Co-Infection of Malaria and Helminthes Infection among Prison Inmates

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ABSTRACT

Prison health is a neglected area and hardly any health professional wants to work in a prison set-up. The lack of concern, facilities and expertise further deteriorates the health of inmates. This study is to determine the co-infection of malaria and helminth infection among inmates in Jos Plateau state, Nigeria. Blood and fresh stool samples of 300 inmates in Jos central prison age 18 to above 60 years, were screened for malaria and helminth infections. Blood samples were collected by finger prick to determine malaria parasitaemia using thick and thin film method while the stool samples were processed using formalin-either sedimentation techniques and examined microscopically for intestinal parasites. The overall co-infection of malaria parasite and helminthes infection, prevalence of malaria parasites and helminthes among the inmates were 6.9%, 93.1% and 9.2% respectively. The four species of intestinal helminthes recovered were Ascaris lumbricoides (7.5%), Hookworm (8.4%), Schistosoma mansoni (20.1%) and Strongyloides stercoralis (1.5%). The study further revealed that malaria and helminthes infection was highest among inmates within ages of 21-30. The prevalence of malaria parasites and helminthes infection with respect to the various units of the prisons showed that those serving Jail terms were most parasitized (62.0%) compared to those serving life term. Statistical analysis showed a significant difference (p<0.05) in terms of malaria and helminthes infections among the inmates with respect to their age and various Units of the prison. In this study, adequate water supply to promote hygienic practices among inmates, health education and use of mosquito nets were highly recommended.

Key words: co-infection, inmates, helminthes, malaria parasite, Jos.

INTRODUCTION

Prisoners carry a much greater burden of illness than other members of the society. They harbor diseases that are determined both by the environment from which they come and by the prison in which they live. Most health professionals find it difficult to work in a prison setup, due to under nutrition, lack of concern, inadequate facilities and expertise, which deteriorates the health of inmates. Weisbuch, (1992) observed that there are problems of severe drug abuse, alcoholism, trauma, homicide, suicide, HIV and AIDS, malaria, STDs, TB, skin and helminthes infections etc among prisoners. Malaria and intestinal helminthes are parasitic diseases with high morbidity and mortality in most tropical parts of the world. They are the major parasitic diseases in developing countries whose epidemiologic coexistence are often studied separately. Malaria caused by Plasmodium falciparum inflicts the largest burden among the parasitic diseases and hookworm infection is among the most common of all chronic infection with a third of the continent’s population infected at any one time (Snow et al 2005and WHO 2003). The high prevalence of both infections
among individuals living in Africa means that co-infection with *Plasmodium falciparum* and hookworm is extremely common (Petney and Andrew, 1998). Co-infection with *Plasmodium falciparum* and hookworm may also enhance severity of anaemia because of the distinct mechanism through which each parasite caused anaemia (Hotez et al, 2005).

In human populations, Murray *et al* (1994) observed protective role of helminthes. Result from the study showed that treatment of severe Ascariasis was accompanied by recrudescence of malaria attacks in children. Studies by Le Herson *et al*, (2004) suggested a deleterious effect of competition. Others found that helminthes infection was associated with a protective role from cerebral malaria (Nacher *et al*, 2000). It is estimated that over a third of the world’s population, mainly those individual living in the tropic and sub-tropics, are infected by parasitic helminthes or one or more of the species of *plasmodium* (De Silva *et al*, 2003). Report also showed that the economically developing world, particularly sub-Saharan African, bear the brunt of premature mortality, morbidity and disability. Much of this disease burden is the result of endemic parasitic infection that had adapted to tropical ecosystems and their vectors (WHO, 2002).

Studies on animal model have shown that concurrent infection by two or more parasites could affect the pathogenesis of each other. Therefore it is possible that antagonistic or synergistic interaction between parasites in animals exist. This has also raised the question of a similar phenomenon in humans. Thus, this study was aimed at determining the co-infection of malaria and helminth infection among the inmates of Jos central prison, Jos Plateau State, Nigeria.

**MATERIALS AND METHOD**

**Study area**

This study was carried out at Jos central prison. The prison is located in Jos, the state capital of Plateau state, Nigeria. Jos is an old tin mining city with an upland stretching approximately 104km from North to South, characterized by impressive ridges and isolated rocky hills separated by extensive plain. Jos is linked by road, rail and air to the rest of the country. It has an average daily temperature of 22°C, humidity of 60% and an average rainfall of 1400mm (Udo, 1970). The inhabitants are mostly civil servants, businessmen, traders, farmers and casual laborers.

**Study Population**

Three hundred (300) inmates that presented themselves for medical treatment at Jos prison’s clinic were used for this study. This comprised of 110 awaiting trial (AT), 100 serving Jail terms, 50 serving Life terms and 40 Condemned prisoners ages ranging from less than 20 to above 60 participated in the study.

**Collection of Sample**

Following an official consent secured from the prison officers and the inmates and assurance of confidentiality of the results, the inmates were told on how to collect stool samples without contaminating it with urine. Cleaned, dried and leak-proof labeled specimen containers were given to the inmates for stool and early morning clean mid-stream catch urine samples. Blood samples for thin and thick smears on the other hand were obtained by finger pricking using sterile disposable lancets on the slides.

Demographic information such as age, sex, and unit of each inmate was obtained orally.

**Preparation and Microscopic Examination of Parasites**

Thin and thick Giemsa’s stained blood smeared slides were prepared following standard microbiological method and formalin ether sedimentation technique and Kato-katz technique for faecal specimens were used for microscopic identification of malaria parasites and helminth eggs respectively as described by Cheesbrough (2000) and Arora and Arora (2005).

The data were analyzed using percentages and Chi-squares ($X^2$) test to compare the rate of infections.

**RESULTS**

From the 300 inmates examined for this study, 36.7% and 22.7% fall within ages 21-30 and 31-40 years respectively (See Table 1). Malaria parasite and helminth overall co-infection was 4.7% with those serving Jail term having the
Table 1. Prevalence of Plasmodium sp and Helminthes in Jos prison with respect to age

<table>
<thead>
<tr>
<th>Age group</th>
<th>No. Examined</th>
<th>Plasmodium sp (%)</th>
<th>S. mansoni (%)</th>
<th>A. lumbricoides (%)</th>
<th>Hookworm (%)</th>
<th>S. stercoralis (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20</td>
<td>56</td>
<td>26(46.40)</td>
<td>5(8.90)</td>
<td>1(1.80)</td>
<td>1(1.80)</td>
<td>0(0.00)</td>
</tr>
<tr>
<td>21-30</td>
<td>110</td>
<td>63(57.27)</td>
<td>5(4.50)</td>
<td>2(1.80)</td>
<td>4(3.60)</td>
<td>0(0.00)</td>
</tr>
<tr>
<td>31-40</td>
<td>68</td>
<td>37(54.41)</td>
<td>2(2.90)</td>
<td>2(2.90)</td>
<td>1(1.50)</td>
<td>1(1.50)</td>
</tr>
<tr>
<td>41-50</td>
<td>27</td>
<td>19(70.40)</td>
<td>1(3.70)</td>
<td>0(0.00)</td>
<td>0(0.00)</td>
<td>0(0.00)</td>
</tr>
<tr>
<td>51-60</td>
<td>25</td>
<td>9(36.00)</td>
<td>0(0.00)</td>
<td>0(0.00)</td>
<td>1(1.50)</td>
<td>1(1.50)</td>
</tr>
<tr>
<td>61 &gt;</td>
<td>14</td>
<td>7(50.00)</td>
<td>0(0.00)</td>
<td>0(0.00)</td>
<td>0(0.00)</td>
<td>0(0.00)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>300</td>
<td>161(53.67)</td>
<td>13(4.33)</td>
<td>5(1.67)</td>
<td>6(2.00)</td>
<td>1(0.33)</td>
</tr>
</tbody>
</table>

$X^2=9.62$  $P<0.05$

Table 2. Plasmodium sp and helminthes co-infection among inmates in Jos prison with respect to the various Units

<table>
<thead>
<tr>
<th>Units</th>
<th>No. Examined</th>
<th>Plasmodium sp (%)</th>
<th>S. mansoni (%)</th>
<th>A. lumbricoides (%)</th>
<th>Hookworm (%)</th>
<th>S. stercoralis (%)</th>
<th>Co infection (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWT</td>
<td>110</td>
<td>41(37.30)</td>
<td>5(4.50)</td>
<td>1(0.91)</td>
<td>1(0.91)</td>
<td>0(0.00)</td>
<td>4(3.64)</td>
</tr>
<tr>
<td>JT</td>
<td>100</td>
<td>62(62.00)</td>
<td>7(7.00)</td>
<td>2(2.00)</td>
<td>4(4.00)</td>
<td>1(1.00)</td>
<td>7(7.00)</td>
</tr>
<tr>
<td>LT</td>
<td>50</td>
<td>29(58.00)</td>
<td>0(0.00)</td>
<td>1(2.00)</td>
<td>1(2.00)</td>
<td>0(0.00)</td>
<td>1(2.00)</td>
</tr>
<tr>
<td>CD</td>
<td>40</td>
<td>29(72.50)</td>
<td>1(2.50)</td>
<td>2(5.00)</td>
<td>1(2.50)</td>
<td>0(0.00)</td>
<td>2(5.00)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>300</td>
<td>161(53.67)</td>
<td>13(4.30)</td>
<td>6(2.00)</td>
<td>7(2.30)</td>
<td>1(0.30)</td>
<td>14(4.70)</td>
</tr>
</tbody>
</table>

$X^2=9.62$  $P<0.05$  AWT=Awaiting trial; JT=Jail term; LT=Life term; CD= Condemned.

Figure 1. Prevalence of Plasmodium spp and Helminthes among prison inmates with respect to age

highest malaria parasite and helminth co-infection rate of 7.0%. The prevalence of Malaria parasite in this study was 53.7% in which the Condemned inmates had the highest prevalence of 72.5% while those awaiting trials had 37.3% (See Table2). The study further revealed that out of the number of inmates examined, 27(9.0%) had different helminth parasites with *Schistosoma mansoni* having the highest prevalence (4.3%). This was followed by Hookworm infection (2.3%). Malaria parasite and helminthes infection among the inmates with respect to age revealed that age 41-50 had the highest prevalence (70.4%) for malaria parasite and ages less than 20years for helminthes infection. (See figure 1).
DISCUSSION

This study showed that most of the inmates in Jos prison were youths of ages 21-45 years old. These age groups are the most active and highly infected group of inmates in the prison. This high prevalence of malaria parasite (53.7%) and helminthes infection (9.0%) is a concern for health intervention particularly among the inmates. Helminths have been reported to be protective against the severe forms of malaria but they were also possibly linked to increased malaria incidence and gametocyte carriage (Nacher 2004). This is because a mild anemia caused by helminthes in a host might favours gametocytogenesis that sends attractive cues to the vectors. Helminth infection rate of 9.0% as reported in our work was observed to be lower than those reported elsewhere by Okoli (2009), Morenikeji et al, (2009) and Colman et al, (2013).

Infection was observed among inmates of ages less than 20 years with a higher prevalence rate of helminthes, followed by age 21-30 and 31-40. These inmates were constantly taken out for manual labour on farms and fetching of water from the dam which predisposes the inmates to helminthes infection. This agreed with that presented by Okoli, (2009) in Owerri prison where helminthes infection was high among the young adult inmates.

In the study the overall prevalence rate of malaria among the inmates was 53.7%. This infection by age was highest (70.4%) among ages 41-50 years and among the condemned inmates (See Figures 1 and 2) respectively due probably to several factors. These may include; constant exposure to the vector, person to person transfer of the parasites, inmates' duration in the prison and age as observed by Smith et al (1995), and Trape and Rogier (1996), in Tanzania and Congo respectively. In addition, these Condemned inmates were never allowed to move out of the prison and received less attention in terms of health as agreed by Weisbuch, (1992). A higher prevalence of malaria was also observed among those serving Jail terms.

Poor sanitation, source of drinking water, and lack of mosquito nets create opportunities for these infectious agents to thrive among the inmates.

The establishment of these parasites in these inmates may portend grave consequences on human health as they serve as reservoirs for these parasites. There is therefore the need to introduce and or intensify preventive and control measures for malaria and helminthes infection among prison inmates. Thus more and better source of drinking water, provision of improved latrines to promote hygienic practices among the inmates, health education, adequate bed space with treated mosquito nets and other social and recreational facilities be provided to reduce vector-borne and water-borne helminthes infections.

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REFERENCES