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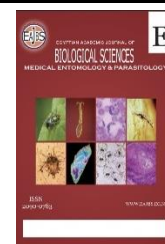
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## Prevalence of Malaria and Associated Factors in Pregnancy: A cross-sectional Study at Wad Madani Maternity Teaching Hospital in Sudan

Aida A.F. Ahmed

Nursing Department, Faculty of Applied Medical Sciences, Al-Baha University, Al-Baha, Saudi Arabia.

\*E-mail : aafahmed@bu.edu.sa

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### ABSTRACT

**Objective:** Due to the significant risks, it poses to both the mother and the fetus, malaria during pregnancy continues to be a substantial public health concern in many countries, especially in sub-Saharan Africa. The goal of the current study was to find out how common malaria is among expectant women at the Wad Madani Maternity Teaching Hospital in Gazira, Sudan.

**Methods:** This is a descriptive cross-sectional study; it was conducted at Wad Madani Maternity Teaching Hospital from March to June 2022. A convenience sampling technique was used. The included number in this study was 800 pregnant women. The data was collected retrospectively by reviewing all records of pregnant women who attended the hospital. The collected data were analyzed by SPSS. **Results:** The study shows that among the 800 participants, the majority (48%) were between the ages of 20-30 years, 61% were from Wad Madani, and the rest were from various regions. In terms of education, 45% had a university-level education, and 40% completed secondary school. Around half of the women were housewives (53%), and 48% were employed. The study also shows that the overall prevalence rate of malaria during pregnancy is 20.6%. Significant associations were found between malaria prevalence and age of 20-30 years, housewife occupation, and gestational age in the second trimester. **Conclusion:** The study showed that the prevalence of malaria among pregnant women at Wad Madani Maternity Teaching Hospital in Gazira, Sudan, was high and the women aged between 20-30 years, housewife occupation, and second trimester were significantly associated with higher malaria cases.

### INTRODUCTION

Malaria causes 300 to 500 million clinical cases annually, 90% of which are found in Sub-Saharan Africa (Talisuna, 2018). Malaria offers a significant risk to pregnant women, the fetus, and the newborn due to the possibility of severe clinical sickness, anemia, and low birth weight (van Eijk *et al.*, 2011). Worldwide, there were 212 million reported cases of malaria in 2015. In 2015, the WHO African Region saw the majority of cases (90%) followed by the WHO South-East Asia Region (7%), and the WHO Eastern Mediterranean Region (3%). (2 percent ) (van Eijk *et al.*, 2011).

The effect of malaria on the national economy and healthcare systems in Sudan is significant because it results in more than 20% lost working hours (Talisuna, 2018), Malaria is responsible for 40% of outpatient visits and putting 98% of the population at risk for the disease. Malaria kills one person in Sudan every 50 minutes (Idris, 2003, Okwa, 2012). Malaria affected around 4 million children under the age of five who were treated in hospitals (van Eijk *et al.*, 2011). Each year malaria results in 300 to 500 million clinical cases globally, 90% occur in Sub-Saharan Africa (Talisuna, 2018). primarily among children under the age of five, who are dying at a rate of approximately 3000 each day, accounting for 20% of all child fatalities (Idris, 2003, and Okwa, 2012). During pregnancy, malaria poses a substantial risk to mothers, the fetus and the neonate as it can lead to severe clinical illness, anemia and low birth weight (van Eijk *et al.*, 2011).

The burden of malaria continues to be disproportionately heavy in Sub-Saharan Africa. 90% of malaria cases and 92% of malaria deaths in 2015 occurred in the region. Approximately 13 nations, mostly in sub-Saharan Africa, account for 76% of malaria cases and 75% of deaths worldwide (World Health Organization, 2014).

In Africa, where about 25 million pregnant women face the risk of *P. falciparum* infection annually, one in four women shows evidence of placental infection during delivery. *P. falciparum* infections during pregnancy often go unnoticed and untreated as they rarely cause fever (Desai *et al.*, 2007). It is well-established that the rate of malaria during pregnancy is higher than in the general population (Bruce-Chwatt, 1952). This can lead to miscarriage, intrauterine fetal restriction, preterm labor, and increased maternal mortality (Mvondo *et al.*, 1992). Research on malaria in pregnancy mainly comes from studies conducted in Africa, showing variations in clinical and epidemiological patterns from one endemic area to another (McGregor, 1984).

In Sudan, malaria poses a significant health burden, but progress has been made through the national malaria control program with WHO's support. Malaria cases have decreased from over four million in 2000 to less than one million in 2010, and malaria-related deaths have dropped by 75% between 2001 and 2010. WHO collaborates closely with the national program to implement cost-effective interventions, including distributing artemisinin-based combination therapy treatments, rapid diagnostic tests, and long-lasting insecticidal nets. The home-based management of malaria strategy has been introduced in remote villages to improve access to diagnosis and treatment, reducing the burden of malaria (Hamza, 2015).

The general objective of this research is to study the prevalence of malaria during pregnancy in Sudan and understand the associated risks for pregnant women, their fetuses, and newborns. The research aims to address the inadequate investigation and lack of recent records on malaria prevalence during pregnancy, considering its common occurrence in Sudan and the high risks it poses during this period.

## MATERIALS AND METHODS

**Study Design:** A descriptive cross-sectional study was conducted at Wad Madani Maternity Teaching Hospital.

**Study Area:** This study was conducted at Wad Madani Maternity Teaching Hospital, which is the largest hospital for maternity in Gazira State, Sudan. It is in Wad Madani, the capital of Gazira State.

**Study Population:** This study was done on the pregnant women attending for follow-up for pregnancy during the year 2022. All pregnant women who attended the hospital from March to June 2022 were included in this study.

**Sampling and Sampling Size:** A convenience sampling technique was used to select all women who attended antenatal care. The number of 800 women were included in this study.

**Data Collection Technique and Tools:**

The data was collected retrospectively by reviewing all records of pregnant women who attended the hospital. The collected data includes demographic data of women and information related to pregnancy and malaria.

**Data Analysis:** The collected data was analyzed by SPSS software program, version 24. The descriptive analysis for frequency and distribution was applied, and for the prevalence of malaria, then inferential statistics was applied to test the relationship between demographic factors and the prevalence of malaria.

**Ethical Consideration:** Ethical approval was obtained from the Ethical Committee at the International University of Africa before conducting the study.

**RESULTS****Summary of Findings:**

Table 1, presents the demographic characteristics of pregnant women at Wad Madani Maternity Teaching Hospital in Sudan. The table shows the

distribution of pregnant women based on age, residence, level of education, current occupation, gestational age, and gravidity. Among the 800 participants, the majority (48%) were between the ages of 20-30 years, and 33% were aged 31-40 years. Regarding residence, 61% were from Wad Madani, while the rest were from various regions in Sudan. In terms of education, 45% had a university-level education, and 40% completed secondary school. Around half of the women were housewives (53%), and 48% were employed. Most participants were in their 1st trimester of pregnancy (53%), followed by 29% in the 2nd trimester and 19% in the 3rd trimester. In terms of gravidity, 53% were primigravida, 39% had 2 to 5 previous pregnancies, and 9% had experienced more than 5 pregnancies. These demographic details provide essential insights into the study population and will be useful for analyzing malaria prevalence and its associated factors during pregnancy at the hospital.

**Table 1:** Demographic characteristics of pregnant women at Wad Madani Maternity Teaching Hospital, Sudan.

Variable		Frequency (n=800)	Percent (%)
Age in years	20-30	380	48
	31-40	260	33
	41-50	160	20
Residence	Wad Madani	484	61
	Hasahesa	89	11
	Alhoosh	26	3
	Alkamileen	23	3
	Sinar	11	1
	Albutana	118	15
	Mangil	18	2
	Other state	20	3
	not specified	11	1
Level of education	Illiterate	48	6
	Primary school	72	9
	Secondary school	320	40
	University	360	45
Current occupation	Employed	380	48
	Housewife	420	53
Gestational age	1 <sup>st</sup> trimester	420	53
	2 <sup>nd</sup> trimester	230	29
	3 <sup>rd</sup> trimester	150	19
Gravidity	Primigravida 1	420	53
	2 to 5 gravida	310	39
	More than 5 gravida	70	9

Table 2, displays the prevalence of malaria among pregnant women at Wad Madani Maternity Teaching Hospital in Gazira, Sudan. Among the 800 pregnant women in the study, 165 cases were diagnosed with malaria during pregnancy, resulting in an overall prevalence rate of 20.6%. The table further presents the distribution of malaria cases per season, showing that 48.5% of cases occurred in

spring, 27.3% in summer, 13.3% in autumn, and 10.9% in winter. These results highlight the significant burden of malaria on pregnant women in Gazira and indicate seasonal variations in the occurrence of malaria cases, which may be crucial for designing targeted interventions and healthcare planning to address this public health issue effectively.

**Table 2:** Prevalence of malaria among pregnant women at Wad Madani Maternity Teaching Hospital in Gazira, Sudan.

Variable		Frequency (n=800)	Percent (%)
Prevalence of malaria during pregnancy in Gazira, Sudan		165	20.6%
Distribution of cases malaria per season	Spring	80	48.5
	Summer	45	27.3
	Autumn	22	13.3
	Winter	18	10.9

Table 3, reveals the relationships between the demographic characteristics of pregnant women at Wad Madani Maternity Teaching Hospital, Sudan, and the occurrence of malaria. Significant associations were found between malaria prevalence and age, current occupation, and gestational age. Pregnant women aged 20-30 years had a higher malaria prevalence (26.8%), compared to those aged 31-40 years (21.9%) and 41-50 years (3.8%). Employed women showed a higher malaria prevalence (19.7%) compared to

housewives (21.4%). Additionally, malaria prevalence was higher during the 2nd trimester (28.3%) compared to the 1st trimester (21.2%) and significantly lower during the 3rd trimester (7.3%). However, residence and level of education did not demonstrate significant associations with malaria occurrence. These findings emphasize the importance of age, current occupation, and gestational age as potential factors influencing malaria prevalence in pregnant women at the hospital.

**Table 3:** Relationships between demographic characteristics of pregnant women at Wad Madani Maternity Teaching Hospital, Sudan and the occurrence of malaria.

Variable		Malaria positive (165)	Malaria negative (635)	p-value
Age in years	20-30	26.8%	73.2%	<0.05*
	31-40	21.9%	78.1%	
	41-50	3.8%	96.3%	
Residence	Wad Madani	18.0%	82.0%	> 0.05
	Hasahesa	15.7%	84.3%	
	Alhoosh	38.5%	61.5%	
	Alkamileen	21.7%	78.3%	
	Sinar	36.4%	63.6%	
	Albutana	32.2%	67.8%	
	Mangil	22.2%	77.8%	
	Other state	10.0%	90.0%	
Level of education	not specified	9.1%	90.9%	> 0.05
	Illiterate	16.7%	83.3%	
	Primary school	13.9%	86.1%	
	Secondary school	22.5%	77.5%	
Current occupation	University	20.8%	79.2%	<0.05*
	Employed	19.7%	80.3%	
Gestational age	Housewife	21.4%	78.6%	<0.05*
	1 <sup>st</sup> trimester	21.2%	78.8%	
	2 <sup>nd</sup> trimester	28.3%	71.7%	
Gravidity	3 <sup>rd</sup> trimester	7.3%	92.7%	> 0.05
	Primigravida 1	20.2%	79.8%	
	2 to 5 gravida	23.2%	76.8%	
	More than 5 gravida	11.4%	88.6%	

(\*) significant

## DISCUSSION

Malaria during pregnancy remains a major public health concern in many regions, particularly in sub-Saharan Africa, as it poses significant risks to both the mother and the unborn child. Implementing targeted interventions and enhancing maternal and fetal health outcomes require a thorough understanding of the prevalence of malaria during pregnancy and its contributing variables.

Following the study's enrollment of 800 pregnant women, the overall prevalence of malaria during pregnancy was found to be 20.6%. The prevalence rate illustrates the ongoing consequences of malaria in the region and the need for effective management strategies for expecting mothers. In contrast, research in the Sherkole area of the Benishangul Gumuz regional state of West Ethiopia included 498 pregnant women but found

only a low prevalence of malaria (10.2%), (Gontie *et al.*, 2020). According to earlier studies, a cross-sectional survey of 238 pregnant women in northwest Uganda revealed a significant frequency of malaria during pregnancy (26.1 percent) (Mangusho *et al.*, 2023). Another study from Benin City, Southern Nigeria, showed that pregnant women had a prevalence of malaria parasitaemia of 19.2% (Accrombessi *et al.*, 2018).

It has been demonstrated that age has a major impact on the prevalence of malaria. Pregnant women aged 20 to 30 years had the highest prevalence of malaria (26.8%), followed by those aged 31 to 40 years (21.9%), and only a small proportion of pregnant women aged 41 to 50 years had malaria (3.8 percent). This study highlights the importance of concentrating malaria prevention and control efforts on young pregnant women because they appear to be

at a greater risk of contracting the illness. This result is similar to a study from Benin City that discovered a connection between malaria parasitaemia and pregnant women's ages (Falade *et al.*, 2008). This finding, however, varies from that of the earlier study by Periconceptional, which found no association between malaria and maternal age (Falade *et al.*, 2008). This finding, however, varies from that of the earlier study, which found no association between malaria and maternal age (Accrombessi *et al.*, 2018).

The prevalence of malaria during pregnancy and the current occupation were also strongly correlated. Pregnant working women had a higher prevalence of malaria than stay-at-home mothers (19.7 percent). 21.4 percent. Variations in exposure to places where malaria is transmitted, or other factors related to work-related activities may help to explain this result. The risk of malaria among pregnant employees could be reduced with the use of preventative measures and focused health education.

Gestational age had a considerable impact on malaria prevalence, with variations between trimesters. The first and second trimesters were the highest while the third trimester was the lowest. This study demonstrates the importance of routine malaria testing and treatment during antenatal care, particularly during the second trimester when pregnant women seem to be at higher risk. This outcome is comparable to a study conducted in Ethiopia and Nigeria that discovered a considerable variation in the relationship between malaria infection and gravidity (Accrombessi *et al.*, 2018). In contrast, Almaw *et al.*, 2022 discovered that the first trimester has a significant malaria prevalence (Almaw *et al.*, 2022). The presence of malaria during pregnancy, however, did not appear to be significantly correlated with either area of residence or level of education. These findings imply that other variables may affect malaria risk more than the pregnant women's domicile or educational level in this case. However,

a study conducted in Nigeria by Eghonghon revealed that the prevalence of malaria in rural PHCs was lower than that in urban areas, and it has been shown that respondents' awareness of malaria and malaria control is significantly impacted by their level of education (Eghonghon *et al.*, 2020).

While this study sheds light on the prevalence of malaria among pregnant women at Wad Madani Maternity Teaching Hospital in Gazira, Sudan, and identifies certain associated factors, it is important to acknowledge some limitations that might impact the generalizability and depth of the findings. Future research endeavors should consider more diverse and representative sampling techniques, longitudinal designs, and the incorporation of a broader array of potential variables to provide a more comprehensive understanding of malaria prevalence during pregnancy.

#### **Conclusion:**

In conclusion, this study demonstrated a high incidence of malaria in pregnant women in Gazira, Sudan, and strong correlations between malaria cases and age (20–30 years), employment as a housewife, and the second trimester of pregnancy. The results imply the significance of focused therapies for early-stage pregnancies. Implementing strategies like insecticide-treated bed nets, early antenatal care, and intermittent preventative medication for pregnant women will help to lessen the impact of malaria and improve mother and child health outcomes. To explore additional potential risk variables and evaluate the efficacy of various therapies in this situation, more research is necessary. The results of this study can be a useful resource for medical professionals, decision-makers, and researchers battling.

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