**Prevalence of Malaria Infection among Inmates of Makurdi and Gboko Prisons, Benue State, Nigeria.**

**ABSTRACT**

Prison inmates are often tagged “the forgotten ones” and are among the populations with high risk for dangerous and contagious diseases. This study was carried out to determine the prevalence of malaria infection among prison inmates in Makurdi and Gboko, Nigeria. Using structurally designed questionnaires, Blood samples of 144 inmates within the age range of 21years and 60 years plus, was screened for malaria. Blood samples were collected among inmates and were investigated for malaria infection using Malaria Rapid Test Kit (mRDT) kits, thick and thin film methods. Of 144 inmates screened, (93.06%) were males and (6.94%) were females and the overall prevalence of malaria infection obtained from the study was 15.28%. Malaria infection was higher among inmates within the age range of 21-30 years. The prevalence of the infection with respect to their months of stay in prison showed that inmates with short period of stay were infected most with this disease. In relation to gender, males had the higher prevalence than the females. There was no statistical relationship between the prevalence of Malaria infection (P>0.05) with respect to age groups, occupation and duration of stay. On the other hand, there was statistical relationship between the prevalence of Malaria infection (P<0.05) with respect to gender. The used of insecticides treated nets and the incorporation of basic health education into the curricular of the inmates were recommended.

**Key words:** Malaria, inmates, prevalence, infection.

1. **INTRODUCTION**

According to Ishaku and Mamman (2014), prisoners carry much more burden of illness than other members of the society, they harbour diseases that are determined both by the environment from which they come from and by the prison in which they live. Most health professionals find it difficult to work in a prison set up, due to under nutrition, lack of concern, inadequate facilities and expertise, which deteriorates the health of inmates. Abah *et al*. (2018) observed that there are problems of severe drug abuses, alcoholism, trauma, homicide, suicide, malaria fever, tuberculosis (TB), HIV/AIDS, Sexually Transmitted Diseases (STDs), and skin and helminthes infection among prisoners.

According to WHO (2000), malaria is a potentially deadly disease characterized by fever, muscle stiffness, shivering and sweating. They also stated that malaria is a parasitic infection transmitted to humans through the bites of an infected female *Anopheles* mosquito, (WHO, 2002). The name “malaria” is derived from the Italian words Mal (bad) and aria (air). It arose originally because the citizens of Rome thought that the disease was contracted by breathing the bad air of the Pontine Marshes (Hornby, 2007). He defined malaria (ague, marsh fever, periodic fever, and paludism) as an infectious disease due to the presence of parasitic protozoa of the genus *Plasmodium* (*P. falciparum, P. malariae, P. ovale* and *P. vivax*) within the red blood cells. The disease is confined to tropical and subtropical areas. Malaria is one of the most prevalent diseases of the tropical world. Current estimates predict over two hundred million cases annually.

About 90% of all malaria deaths in the world today occur in Africa, South of the Sahara. This is because the majority of infection is caused by *Plasmodium falciparum*, which is the most dangerous of all the four malaria parasites species. It is also because the most infective malaria vectors, *Anopheles gambiae* is most widespread in Africa and most difficult to control. According to WHO (2000) severe malaria is not easily distinguishable from other severe diseases such as typhoid, pneumonia, and meningitis which require very different diagnosis and therapy.

Worldwide, great and varied efforts are being made to learn about this disease and to determine how to control it, this is a formidable task. The official malaria eradication programme, run by world Health Organization (WHO), was cancelled in the late 1960s because of growing difficulty given that the complex and persistent nature of this disease became increasingly obvious. A management strategy today includes the development of vaccines and chemotherapeutic agents, vector control, insecticides, education, long lasting insecticide treated nets (LLIN). Resistance to drugs by both the mosquito and the parasite is a growing obstacle in the battle against malaria. Combination of therapy has been shown to increase the efficacy of combining drugs such as Artemisinin based Combination therapy (ACT) which includes Artemeter\lumefantrine and Artemeter + Amodiaquine (WHO, 2009).

Malaria continues to be one of the most serious infectious diseases causing approximately about one million deaths (WHO, 2008). The malaria parasites, *Plasmodium falciparum* invades and grows within the host red blood cells (Miller *et al*., 2002). According to Snow *et al. (*2005) and WHO (2011) despite substantial advances in the treatment and prevention of malaria over the past decades, malaria still threatens the lives of millions in tropical countries. The symptoms of malaria are nonspecific and parasitological diagnosis of the disease is very difficult and not common among medical diagnostic laboratories. This study is an attempt to determine malaria status of persons from a section of our society, who condemned by law, are behind the high walls of two of the largest Nigerian Correctional service, maximum and minimum centers of our State, with the view to generating information that may spur or stimulate planning, management, prevention and control strategies for Nigerian correctional centers.

This present study was conducted to access the prevalence of malaria infection and the contribution of active case finding for malaria elimination program and control in Makurdi and Gboko Nigerian Correctional Service, both maximum and minimum security custodial centers in Benue State, Nigeria.

1. **MATERIALS AND METHODS**

**2.1 Study Area**

The study wascarriedout in Makurdi and Gbokometropolis both in Benue State, Nigeria. The State lies in the middle of the country (North Central Geo-Political Zone) and shares boundaries with Cameroon and five other states namely, Nasarawa to the north, Taraba to the east, Cross River and Enugu to the south, and Kogi to the west. Benue State derives its name from the River Benue, the second largest river in Nigeria. The most prominent geographical feature in the State is the river Benue. The State has a population of about 5 million, and an area of about 34, 059sq.kms. Benue state lies within hot humid zone with seasonal temperature variation throughout the year and experiences two distinct major seasons in the year. The seasons are dry and wet seasons. The wet season occurs between April to October, while the dry season usually occurs between November to March (Mngutyo and Ogwuche, 2013).

**2.2 Study Population**

The study population included the Makurdi and Gboko prisons in Benue State Nigeria. The population of inmates in Makurdi and Gboko prisons as at the time of study were 452 inmates in Makurdi and 274 inmates in Gboko prisons respectively, with staff strength of 89 employees spread across different departments in Makurdi and Gboko.

**2.3 Sample size and parameters.**

 A sample size of 90 inmates in Makurdi prison and 54 inmates in Gboko prison were collected as samples for the study. The sampling parameters adopted for this study was based on random sampling. It was assumed that none of the inmates were using Long Lasting Insecticides Nets (LLIN). A total number of samples collected for the study were 144 blood samples (Niaing *et al.,* 2006).

**2.4 Ethical Consideration**

Ethical clearance was sought for and obtained from Benue State Ministry of Health and human services; also permission was sought from the Benue State Comptroller of Prison and the Chief Warden of the two prisons. Informed consent was also obtained from all the subjects enrolled in the study.

**2.5 Sample collection**

Following an official consent secured from the prison officers and the inmates with assurance of confidentiality of the results, the 2ml of blood samples were obtained in the EDTA bottles by venapucture using syringe and needles. Thick and thin smears were prepared from the blood samples collected from the inmates. Demographic information such as age, sex and prison unit of each inmate was obtained.

**2.6 Preparation and Microscopic Examination of Parasites**

Thin and thick Giemsa’s stained blood smeared slides were prepared following standard microbiological method for microscopic identification of malaria parasites as described by Cheesbrough (2002) and Arora and Arora (2005). Malaria Rapid Test Kit’ (mRDT) were also done by collectingfifty microlitres (50µl) of whole blood (sample) was collected using automatic pipette and dropped into the test kit sample pot well. Two (2) drops of (care start malaria test kit) buffer was added into the test kit buffer well. The timer immediately set after buffer was added for 15 minutes. Results were read 15 minutes after the addition of buffer for each sample tested, (Incubation time) (Endeshaw *et al*., 2008, Bisoffi *et al*., 2009 Clinton and Jason, 2011 and Obeagu *et al.,* 2018). The data obtained were analyzed using chi-squares (χ2) test to compare the rate of infection. All malaria rapid test results were read after the incubation period of 15 minutes, also all results of malaria microscopy were read.

1. RESULTS

**3.1 Prevalence of malaria Infection among inmates in relation to gender.**

One hundred and fourty four (144) inmates screened from Makurdi and Gboko Medium and Security Prisons for Malaria parasites. Males had (15.7%) prevalence of malaria parasites while females (10%). The overall prevalence of malaria parasites obtained from this study (15.3%)

**3.2 Prevalence of malaria Infection among inmates in relation to age groups.**

The prevalence of malaria infection with respect to age groups showed 21-30years had the highest prevalence of (18.9) followed by 41 & above (16.7%) and 31-40years (11.3)

**3.3 Prevalence of malaria Infection among inmates in relation to occupation**

The Prevalence of malaria infection among inmates in relation to occupation revealed that farmers had the highest prevalence of (22.2%), Business men and women had (13.3%), and artisans had (13.3%) while the civil servants had the least of (10.3%)

* 1. **Prevalence of malaria Infection among inmates in relation duration to stay.**

Infections with respect to the duration of stay in the prison showed inmates stay for 40months and above had the highest prevalence of (30.0%),followed by 6-12months had (20.5), 19- 24months had (16.0%), 13-18months had (10.0%) while the least is 25-37months at (3.3%).

**Table 1: Prevalence of malaria Infection among inmates in relation to gender.**

|  |  |  |  |
| --- | --- | --- | --- |
| Gender | No. Examined | No. Positive (%) | No. Negative (%) |
| Male | 134 | 21(15.7) | 113(84.3) |
| Female | 10 | 1(10) | 9(90) |
| Total | 144 | 22(15.3) | 122(84.7) |

**Table 2: Malaria infection distribution in inmates with various age groups**

|  |  |  |  |
| --- | --- | --- | --- |
| Age  | No. Examined | No. Positive (%) | No. Negative (%) |
| 21-30 | 58 | 11(18.9) | 47(81.0) |
| 31-40 | 62 | 7(11.3) | 55(88.7) |
| 41 & Above | 24 | 4(16.7) | 20(83.3) |
| Total | 144 | 22(15.3) | 122(84.7) |

**Table 3: Prevalence of malaria Infection among inmates in relation to occupation.**

|  |  |  |  |
| --- | --- | --- | --- |
| Occupation | No. Examined | No. Positive (%) | No. Negative (%) |
| Civil Servants | 39 | 4(10.3) | 35(89.7) |
| Business men/women | 30 | 4(13.3) | 36(86.7) |
| Artisans | 30 | 4(13.3) | 36(86.7) |
| Farmers | 45 | 10(22.2) | 35(77.8) |
| Total | 144 | 22(15.3) | 122(84.7) |

**Table 4: Prevalence of malaria Infection among inmates in relation to duration of stay.**

|  |  |  |  |
| --- | --- | --- | --- |
| Duration of Stay(Months) | No. Examined | No. Positive (%) | No. Negative (%) |
| 6-12 | 39 | 8(20.5) | 31(79.5) |
| 13-18 | 30 | 3(10.0) | 27(90.0) |
| 19-24 | 25 | 4(16.0) | 21(84.0) |
| 25-39 | 30 | 1(3.33) | 29(96.67) |
| 40 & Above | 20 | 6(30.0) | 14(70.0)  |
| Total | 144 | 22(15.3) | 122(84.7) |

1. **DISCUSSIONS**

The malaria prevalence rate of 15.28% among inmates in Makurdi and Gboko prisons is not surprising for number of reasons. Poor environmental sanitation, lack of Mosquito nets coupled with the fact that prisons are not regularly fumigated which encourages the breeding of mosquitoes. Presently, Makurdi and Gboko prisons are overcrowded.

The study indicated that, the prevalence rate of 15.28% of Malaria parasites (MP) among prisoners in Makurdi and Gboko is lower than previous studies conducted in Jos by Mamman *et al.* (2014) which recorded prevalence rate of 53.67%, in Port Harcourt with 55.2% by Adah *et al.* (2018) and in Abakiliki with 92.57% by Alao *et al.* (2015).The prevalence rate of the present study was lower than study done on prison in Delta State 35% by Erhabor *et al.* (2012) and in Otukpo, Benue State 36.1% by Jombo *et al.* (2010).

The prevalence rate of the present study was nearly comparable to the results of the study done by Adedotun *et al.* (2010) in Oshogbo who recorded 18.2%. The possible explanation of the similarity might be that whatever different methodologies they may have used; they may have implemented good comparable prevalence and diagnostic in their setting.

The Malaria infection in relation to Age group was higher among the age groups between 21-30 years as shown in table 1 in Makurdi and Gboko prisons and among those that stayed within 6-12 months and 40 months and above in table 4 has the high prevalence rate of Malaria infection in Makurdi and Gboko prisons. This could be due to several factors which may include constant exposure to vector, inmate’s duration in the prisons and age as observed by Smith *et al*. (1995), Trape and Rogier (1996) in Tanzania and Congo respectively that Malaria infection are inversely related to age group. Thus some inmates suffer from a disproportionately high rate of infection while other inmates are at lower risk.

Male’s inmates were reported to have higher prevalence rate of Malaria infection (29.99%) than their Female (1.11%) counterparts in Makurdi and Gboko prisons as reported in Table 2 This confirms with the results of Umar (2006), in Port Harcourt by Adah *et al.* (2018) and in Jos by Mamman *et al.* (2014). However, studies have shown that female have better immunity to parasitic disease and this was attributed to genetic and hormonal factors (Kwabla *et al.,* 2015). This may be because the male inmates are freer than females which leisure hours are strictly controlled and restricted. Also, female’s inmates have better personal hygiene practice.

 In relation to occupation, inmates in Makurdi and Gboko prisons as shown in Table 3, malaria infection was high among farmers (14.81%) and low among artisan and business men/women. This agrees with the results of Humphrey *et al.* (2010) in Tanzania and is in disagreement with that of Adedotun *et al*. (2014) in south- western Nigeria who has higher prevalence rate of Malaria parasites infection among Civil servants.

1. **Conclusion**

The establishment of these parasites in these inmates may portend grave consequences on human health. There is therefore the need to introduce and intensify preventive and control measures for malaria infection, and therefore basic health education should be incorporated into the curricular of the inmates, adequate bed space with treated mosquitoes nets and other social and recreational facilities be provided to reduce vector borne infections.

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