25. Ugwu, O. P., Nwodo, O. F., Joshua, P. E., Odo, C. E., Bawa, A., Ossai, E. C., & Adonu, C. C. (2013). Anti-malaria and hematological analyses of ethanol leaf extract of Moringa oleifera on malaria infected mice. *International Journal of Pharmacy and Biological Science*, *3*(1), 360-371.
26. Ugwu, O. P. C., Nwodo, O. F. C., Joshua, P. E., Odo, C. E., Ossai, E. C., & Aburbakar, B. (2013). Ameliorative effects of ethanol leaf extract of Moringa oleifera on the liver and kidney markers of malaria infected mice. *International Journal of Life Sciences Biotechnology and Pharma Research*, *2*(2), 43-52

CITE AS: Godwinnie Twinamazima (2024). Assessing the Prevalence and Socio-Demographic Determinants of Malaria in Pregnant Women: A Study at Fort Portal Regional Referral Hospital, Uganda. EURASIAN EXPERIMENT JOURNAL OF BIOLOGICAL SCIENCES, 5(1): 10-16.