ANTENATAL MALARIA PARASITAEMIA AND PCV PROFILE OF PREGNANT WOMEN IN IDAH, KOGI STATE, NORTH CENTRAL NIGERIA

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Abstract

This paper assesses the Antenatal Malaria Parasitaemia and PCV Profile of Pregnant Women in Idah, Kogi State of Nigeria. A total of 1103 women were sampled out of which 1003 women were pregnant, 100 were not pregnant (thus, this serves as the control group of the study). The major thrust of paper is: to ascertain if malaria parasitaemia infection, severity is independent of the pregnancy parity, and to consider if prevalence rate is adverse at different parity. To achieve these objectives, prevalence rate, add ratio, $x^2$ test of independence were employed to analyze the set of suitably collected data from Idah General Hospital, the results indicate that malaria is strongly associated with pregnancy, severity of malaria parasitaemia infection depends on pregnancy parity, the highest malaria prevalence rate of 53% was recorded among primiparae, with over 65% of malaria positive primigravid mother’s having PCV below the World Health Standard, these and some other findings were discovered, recommendation was given based on the findings.

Keywords: Malaria, Pregnancy, Primiparae, Multiparae.

Introduction

Malaria is a common but deadly infection in hot, tropical areas of the world. Malaria (although rarely) can also occur in temperate climates. Malaria is caused by a parasite known as plasmodium infected into the body (blood) by the bite of the female anopheles mosquitoes. WHO (1995) noted that malaria is a disease of poverty afflicting primarily the poor who tend to live in malaria-prone rural areas that offer very little or no barriers against mosquitoes.
It is very common in many areas in Africa, because of its wet, humid and hot climate. The dumpiness and warmth provide perfect treading conditions for mosquitoes. These mosquitoes usually bite between dusk and down. Pregnant women are more susceptible than the general population of malaria. They are more likely to become infected, suffer recurrence, developed severe complications and may even die from the disease. Malaria contributes very significantly to maternal and fetal mortality with at least 10,000 maternal deaths per annum attributable in Sub-saharan Africa (Tolkit, 2010).

Regardless of symptoms, the presence of plasmodia parasites in pregnant women body will have negative impact on their health and that of the fetus. Restricting treatment to symptomatic pregnant women is inadequate strategy to reduce the morbidity and mortality associated with malaria [WHO (1995)]. Subclinical infection is common in areas where natural immunity is high. Malaria in pregnancy is different to the disease in the non-pregnant patients. The severity of pregnancy is thought to be due to general impaired immunity plus diminution of acquired immunity to malaria in endemic areas.

In unstable (low) malaria transmission areas, women generally have developed no significant level of immunity and usually become ill when infected, the risk of developing severe disease is 2 to 3 times greater than their non-pregnant counterparts living in the same area (Luxemberger, 2011). In these same areas, malaria infection is more likely to result in spontaneous abortions, foetal loss and low birth weight (Shulman, 1996). Also death due to maternal anemia may occur among pregnant women (Hammerick, 2002).

The major thrust of this paper is to ascertain if malaria parasitaemia and its severity are dependent on pregnancy, parity, and to compare the prevalence rate of malaria in different trimester, to determine the peak trimester of malaria prevalence, these and some other salient issues are going to be address in this research.

Literature Review

Malaria is a major public health problem in developing countries causing considerable morbidity and mortality especially in sub-Saharan Africa. It is endemic in 103 countries with about 2000 million people exposed to infection [Menendez, 1995]. An estimate of about 1 to 2 million deaths results each year from about 300-500 million clinical cases in highly endemic area [Snow et al, 2001]. Mostly affected are children less than 5 years and followed closely by pregnant women. An increased risk of malaria during pregnancy was observed over 60 years of age [Stekete and Mutabingwa, 1999]. In all endemic areas, it has been attributed that the pregnancy and severity of malaria increases with pregnancy [Giles et al, 1984]. Several reasons have been adduced for these increase, such as relative impairment of the immune system [Ibeziko et al, 1980], cyto adherence to chondoritin sulphate A in the placenta [Fried and Duffy, 2006] and an increased attractiveness of pregnant women to malaria vectors [Lindsay et al, 2002]. More so, in area of high transmission pregnant women are susceptible to infection than multifarious women [Okoro et al, 2003]. Furthermore, it has been observed that increase risk of malaria varies during the course of pregnancy with the first trimester showing highest prevalence and parasite density than the 2nd and 3rd trimester [Menendez, 1995].

Malaria in pregnancy holds severe consequences which ranges from anemia to severe complications such as cerebral malaria, pulmonary oedema and renal failure to the mother [Stekete et al, 1999]. More so, this trend increase still birth intra-uterine growth retardation and low birth weights in the foetus [Kasumba et al, 2000 and Stekete et al, 1999]. It is well established that in area of moderate or High Malaria transmissions where adults usually have a High level of immunity to malaria, fulciparium malaria is more common, often at higher parasite density in pregnant than non-pregnant woman [Braben, 1997]. In Africa, malaria in pregnancy (MIP) is usually caused by strains plasmodium falciparium that express unique variant surface antigens which allow the parasite to sequester in the placenta by binding to
chondroitin sulphate A, women acquire antibodies to these variant surface antigens as a function of purity, and susceptibility to (MIP) full within increasing purity [Rogerson et al, 2003].

Studies on malaria burden to the first trimester of pregnancy are scarce but it is believed that the rates are similar to that of the second trimester. However, considering the difficulty of collecting information [Pregnant Womenstart attending the antenatal clinic after the first trimester], and of determination of the gestation age with accuracy, it is unclear whether the risk starts to increase towards the end of the first trimester.

Very few studies on malaria in pregnant women have evaluated infants outcomes, congenital malaria can occur in neonatal period and can contribute to infant morbidity and mortality. A recent study in Gambia revealed that malaria infection during pregnancy influences infants growth, independently of low birth weight, it also increases the risk of infant death and prenatal mortality, by causing low birth weight [Miller et al, 2002].

Materials and methods

Study Area

Idah, a Local Government Headquarter of Idah Local Government and the seat of Igala Kingdom is found in Kogi State North Central Nigeria. Idah is also a town that is predominately Igala tribe with some other minor tribes in the town which includes Hausa, Igbo, Fulani, Yoruba, etc. The main occupation of the people are farming, fishing and blacksmithing.

Study Population

The study population is population of Pregnant Women attending Antenatal Care at Idah General Hospital which is made-up of primigravid and multigravid women, another group was also considered.

Sample Size

For the purpose of this research work one thousand and three pregnant women attending antenanal clinic were also considered with a sample of One hundred non-pregnant women attending Idah General Hospital were considered as sample size for these research work i.e. a total of one thousands one hundred and three (1103) respondents.

Sampling Techniques

Stratified random sampling with optimum allocation were employed to select a number of pregnant women and non-pregnant women attending Idah General Hospital, and the simple random sampling were employed to select the required number of women among non-pregnant women.

Method of Data Analysis

Chi-square tests of independent, prevalence rate, relative risk, odd ratio with some other statistical techniques were employed to analyze the data.

Chi-square procedures

Hypothesis

$H_0$: Malaria parasitaemia and its severity are independent of the pregnancy parity.
H₁: Malaria parasitaemia and its severity are dependent of the pregnancy parity.

Level of significance \( \alpha = 0.05 \)

Test Statistic \( x^2 = \Sigma (O_{ij} - E_{ij})^2 / E_{ij} \)

or \( x^2 = \Sigma (O_{ij} - E_{ij})^2 / \) (estimated expected frequency)

Decision Rule

Reject \( H_0 \) if and only if \( X^2_{cal} \leq X^2_{tab} \), otherwise accept it.

Prevalence Rate

\[
PR = \frac{\text{Num. of Individual Infected}}{\text{Total Num. Exposed To Such Infection}} \times 100
\]

Odds Ratio

Is usually denoted by OR is one of the three ways of quantifying how strongly the presence or absence of property A is associated with presence of absence of property B. In a given population, if each individual in a population either does or does not have a property “A” (e.g. pregnancy), and also either does or does not have property B (e.g. Malaria parasitaemia) were both properties are appropriately defined, then a ratio can be formed which quantitatively describe the association between the presence/absence of “A “ pregnancy and the presence/absence of “B” malaria parasitaemia for individuals in the population this ratio is odd ratio (OR) and can be computed following these steps.

1. For individual that has “B” compute the odds that same has “A”.
2. For a given individual that does not have ‘B’ compute the odds that same individual has “A”.
3. Divide the odds of step 1 by the odds of step 2 to obtain the odds ratio (OR)
If: \( OR > 1 \) “The having A is considered to be associated with having B”. In the sense, that having of B raises the odds of having “A”.

Results

Out of 1103 women examined, 100 women were not pregnant which serve as a control group in these research work, while 1003 women were pregnant and attended antenatal care at General Hospital Idah, from table I, it is clear that 50.7% of women with pregnancy have malaria infection with about 49.3% that were tested malaria negative, indicating 0.50 as probability of having malaria among pregnant women, from that same tests, the \( X^2_{calculated} = 17.83 > X^2_{tabulated} (16.919) \) in which null hypotheses were rejected.

Table II were constructed to that the inter-dependency between malaria parasitaemia severity and the pregnancy parity which gives a value of \( X^2_{cal} \) to be 52.63 with corresponding \( X^2_{tabulated} \) to be 14.067 which leads to rejection of Null hypotheses at 5% level of significance.
Table III shows that out of 1103 woman examined, 526(48%) were positive for malaria parasites, with highest prevalence rate of 53% in the primiparae, followed closely by the multiparae (49%) and the least prevalence rate in the control group (18%) from that same table III, odd ratio i.e. or was computed to be 1.0304, which is greater than one indicating that having malaria is strongly associated with pregnancy.

Table IV shows that PCV profile of the women is highly dependent on malaria infection status and the parity of pregnancy over 65% of malaria positive primigravid mothers have PCV below or equal to 29 which is below the World Health Organization benchmark for pregnant woman (>30) while only 5.55% of the control group fall below this point.

From Table V, Comparison of PCV by malaria status revealed that malaria positive pregnant women are more prone to low PCV compared their co-pregnant women that are malaria negative, about 20.1% of malaria positive have their PCV below 29 which is below the world health organization benchmark, while only 7.4% of the malaria negative are below the world Health organization benchmark.

### Table I: Distribution of Malaria by Party

<table>
<thead>
<tr>
<th>PARTY</th>
<th>MP POSSITIVE</th>
<th>MP NAGETIVE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>205</td>
<td>182</td>
<td>387</td>
</tr>
<tr>
<td>2</td>
<td>113</td>
<td>119</td>
<td>232</td>
</tr>
<tr>
<td>3</td>
<td>90</td>
<td>75</td>
<td>165</td>
</tr>
<tr>
<td>4</td>
<td>53</td>
<td>55</td>
<td>108</td>
</tr>
<tr>
<td>5</td>
<td>11</td>
<td>22</td>
<td>33</td>
</tr>
<tr>
<td>6</td>
<td>19</td>
<td>27</td>
<td>46</td>
</tr>
<tr>
<td>7</td>
<td>6</td>
<td>3</td>
<td>09</td>
</tr>
<tr>
<td>8</td>
<td>6</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>9</td>
<td>4</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>≥ 10</td>
<td>1</td>
<td>2</td>
<td>03</td>
</tr>
<tr>
<td>TOTAL</td>
<td>508</td>
<td>494</td>
<td>1002</td>
</tr>
</tbody>
</table>

P(x) 0.507 (50.7%) 0.493 (49.3%)

**Field Research (2014)**

### Table II: Distribution of Malaria Severity by Party

<table>
<thead>
<tr>
<th>PARTY</th>
<th>+1</th>
<th>+2</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>53</td>
<td>152</td>
<td>205</td>
</tr>
<tr>
<td>2</td>
<td>23</td>
<td>90</td>
<td>113</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
<td>60</td>
<td>90</td>
</tr>
<tr>
<td>4</td>
<td>32</td>
<td>21</td>
<td>53</td>
</tr>
<tr>
<td>5</td>
<td>03</td>
<td>08</td>
<td>11</td>
</tr>
<tr>
<td>6</td>
<td>13</td>
<td>06</td>
<td>19</td>
</tr>
<tr>
<td>7</td>
<td>05</td>
<td>01</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>03</td>
<td>02</td>
<td>6</td>
</tr>
<tr>
<td>9</td>
<td>03</td>
<td>01</td>
<td>4</td>
</tr>
<tr>
<td>≥ 10</td>
<td>01</td>
<td>00</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL</td>
<td>167</td>
<td>341</td>
<td>598</td>
</tr>
</tbody>
</table>

**Field Research (2014)**
Table III: Malaria Parasitaemia By Parity Groups

<table>
<thead>
<tr>
<th>PARTY</th>
<th>NO. SAMPLED</th>
<th>NO. POSITIVE (%)</th>
<th>NO. NEGATIVE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primiparait</td>
<td>387</td>
<td>205 (0.53)</td>
<td>182 (0.47)</td>
</tr>
<tr>
<td>Multiparait</td>
<td>616</td>
<td>304 (0.49)</td>
<td>312 (0.51)</td>
</tr>
<tr>
<td>Control</td>
<td>100</td>
<td>18 (0.18)</td>
<td>82 (0.82)</td>
</tr>
<tr>
<td>Total</td>
<td>1103</td>
<td>526 (0.48)</td>
<td>576 (0.52)</td>
</tr>
</tbody>
</table>

Field Research (2014)

Table IV: Pcv Profiles of Malaria Positive Women By Party Groups

<table>
<thead>
<tr>
<th>PCV</th>
<th>PRIMIPARE (%)</th>
<th>MULTIPARE (%)</th>
<th>CONTROL (%)</th>
<th>TOTAL (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 29</td>
<td>134 (65.37)</td>
<td>90 (62.50)</td>
<td>02 (5.55)</td>
<td>94 (17.9%)</td>
</tr>
<tr>
<td>30-34</td>
<td>37 (18.05)</td>
<td>50 (11.50)</td>
<td>08 (44.44)</td>
<td>332 (63.1)</td>
</tr>
<tr>
<td>35-39</td>
<td>28 (13.66)</td>
<td>59 (19.47)</td>
<td>02 (11.11)</td>
<td>89 (16.9)</td>
</tr>
<tr>
<td>≥ 40</td>
<td>6 (2.93)</td>
<td>4 (1.32)</td>
<td>07 (38.89)</td>
<td>11 (2.1)</td>
</tr>
<tr>
<td>Total</td>
<td>205</td>
<td>303</td>
<td>18</td>
<td>526</td>
</tr>
</tbody>
</table>

Field Research (2014)

Table V: Distribution of Malaria By Pcv

<table>
<thead>
<tr>
<th>Pcv</th>
<th>Mp Positive</th>
<th>Mp Negative</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 29</td>
<td>103 (0.201)</td>
<td>36 (0.074)</td>
<td>139</td>
</tr>
<tr>
<td>30-34</td>
<td>330 (0.645)</td>
<td>298 (0.609)</td>
<td>628</td>
</tr>
<tr>
<td>35-39</td>
<td>66 (0.129)</td>
<td>117 (0.239)</td>
<td>183</td>
</tr>
<tr>
<td>≥ 40</td>
<td>12 (0.023)</td>
<td>38 (0.078)</td>
<td>50</td>
</tr>
<tr>
<td>Total</td>
<td>511</td>
<td>489</td>
<td>1000</td>
</tr>
</tbody>
</table>

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**STEP I**

OR= for women that are pregnant; the odd that they have malaria

\[
\text{OR} = \frac{509}{1003}
\]

For women that have pregnant; the odd that they have no malaria = 494

\[
\text{OR} = \frac{494}{1003}
\]

Odd nation = \( \frac{509 \div 494}{1003} \)

\[
\text{OR} (1.0304) \text{ is } > 1, \text{ meaning that having pregnancy is associated with having malaria.}
\]

In the sense, that having pregnancy rises the odd of having malaria.

**Discussion**

Based on the data collected and analysis carried out, it was discovered that the distribution of malaria severity is dependent upon the pregnancy parity, so also the status of malaria
infection depends on the parity of the pregnancy. Moreso, the pregnant women especially the primipara recorded relatively lower PCV level as opposed to the control group which indicate that anaemia is an intrinsic feature of malaria which is more intense amidst pregnancy especially in the first pregnancy, this observation is attributed to the increased susceptibility to malaria and other infections during pregnancy thus, due to the suppression of immune system to ensure the establishment and non rejection of foetus as a foreign.

Conclusion and Recommendation

From the empirical evidence in this paper, the research revealed that malaria is strongly associated with pregnancy and severity of malaria parasitemia infection depends on pregnancy parity. Consequently, the paper recommends that massive Health Education Campaign should be intensified to create and improved the level of education on Malaria Infection, and preventives measures of malaria both at local and international by Donors on malaria control and treatment should increase their funding capacity. Finally, the paper recommends that monitoring and evaluating the Programs to make it successful also more intensified research in this area is highly needed.

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