Hamatological parameters and malaria parasite infection among pregnant women in Northwest Nigeria

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Objective: To evaluate some hematological and anthropometric parameters, malaria infection at different trimesters in pregnancy. Methods: Fifty pregnant women (6 in first trimester, 28 in second trimester and 16 in third trimester) between ages of 15-40 years with ten age-matched non-pregnant women used as control were enrolled in the study. Consent were obtained from the subjects after which semi-structured questionnaires were administered to obtain data on demographic and socio-economic variables, reproductive and medical history. Anthropometric variables, and hematometry were carried out using standard procedures. Results: Anthropometric characteristics showed no significant difference in weight, height and BMI when compared with non-pregnant control. Hematological values indicated higher values for non-pregnant women but not statistically significant. Prevalence of malaria infection in pregnant women showed that 40% of pregnant women examined were infected compared to 30% non-pregnant with those with first pregnancy (primagravid) recording the highest infection (47.62%) with pregnant women within age 15-18 years least infected (16.7%). Pregnant women in the third trimester had the highest (50%) malaria infection and there was increase in prevalence with increase education status and those with first pregnancy (primagravid) recorded the highest infection (47.62%). Treatment used when infected showed 36.8% and 42.9% used malaria drug and both drug/herbs respectively. Conclusions: Higher prevalence rate of malaria infection in pregnant women with the highest prevalence recorded in those with first conception (primigravidae). There is a need for continuous monitoring of hematological parameters and malaria parasite infection for better outcome of pregnancy.

1. Introduction.

Maternal mortality is the death of pregnant women due to complications of pregnancy or during child birth. Out of the global maternal deaths, 99% occur in the developing countries, and Nigeria accounts for 10%, which is the second highest in the world[1]. About 50% of pregnancies are unplanned[2], therefore, most women are unprepared for pregnancy in that the physical, nutritional, physiological demands are not met. During pregnancy, extra calories are needed due to a woman’s increased basal metabolic rate and higher energy demands[3]. Prenatal infection is a major cause of maternal, fetal and neonatal morbidity and mortality[4,5]. Nutritional deficits may increase the risk of perinatal infection by diminishing or abolishing protective mechanisms[6].

Infection has a major effect on adverse pregnancy outcomes

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which appears the strongest among populations that suffer from malnutrition[7]. The most likely mediating factor linking this association is the effect of nutritional status on various host defense mechanisms and relationship existing between micronutrient deficiency and infection-mediated adverse pregnancy outcomes[7]. Malaria infection during pregnancy is a major public health problem in tropical and subtropical regions throughout the world[8]. Malaria is the most highly prevalent tropical disease, with high morbidity and mortality and high economic and social impact[9]. This study was centered on pregnant women attending antenatal clinic, their stages of pregnancy, nutritional status and malaria infection.

3. Results

Table 1 shows characteristics of respondents with majority within age of 20–29 years and, most had secondary education (38%) followed by Quaranic/Adult education (30%) compared to non-pregnant respondents which majority had post-secondary education (70%). Occupations of pregnant women are mostly as full-time housewives (54%).

Table 1

Demographic and socio-economic characteristics of respondents.

| Variable                  | Pregnant women | Non-pregnant women |
|---------------------------|----------------|--------------------|
| Tribe                     | Frequency %    | Frequency %        |
| Hausa                     | 37 74          | 4 40               |
| Igbo                      | 2 4            | 2 20               |
| Yoruba                    | – –            | 1 10               |
| Others                    | 11 22          | 3 30               |
| Age (year)                |                |                    |
| 15–19                     | 11 22          | – –                |
| 20–29                     | 24 48          | 8 80               |
| 30–40                     | 15 30          | 2 20               |
| Education                 |                |                    |
| No Formal Education       | 2 4            | – –                |
| Quaranic/Adult Literacy   | 15 30          | 2 20               |
| Primary                   | 12 24          | 1 10               |
| Secondary                 | 19 38          | – –                |
| Post Secondary            | 2 4            | 7 70               |
| Occupation                |                |                    |
| Full-Time Housewife       | 27 54          | – –                |
| Civil Servant             | 2 4            | – –                |
| Petty Trader              | 15 30          | 3 30               |
| Student                   | 1 2            | 7 70               |
| Casual labour             | 5 10           | – –                |

Table 2 presents the anthropometric characteristics of respondents which showed no significant difference in weight, height and BMI when compared across the trimesters with non-pregnant control.

Table 2

Anthropometric characteristics of respondents.

| Respondent         | Frequency | Weight (kg) | Height (m) | BMI (kg/m²) |
|--------------------|-----------|-------------|------------|-------------|
| Non-pregnant women | 10 62.48±10.38 1.56±0.06 | 25.59±3.96 |
| Pregnant women     | 50 59.04±13.09 1.56±0.05 | 24.19±5.01 |
| Trimester 1        | 6 51.00±12.28 1.59±0.04 | 20.38±5.10 |
| Trimester 2        | 28 57.21±9.65 1.57±0.05 | 23.39±4.02 |
| Trimester 3        | 16 65.25±16.40 1.55±0.06 | 27.03±5.36 |

Values were mean±SD.

Table 3 shows mean haematological values (WBC, RBS, PCV, Hb, and Albumin) between non-pregnant women, pregnant women and three trimesters, which indicated higher values for all the parameters for non-pregnant women but not statistically significant. The prevalence of malaria infection in pregnant women is shown in Table 4 which showed 40% of pregnant women examined were infected compared to 30% non-pregnant with those with
first pregnancy (primagravid) recording the highest infection (47.62%).

Table 4
Malaria parasites infection level of pregnant women.

| Respondent                | No. Examined | No. Infected | Percentage of infection (%) |
|---------------------------|--------------|--------------|-----------------------------|
| Non–pregnant women        | 10           | 3            | 30.0                        |
| Pregnant women            | 50           | 20           | 40.0                        |
| Primagravid               | 21           | 10           | 47.6                        |
| Multigravid               | 29           | 10           | 34.5                        |

When data were also disaggregated according to age of pregnant women (Figure 1), those within age 23–26 years were least infected (16.7%). Pregnant women in the third trimester had the highest (50%) malaria infection followed by those in second trimester (35.7%) and third trimester (33.3%). Figure 2 shows the distribution of malaria infection according to educational status of the pregnant women which indicated increase in prevalence with increase education status. Data obtained on prevalence of malaria infection in pregnant women based on treatment used when infected indicates majority uses local herbs (66.7%), while 36.4% and 42.9% used malaria drug and both drug/herbs respectively.

### 4. Discussion

The aim of this study was to evaluate some anthropometric indices, hematological profile and malaria infection of pregnant women at different trimesters and compare with non pregnant women. There is no significant difference in the value of all the anthropometric and hematological parameters analyzed even when compared at different stages of pregnancy, although there was variation in actual numeric values. This study agrees with the report of Osonoga et al. but disagrees with the report of James et al. that there is significant difference across the trimesters in the value of WBC and PCV[14,15]. Osonoga et al. reported that reasons for the lack of significant difference may be due to quality healthcare available to the pregnant woman, and adequate management of their blood profiles with dietary supplementation[14]. However, mean numeric values for most of the hematological profiles were below the normal range values for pregnant women reported[16]. In highly endemic malarious area, the prevalence of clinical malaria is higher and its severity greater in pregnant women than that of in non–pregnant women[17]. This is also true in this study in which higher prevalence rate (40%) of malaria infection in pregnant women was recorded compared to non–pregnant women (30%). This was higher when correlated with other report which recorded low prevalence rate (6.8%)[17]. High prevalence rate was in primigravidae than multigravidae in accordance with report of Marielle et al. in pregnant women in Gabon and woman within age group of 15–18 years[18]. This may be attributed to the low level of immunity at the early periods of conception by women with first conception as reported[19]. High prevalence rate in the study area could result in maternal anaemia as reported by Osonoga et al. which correlated with the haemoglobin concentration of the pregnant women obtained in this study[14]. Inadequacies during pregnancy can trigger a cascade of metabolism disorders and result in severe health disorder which can adversely affects mother’s and child’s health by increasing the rate of pregnancy and delivery complications in women and contributes to deteriorating fetus development and fetus conditions which leads to increasing newborn morbidity[20]. The result of this study showed higher prevalence rate of malaria infection in pregnant women and those with first conception (primigravidae) with the highest prevalence. Continuous monitoring of hematological profile and malaria parasites infection is very essential for better outcome of pregnancy.

![Figure 1](image1.png)  Prevalence of malaria parasite in pregnant women by age.

![Figure 2](image2.png)  Distribution of malaria parasite by educational status of pregnant patients.
Conflict of interest statement

We declare that we have no conflict of interest.

Comments

Background

The authors tried to provide the background on an important work to address the question on the etiology of variable hematologic parameters and malaria infection during pregnancy. However, the authors unsuccessfully provided only limited references to support his hypothesis that widely exist today. The author has also failed to present a strong argument/rationale to justify the question wanted to research for.

Research frontiers

The question at hand is a crucial research question to be investigated on the existing varying literatures that reported this topic. However, the design of the research that was intended for this question has not been well formulated hence implemented to bring up vivid answers.

Related reports

The design of this work was based on a case–control study. This design is a perfect design for similar etiology studies. Contrary to what was expected, however, the authors reported the findings in a way that differed from the usual reporting frame for the case–control studies. It would be more precise if the authors did report odds of hematologic indices or malaria cases for cases and controls and their ratios. The current results in this report are difficult to associate with the question at hand.

Innovations & breakthroughs

Difficulty to discern.

Applications

Possible after major revisions.

Peer review

The work presented here can be improved further to make up a case report. Otherwise major revisions (design procedures including the appropriate choice of sample size and results analysis and presentation) will be required to qualify this article to a peer review article.

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