OPEN ACCESS

Global Journal of Research in Humanities & Cultural Studies

ISSN: 2583-2670 (Online)

Volume 03| Issue 03 | May-June | 2023

Journal homepage: https://gjrpublication.com/gjrhcs/

Original Research Article

Assessment of Malaria Infection among Pregnant Women in Rimin Gado Local Government Area, Kano State

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DOI: 10.5281/zenodo.8076654 **Submission Date: 12 June 2023 | Published Date: 24 June 2023**

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Abstract

This study assessed malaria among pregnant women attending antenatal care in Rimin Gado Local Government Area (LGA) of Kano State. The study adopted mixed methods for data collection, where quantitative and qualitative methods were used. The research utilized two sources of data (primary and secondary data). The primary data include copies of a questionnaire distributed to 100 women available at antenatal care. The secondary data was obtained from records on the number of cases of malaria for all the pregnant women that attended antenatal care at Rimin Gado General Hospital, from 2013 to 2017. The data were analysed using Descriptive (Line graphs and frequency tables) and inferential statistics. In view of these, the following results were obtained: non-educated pregnant women had the highest prevalence rate (52%), while those with a tertiary level of education had the lowest (2.5%). The number of malaria cases was observed to decrease (from 25% to less than 8%) with age, and the number of children and pregnancy rate of pregnant women increased. There are variations between the type of occupation and malaria cases during pregnancy with unemployed, Traders, Civil servants, and others accounting for 12.5%, 40%, 0% and 47.5% respectively. The study shows that antenatal care has no significant effect on the decline of malaria cases during pregnancy as 95% of the infected women fully attend antenatal care while the remaining 5% are among those that partially attend antenatal care in all their pregnancy. The temporal variation of the number of cases of malaria during pregnancy varied significantly across the various months of the year in 2013, 2014, and 2015 while variations for the remaining years (2016 and 2017) have little significance. The study recommends enlightenment of pregnant women on the importance of, environmental sanitation, intermittent preventive treatment of malaria and the use of insecticide-treated nets during pregnancy.

Keywords: Ante Natal, Malaria, Pregnancy

INTRODUCTION

Malaria is one of the most important public health problems in the world. According to malaria report 2011 of World Health Organization (WHO), approximately 106 countries are at risk of transmission of malaria in the world. In 2010 a total of 216 million malaria cases occurred, in which 81% were reported in Africa region, 13% in Southeast Asia, 5% in Eastern Mediterranean region (World Malaria Report, 2011). Malaria remained the leading cause of death in Nigeria with approximate 227,645 deaths in 1990 and 192,284 deaths recorded in 2015. Malaria is a mosquito-borne disease in humans and animals (Ukaegbu *et al* 2014), it is caused by parasite protozoan of the genus *plasmodium* with species *P. falciparum, p. malariae, p. ovale* and *p. vivax*. Among these species, *p. falciparum* is the most dangerous and deadly, causing severe health outcomes from malaria, especially in sub-Saharan Africa where it predominates (WHO, 2011). The parasites were transmitted via female *Anopheles funestus, Anopheles moucheti, Anopheles gambiae* and *Anopheles arabiensis* (Kar *et al.*, 2014).

Malaria during pregnancy is a serious public health problem in Sub-Saharan Africa. It is estimated that each year approximately 25 million pregnant women in Sub-Saharan Africa live at risk of malaria infection (Uneke, 2007; and Steketee, 2010). Institution-based study in eastern Sudan showed that, 13.7% of pregnant women were infected with *P. falciparum* (Adam, 2005). Studies conducted in Burkina Faso (Cisse *et al.*, 2014), and Malawi (Boudova *et al.*, 2015) also showed the prevalence to be 18.1% and 19% respectively. Besides, two institutional and community-based studies conducted in different parts of Ethiopia also showed the prevalence of malaria among pregnant women to be between 2.83% and 16.3% (Asmamaw, 2013; Gileta, 2017; and Nega, 2015). In Nigeria, two institution-based studies conducted among pregnant women attending antenatal care showed the prevalence of malaria to be 41.6% (Kagu, 2007; Agoma, 2009).

Malaria infection during pregnancy causes an enormous risk to the mother, fetus and neonates (Gajida, 2010). Indeed, although malaria during pregnancy might be asymptomatic due to high level of acquired immunity in the mothers residing in high transmission areas, it is still associated with increased risk of maternal anaemia, spontaneous abortion, stillbirth, prematurity, placental accumulation of parasites, low birth weight due to prematurity, intrauterine growth retardation, congenital infection and overall maternal death (Steketee 2001; Steketee 2010; WHO 2010; and Cornelio and Seriano, 2011). Malaria-related anaemia is estimated to cause as many as 10,000 maternal deaths each year (WHO 2014). Different risk factors of malaria among pregnant women were identified by previous studies (Cisse *et al.*, 2014, and Fana *et al.*, 2015), Age (Agoma *et al*, Jackle *et al* 2013), antenatal care, and gestational age (Mario *et al 2013)*, Parity (Cisse *et al* 2014, Mario *et al* 2013), and gravidity and ITN utilization (Nega, 2015). In Rimin Gado Local Government Area (LGA), about 60% of the population is at risk of malaria infection. Despite the high risk of malaria transmission in the area, there are limited evidences about its burden and risk factors among pregnant women which can be used for reducing maternal and child mortality due to its prevalence and its associated factors among pregnant women.

The aim of the study is therefore to assess malaria among pregnant women attending antenatal care in Rimin Gado LGA of Kano state with a view to examining the socio-economic characteristics of the pregnant women, to identifying the spatio-temporal distributions of malaria among pregnant women and to assessing the measures taken to prevent and cure the malaria among pregnant women.

STUDY AREA

The study was conducted in Rimin Gado LGA of Kano state from 2015 to 2019. Rimin Gado is one of the 44 LGAs in Kano State, and is located about 26km west of Kano metropolis, on latitude 11^0 30' and longitude 8^0 30', with a 2006 census' population record of 104,790 (FGN, 2007). Meanwhile as at December 2019, using the geometric projection method and based on the inter-census growth rates (ICGRs), the LGA has an estimated population of 118,413. And it has an area of about 225km^2; it is bordered with Kabo LGA to the south and southeast, Bagwai LGA to the northwest, Tofa LGA to the north and northeast and Madobi LGA by the south and southeast.

Hausa language and Islam are respectively the major ethnicity and religion of the people in the area. Polygamy system of family is also common among the people in the area. A number of family and the women themselves prefer home delivery. The love for children and ability to have them is an important component of social life in Hausa society, and these make a number of men to marry more than one wife. Therefore, the status of or value of women is more or less influenced by the ability of the wife to bear children, and the situation is same as men.

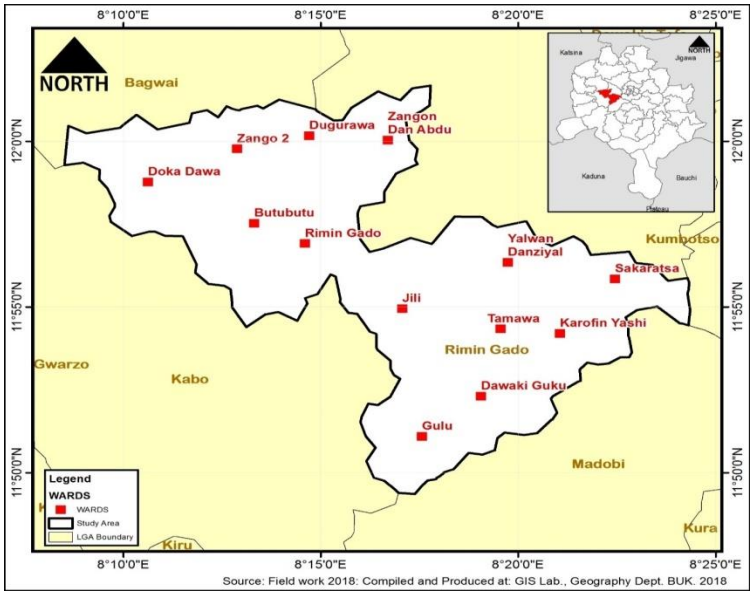

Figure_1: Rimin Gado Local Government Area (LGA)

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The study population consists of the pregnant women attending antenatal care at Rimin Gado General Hospital from the various wards of the LGA. The wards include Butu-butu, Dawakin Gulu, Doka-Dawa, Dugurawa, Gulu, Jili, Karofin Yashi, Rimin Gado, Sakaratsa, Yalwan Dan ziyal, Zango and Zangon Dan Abdu.

RESEARCH METHODS

A descriptive research design was adopted for this study, it was appropriate because it helps in describing the current practices regarding the subject matter. This study also adopted the mixed methods for data collection and analysis, where quantitative and qualitative methods were used in order to enhance greater validity of the research by ensuring that there are no gaps to the information or the data collected (Saunders, Lewis and Thornhill, 2009).

Population, Sample Size and Sampling Techniques

The population for this study was the total number of pregnant women attending antenatal care at Rimin Gado General Hospital (2013-2017). A sample of 100 pregnant women was sampled for malaria testing using simple random/accidental sampling technique.

Sources of Data Collection

There were two sources from which data were collected for this study. These are:

i. Primary sources: The primary source of data for this study was the responses from administered questionnaire to the 100 pregnant women selected at random out of all the pregnant women attending antenatal care at Riming Gado hospital.
ii. Secondary sources: The secondary source of data for this research was derived from hospital record of the pregnant women attending antenatal care in Rimin Gado hospital.

Method of Data Analysis

Descriptive methods of analysis were employed for this study. The descriptive method involved frequency tables and percentages. Descriptive statistical tools were used to present the socioeconomic characteristics of the respondents. Data analysis was carried out using IBM SPSS version 21 software. Chi square was used to examine the effects of the independent variables (socio-economic characteristics) on the dependent variable (malaria infection during pregnancy). Data on the total number of pregnant women with malaria infection were obtained from 2013 to 2017 for temporal analysis. Microsoft excel was used to summarize the data using tables and graphs.

Ethical Considerations

Written application was formally sent to the chairman ethical committee on research through the Executive Secretary of the Kano State Hospital Management Board, Kano State Ministry of Health, and the Executive Secretary Primary Healthcare Management Board, Kano State seeking for permission to access the hospital records. the need and the purpose of the study were clearly stated. The research was set to abide by all the ethical issues therein according to the board.

RESULTS

Socioeconomic Characteristics of Respondents

Education is important for pregnant women because it highlights to them the knowledge and attitude about health system and quantity of medical care. Table 1 shows that occurrence of malaria infection among pregnant women is highest (52.5%) among those with non-formal education while those that had attended tertiary level of education had the lowest proportion (2.5%) of malaria infection. This shows that education plays a vital role in the prevention of malaria in pregnancy. However, the chi-square analysis shows that there is statistical significant difference in malaria infection among pregnant women based on their education status (p-value = 0.093).

The result presented in Table 1 shows that 68% of respondents had children between 0-3 while those with 8-11 accounted for 9%. As regard to malaria infection, our result has shown that 62% of the infected women have between 0-3 children while 7.5% of those with malaria case have between 8-11 numbers of children. This shows that there is a decrease in malaria infection as the number of children increases. This shows that there is an increase in the awareness on the effect and prevention of malaria as the number of children of the pregnant women increases. However, the chi-square analysis shows that the difference in the infection rate between the different groups based on the number of children was not significant (p-value = 0.457).

It was also shown that there is relationship between pregnancy before and malaria during pregnancy. The percentage of infection of those that have pregnancy before is higher (82.5%) than those that have never been pregnant before (17.5%). The chi-square test of significance however, shows that there was a significant difference in the rate of malaria infection among the two groups (p-value = 0.483).

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The incidence of malaria infection among pregnant women according to the number of pregnancies showed that those that were experienced between 1-4 times had the highest proportion (52.5%) followed by those with 5-8 times (Table 1). This analysis shows that there is a decrease in malaria infection as the number of times a woman experiences pregnancy. This pattern is similar to the number of children a woman had, as presented earlier. The result of chi-square analysis revealed that the difference among the groups was not statistically significant (p-value = 0.583). There is also a relationship between occupation and malaria during pregnancy. The percentage of infected pregnant women that are unemployed; trading, civil service, and others are 12.5%, 40%, 0% and 47.5% respectively. This indicates variations between the type of occupation and malaria in pregnancy. However, the chi-square analysis shows that the difference was not statistically significant (p-value = 0.120).

Table_1: Relationship between socio-economic characteristics of respondents and malaria during pregnancy

Educational status	**Malaria in pregnancy**				**Total**
	Yes	**(%)**	**No**	**(%)**	
None	21	(52.5)	17	(28.3)	38
Primary	8	(20.0)	21	(35.0)	29
Secondary	10	(25.0)	21	(35.0)	31
Tertiary	1	(2.5)	1	(1.7)	2
Total	**40**	**(100.0)**	**60**	**(100.0)**	**100**
Number of Children					
0-3	25	(62.5)	43	(71.7)	68
4-7	12	(30.0)	11	(18.3)	23
8-11	3	(7.5)	6	(10.0)	9
Total	**40**	**(100.0)**	**60**	**(100.0)**	**100**
Pregnancy Before					
Yes	33	(82.5)	46	(76.7)	79
No	7	(17.5)	14	(23.3)	21
Total	**40**	**(100.0)**	**60**	**(100.0)**	**100**
Number of time of pregnancy					
Not applicable	7	(17.5)	15	(25.0)	22
1-4	21	(52.5)	28	(46.7)	49
5-8	9	(22.5)	11	(18.3)	20
9-12	3	(7.5)	5	(8.3)	8
>12	0	(0.0)	1	(1.7)	1
Total	**40**	**(100.0)**	**60**	**(100.0)**	**100**
Occupation					
Unemployed	5	(12.5)	14	(23.3)	19
Trading	16	(40.0)	12	(20.0)	28
Civil service	0	(0.0)	1	(1.7)	1
Others	19	(47.5)	33	(55.0)	52
Total	**40**	**(100.0)**	**60**	**(100.0)**	**100**
Antenatal Care Visit					
Yes	38	(95.0)	52	(86.7)	90
No	2	(5.0)	8	(13.3)	10
Total	**40**	**(100.0)**	**60**	**(100.0)**	**100**
Age group of the respondents					
<15	3	(7.5)	2	(3.3)	5
15-19	17	(42.5)	35	(58.3)	52
20-24	7	(17.5)	11	(18.3)	18
25-29	10	(25.0)	4	(6.7)	14
30-34	3	(7.5)	4	(6.7)	7
35-39	0	(0.0)	3	(5.0)	3
>40	0	(0.0)	1	(1.7)	1
Total	**40**	**(100.0)**	**60**	**(100.0)**	**100**

Source: Field survey and Data Analyses, 2021

It is obvious that 95% of those that were infected attend antenatal care in all their pregnancy while the remaining 5% were those that don't attend antenatal care in their pregnancies. This shows that antenatal care has no significant effect on the reduction of malaria in pregnancy. The number of women who visit antenatal care during their pregnancies has a p-value of 1.852, according to the chi-square analysis, which indicates that it has no significant impact on pregnancy. The percentage of pregnant women who are infected with malaria are 7.5%, 42.5%, 17.5%, 25.0%, 7.5%, and 0% accordingly

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for those who are under 15, 15-19, 20-24, 25-29, 30-34, and above 35 years of age. This demonstrates that as pregnant women get older, there is an increase in knowledge about the effects of malaria and its prevention. However, the chi-square analysis reveals that there was no statistically significant difference in the proportion of pregnant women with malaria across the various age groups (p-value = 0.107).

Temporal Variation of Malaria Cases among Pregnant Women

The monthly data of clinically confirmed malaria among pregnant women for the period under study (2013-2017) were used to plot a line graph to show the cumulative monthly variation of cases. As shown in figure 2, malaria cases were recorded in every month and the highest cases occurred in three distinct months (February, April and July). Lowest number of cases was reported in October, June and December.

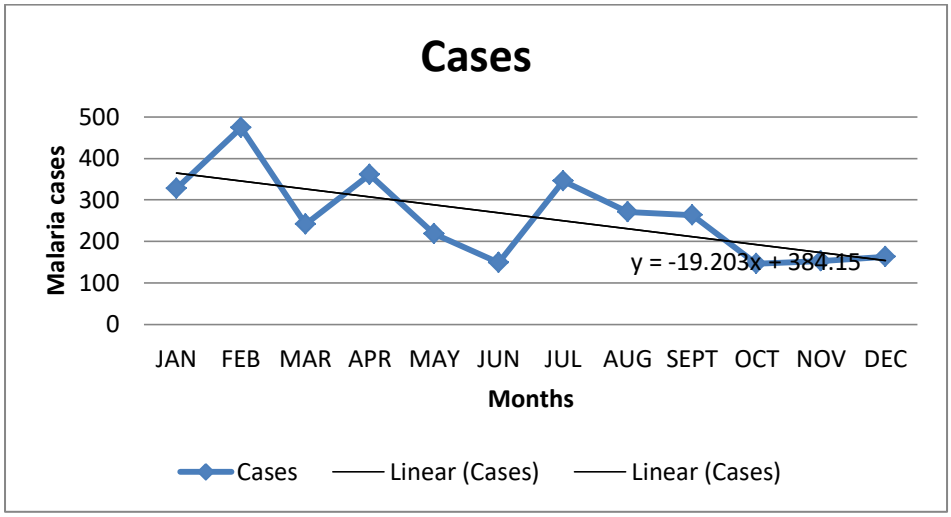

Figure 2: Distribution of cumulative monthly reported cases (2013-2017)

The highest percentage of cases (35.89%) were recorded in the Dry and Cool season, which Olofin (2008) classified as one of the four dominant seasons in the area. The lowest percentage of cases (4.7%), however, were reported during the Dry and Warm or Hot season (Table 2).

Table_2: Seasonal distribution of malaria cases among pregnant women (2013-2017)

Seasons	Number of cases	Percentage (%)
Dry and Cool (Nov-Feb)	1117	35.89
Dry and Hot (Mar-May)	820	26.35
Wet and Warm (Jun-Sep)	1029	33.06
Dry and Warm or Hot (Oct)	146	4.70
TOTAL	**3112**	**100**

Source: Data analysis

The annual incidence of malaria reported cases among pregnant women in Rimin Gado LGA varied from 2013 to 2017. The highest reported incidence of 884 cases occurred in 2014 and the lowest incidence of 471 cases occurred in 2017. Figure 3 shows the trend of the annual cases, which depict a declining pattern in the distribution of the cases.

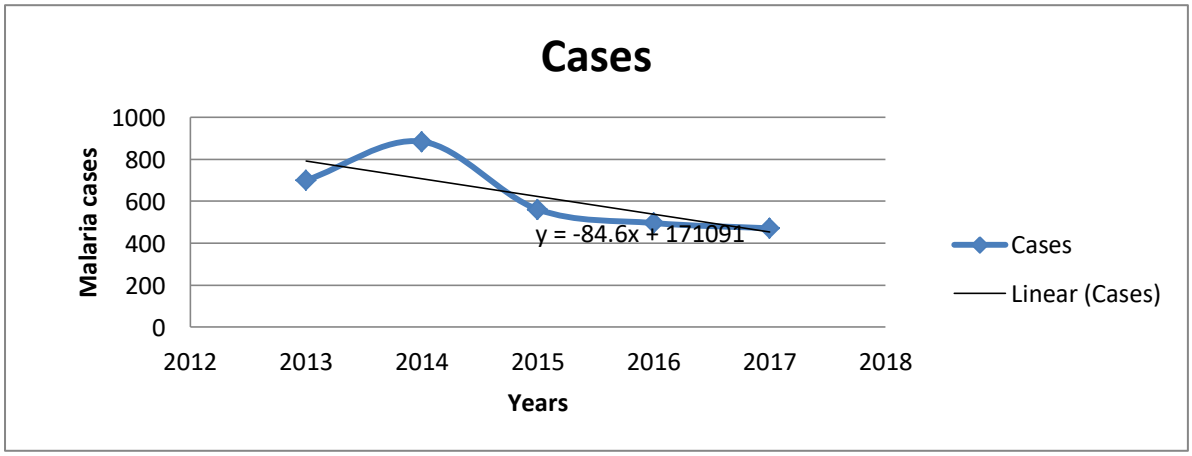

Figure 3: Annual distribution of malaria cases among Pregnant Women

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DISCUSSION ON MAJOR FINDINGS

The study observed high prevalence (40%) of malaria among pregnant women during their antenatal care. This rate of prevalence is comparable to that of Inah *et al.* (2017) and Simon-Oke (2019) who reported 40.7%, and 40.2% in their respective studies. However, there were high prevalence rate reported in other studies (80.9%) by Ohalete *et al*. (2011), (66.7%) by Maureen *et al.* (2016) and (61.3%) by Onyemechi and Malann (2020) respectively. In addition, lower prevalence rates compared to our finding were reported elsewhere in Africa: 22.4% in Mount Cameroun, Cameroun (Anchang-Kimbi *et al.*, 2015), 19.6% in Blantyre, Malawi (Boudova *et al.*, 2015), 31.8% in Nchelenge, Zambia (Chaponda *et al*., 2015) and 20.4% in the middle belt, Ghana (Dosoo *et al*., 2020) respectively. The observed variations across the various studies are likely due to differences in transmission intensities, variation in environmental conditions, seasonal changes, methods of detecting malaria parasites employed and malaria prevention measures employed.

There was a strong association between education level and malaria infection. Prevalence of malaria and parasite density among pregnant women in the area decreased proportionately with the increase in education level. In the present study it was observed that non- educated pregnant women had the highest prevalence rate, while those with a tertiary level of education had the lowest. However, a previous study conducted in Lagos indicated that education was not significantly associated with malaria infection among pregnant women (Agomo and Oyibo, 2013). This stresses the role education could have on the overall success of malaria control programmes in the region. Government policies should be geared towards improving citizens' of education statuses in order to reduce the burden of the disease in the country, especially among the most vulnerable population.

In this study, the highest malaria prevalence was seen in the pregnant women of 15-19 years (42.5%), but the difference is not statistically significant ($p > 0.05$). This finding is consistent with earlier reports of (Bouyou-Akot *et al* 2003; Tako *et al* 2005; Chimere *et al*. 2013; Joseph *et al*. 2017) where age group <20 years where reported to be at high risk, mothers with an increased age were found to have odds of developing malaria infection, this is in line with studies conducted in different tropical Africa countries (Agomo 2009, Jackle 2003 and Oyibo, 2013) which reported pregnant women of young age are at the great risk malaria infection, as well as having the highest parasite densities. This might be attributed to mothers with age have better exposure to health services and gain a good awareness about the disease and ways of prevention. Joseph *et al*. (2017) further attributed high malaria prevalence 15-19 years age group due to their low immunity against malaria compared to other groups, since immunity increases with age and childbirth. Also according to the studies conducted in rural surrounding of Arbaminad Town Ethiopia (Nega 2015) and Sudan (Adam 2005), age had no significant association with malaria infection which contradicted with our finding in which age has an association with malaria infection. It has been consistently demonstrated that infection rates are higher in women in their first and second pregnancies, with lower rates in later pregnancies (Brabin, 1991).

Our result showed that primigravidae 0-3 (62.5%) were more often infected than women of other gravidities and the difference was not statistically significant. This result corroborates with finding of several other studies who also found high prevalence of malaria in younger Primigravidae which decreases with increasing age and gravidity (Elliot *et al*. 2005; Clerk *et al*. 2009; Kweku *et al*. 2017; Berry *et al*. 2018). In areas where were malaria is highly endemic, secungravid and multigravid women seemed to have acquired a higher level of immunity against malaria infection due to their repeated exposure compared to primigravid women who experience malaria attacks for the first or second time during pregnancy in their life (Innah *et al*. 2017). Thus, primigravidae tend to be at greatest risk of malaria in pregnancy because of the lack of specific immunity to malaria which is acquired from exposure to malaria parasites during pregnancy. The findings in this study also showed that pregnant women with no or low level of formal education, and those engaged in informal occupation tends to be at high risk of malaria infection. These observations are in line with other previous work in Ghana (Clerk *et al*. {2009}; Dosoo *et al.* {2020}), Gabon (Jackle *et al*. 2013) and Zambia (Chaponda *et al*. 2015).

Where antenatal service is effective, prevalence of malaria should be low; multiple antenatal attendees should not only own and use ITNs, but should equally have much lower malaria prevalence compared to first-time attendees. On contrary to above, the present study shows that ante natal care has no significant effect on the reduction of malaria in pregnancy. Based on the finding of our study the result has indicated that 95% of the pregnant women attending antenatal care were infected with malaria this in agreement with finding of the study by Adefioye (2007) were the prevalence rate of malaria among pregnant women attending antenatal care was 77%. The difference in the reported prevalence rates of malaria may be attributed to skill and experience of the laboratory resource, individual blood film preparation, staining and reading of the slide.

The finding of this study revealed that malaria infection among pregnant women in the study area occurs all year round, though seasonal and annual variations exist. Surprisingly, high proportion of malaria cases was observed in the dry and cool season than in the wet and warm season. Dry and cool season in this region is associated with low temperature, low relative humidity and absence of rainfall. These conditions are not favourable to mosquito and parasites development and can lead to larval mortality and subsequent decrease of mosquito population (Koenraadt *et al*. 2003;

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Oyewole *et al*. 2007). Literature established that the minimum temperature for mosquito development is between 8-10^{o}C while that of parasite development is between 14-19^{o}C (McMichael *et al*. 1999). Olofin (2008) reported the mean monthly temperature for dry and cool season in the area as between 21 and 22^{o}C. This shows that temperature condition during the period had no adverse effect on the both the mosquito and the parasite developments. Thus, malaria transmission can still occur. The finding further shows that wet and warm season recorded malaria cases that are slightly lower than dry and cool season, though rainfall provides more breeding grounds. The possible explanation is that the area of the study is rural in nature. Traditionally, rural dwellers during the rainy period concentrate on farm. Likely pregnant women may not have time for antenatal visit or their husbands may not have enough money to send them to hospital as much of their available resources are invested on land.

The study also observed an annual variation with a declining trend in the number of reported malaria cases among the studied population. Cases were reduced from 2014 to 2017. The observed reduction in the annual cases can be attributed to increased access to health, increased attention to malaria control and prevention by different bodies (government at all levels and NGOs), increased availability of the new and effective anti-malaria drugs (ACT) and increased awareness and use of malaria preventive measures such as Insecticide Treated Mosquito net and Intermittent Preventive Treatment (using Sulphadoxine-primethamine {SP}), routine lectures given to pregnant women on how to adopt preventive measures against mosquito bite, along with many other efforts to prevent pregnant women from the health effect of malaria.

CONCLUSION AND RECOMMENDATIONS

Pregnant women are more likely than non-pregnant women to become infected with malaria and to have severe infection. This work aims to assess of malaria among pregnant women attending antenatal care at Rimin Gado General Hospital. The study reveals that antenatal care has no significant effect on the lessening of malaria cases in pregnancy. The Study has also shown a relationship of seasonal variations and the rate of the malaria infections. The following recommendations were made:

- ✓ Regular environmental sanitation to dislodge mosquitoes from their breeding places will go a long way to reduce prevalence of malaria in villages commonly seen in the tropics.
- ✓ Early antenatal booking for effective monitoring and prompt treatment of malaria in pregnancy will contribute significantly in reducing maternal morbidity and mortality, and its perinatal mortality.
- ✓ Several studies have shown that protection against malaria contributes to the prevention of malaria in pregnancy, thus highlighting the importance and efficacy of chemoprophylaxis and use of other methods of malaria control like insecticide impregnated nets.

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CITE AS
IA Abdulkarim, I.I. Yakudima, LAS Danbuzu, N Zakari, NA Yaro, FA Umar, & A Mustapha. (2023). Assessment of Malaria Infection among Pregnant Women in Rimin Gado Local Government Area, Kano State. Global Journal of Research in Humanities & Cultural Studies, 3(3), 13–23. https://doi.org/10.5281/zenodo.8076654

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