



Prevalence of Malaria Parasites among Tuberculosis Patients Attending Specialist Hospital, Gombe State, Nigeria

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Abstract

Malaria and tuberculosis (TB) are two of the most prevalent endemic infections in Nigeria. Thus, a study on the co-infection of malaria parasites with tuberculosis was undertaken among patients attending State Specialist Hospital Gombe between November, 2010 and March, 2011. A total of 203 blood samples comprising of 103 samples from confirmed AFB-positive patients and 100 from AFB-negative patients (control) were collected and analysed for the presence of malarial parasites. All the samples were subjected to blood film using Giemsa Staining Technique and viewed under oil immersion Microscopy. The prevalence of malaria parasites among AFB- positive and negative patients were found to be 33% and 31% respectively. Malaria parasites were most prevalent among patients aged 41-64 years (39.0%). Male patients had the highest prevalence of 17.5%, while females had a prevalence rate of 15.5%. The higher prevalence reported may be of significance in the light of recent data, showing that malaria infection may exacerbate TB. Thus, adequate measures should be taken to free TB patients from malaria infection.

Keywords: Prevalence, Malaria, Tuberculosis, Gombe, Nigeria

INTRODUCTION

Malaria is one of the most common serious infectious disease of man caused by plasmodium, a single-celled microscopic organism measuring between 2-5 μ in diameter and belonging to the phylum protozoa and class sporozoa. It is transmitted to man by the bite of an infected female anopheles mosquito vector. It is an old disease still affecting millions of people worldwide. In Africa, it kills over a million people annually and 200-300 million globally causing chronic debility in many (Last, 2007).

According to the World Malaria Report (WHO, 2012) 40% of the estimated cases of malaria worldwide occurred in India, Nigeria and DR Congo. Malaria has been reported to account for an estimated 60% of outpatient hospital visits in Nigeria, 30% of hospitalizations, 30% of under-five mortalities, 25% of infant mortalities and

11% of maternal mortalities (Noland *et al.*, 2014).

Malaria remains a major public health problem in Nigeria where it is endemic where it causes significant human suffering (Adedotun *et al.*, 2013). A report by the Federal Ministry of Health (2005) have shown that more than 90% of the total Nigerian population are at risk of malaria and at least 50% of the population suffers from at least one episode of malaria each year.

Tuberculosis (TB) is a contagious disease caused by bacteria (*Mycobacterium tuberculosis*) that most often affect the lungs. Transmission of TB is from an infected person to a vulnerable person through the air. It is spread through aerosol droplets after infected person coughs, sneezes, sings or even speaks to people nearby if exposure is long enough.

About one-third of the world's population has latent TB, which means people have been infected by TB bacteria but are not (yet) ill with the disease and cannot transmit the disease. Tuberculosis (TB) is one of the top 10 causes of death worldwide. Reports have shown that six countries including India, Indonesia, China, Nigeria, Pakistan, and South Africa have accounted for 60% of the new TB cases (WHO, 2015).

Malaria and TB are two of the world's primary killers, causing up to 4 million fatalities per year. An estimated 90% of malaria deaths occur in sub-Saharan Africa and most of these are children, (UNICEF, 2007). Malaria and tuberculosis among others such as diarrhoea, HIV/AIDS, measles, hepatitis B and pneumonia account for 85 percent of global infectious diseases burden (Murray and Lopez, 1996).

Malaria and tuberculosis are infectious diseases that remain endemic in many regions of the world, and co-infection with the two pathogens is common. In infectious medicine and public health epidemiology, the interaction between both infections within a co-infection episode is an interesting topic and of serious concern, hence adding to the burden rate of diseases worldwide (Viroj, 2006).

Several studies on co-infection with *Mycobacterium tuberculosis* (M. TB) and malaria have shown that malarial parasites decreased the host's effective humoral and cellular immune responses directed against *Mycobacterium tuberculosis* and co-infection exacerbated chronic TB, suggesting a competitive antagonist effect between heat shock protein 70 (HSP70) from M. TB and adenosine triphosphate-binding protein (ATPB) of malaria may exist (Xin-Xu Li and Xiao-Nong Zhou, 2013).

As a result of rising incidence of malaria and TB infection in developing countries; quite a number of studies on malaria have been reported from various regions of Nigeria; however, there is dearth of information from the North-eastern region particularly on the

co-infection of malaria and tuberculosis. Thus, this study aims to determine the prevalence of malarial parasites among TB patients in Gombe State, North-eastern Nigeria.

MATERIAL AND METHODS

Study Area

Gombe is located between latitudes 9°30' and 12°30' North and longitudes 8°45' and 11°45' East. The State lies in the centre of the North-East geopolitical zone of Nigeria.

Sample Size

The sample size for the study was determined using the formula of Sarmukaddam and Gerald (2006) at 95% confidence level and a reported prevalence of 27.29% of malaria from Sokoto, Northwestern Nigeria (Abdullahi *et al.*, 2009). The calculated sample size was 304; however a total of 203 samples were obtained from patients with and without TB and used for the study.

Study Design and Sample Collection

The study comprises a population of 203 subjects of which 103 were confirmed AFB positive and 100 AFB negative patients (as control) that attended Specialist Hospital, Gombe. The study involved both in and out patients of the hospital.

The socio-demographic information of the consented patients was collected with the aid of a questionnaire.

Inclusion and Exclusion criteria

The inclusion criteria were any patient of both sexes with or without TB who presented with malaria illness in the selected hospital and who consented.

The exclusion criteria were patients with or without TB who presented with illnesses other than malaria and did not consent.

Sample processing and Analysis

Thick and thin blood films were made on two separate cleaned grease free slides from EDTA anticoagulated venous or capillary blood aseptically under monitored and controlled conditions and environment. Clinical safety precautions were taken in to account during collections and processing of blood samples.

Both thick and thin blood films were explored and stained using Giemsa Staining Technique. Both films were examined using X100 objectives for malaria parasites (Chessbrough, 2006).

Data analysis

Analysis of malaria infection according to the study population, age and sex was done using GraphPad Statistical Software. Percentages and Chi-square test were used and P values of (< 0.05) were considered statistically significant.

RESULTS

A total of 203 samples were analysed for the presence of malaria parasites. Of the 103 AFB-positive samples examined, 33.0% (34/103) were positive for malaria parasites and was 31.0% (31/100) among the AFB-negative patients. There was no statistically significant difference ($\chi^2=0.02$, d.f=1, P=0.8875) in the prevalence of malaria parasites among the AFB-positive and negative subjects in the study (Table 1.0).

Table 1.0: Overall Prevalence of Malaria Parasites among AFB Positive and Negative Subjects in State Specialist Hospital, Gombe.

Subjects	No. Examined	No. Positive	Prevalence	P-value
AFB-Positive	103	34	33.3%	0.8875
AFB-Negative	100	31	31.0%	

$\chi^2=0.02$, d.f=1, P=0.8875

Analyses of the result by age-group among the AFB-positive patients showed that there was no significant association ($\chi^2=1.4$, d.f=2, P=0.4966) between malaria parasites and age-group. However, malaria parasites was

most prevalent among patients aged 41-64 years (39.0%) while those within the age-group 18-40 and 60 years and above had prevalence of 31.6% and 25.0% respectively (Table 2.0).

Table 2.0: Prevalence of Malaria Parasites among AFB-Positive Subjects based on Age-group Attending State Specialist Hospital, Gombe

Age-group (Years)	No. Positive (%)	No. Negative (%)	Total
18-40	12 (31.6)	26 (68.4)	38
41-64	16 (39.0)	25 (61.0)	41
≥65	6 (25.0)	18 (75.0)	24
Total	34 (33.0)	69 (67.0)	103 (100)

$\chi^2=1.4$, d.f=2, P=0.4966

Analysis of the result by gender among the AFB-positive patients showed that prevalence of malaria Parasites was slightly higher in males (17.5%) than in females

(16.5%) (Table 3.0). However, the difference observed was not statistically significant ($\chi^2=0.71$, d.f=1, P=0.3994).

Table 3.0: Prevalence of Malaria Parasites among AFB-Positive Subjects based on Gender Attending State Specialist Hospital, Gombe

Gender	No. Positive (%)	No. Negative (%)	Total	P-value
Males	18 (17.5)	44 (42.7)	62	
Females	16 (15.5)	25 (24.3)	41	0.3994
Total	34 (33.0)	69 (67.0)	103 (100)	

$\chi^2=0.71$, d.f=1, P=0.3994

DISCUSSION

The prevalence of malaria parasites among TB patients attending State Specialist Hospital Gombe was found to be 33% based on the research carried out. The findings of this study show that there is a slightly higher prevalence rate of malaria parasites among AFB-positive patients attending State Specialist Hospital Gombe when compared with the control. This rate could be attributed to the low immune status of AFB-positive patients, failure to prevent or control malaria vectors, ignorance or low standards of living associated with poverty.

The prevalence of malaria among TB patients in this study is comparable to the report of Emilia *et al.*, (2013) where *Plasmodium falciparum* malaria was diagnosed in 714 of the 1,906 patients with TB given a prevalence of 37.5%. However, the result is higher than those previously reported in other parts of the world such as Okello *et al.*, (2015) who reported a prevalence of 4.0% malaria parasites among TB infected HIV patients from Uganda.

The study revealed a slight increase in the prevalence of malaria compared with the control (31%) conforming with findings of Suwa (2005), who showed that prevalence of malaria parasites among febrile patients (including those with tuberculosis) attending Jos University Teaching Hospital is high with 35.8% prevalence.

The findings also showed that persons infected between the ages of 41 and 64 years had the highest prevalence among the AFB positive subjects. This may be due to the fact that this age-group may be engaged in

various vulnerable working conditions which expose them to the vectors of malaria. However, the result is not in conformity with the findings of Abdullahi *et al.*, (2009) from Sokoto where patients within the age group of 36-40 years recorded lower infection. This could probably be due to differences in living environments and others such as social and economic factors.

The study also showed that males had the highest prevalence of malaria parasites when compared to females. This is in accordance with the reports of Askling *et al.*, (2005) and Abdullahi *et al.*, (2009) where they reported higher prevalence rate in males than in females. However, some studies have reported higher prevalence rate in females than in males (Ibekwe *et al.*, 2009; Adedotun *et al.*, 2013). The difference observed may be attributed to differences in their life style. This could be as a result of males' outdoor activities including at late hours.

Conclusion

The prevalence of Malaria parasites among TB patients attending State Specialist Hospital Gombe was found to be 33%. The higher prevalence reported may be of significance in the light of recent data, showing that malaria infection may exacerbate TB.

Recommendation

Studies have shown that interventions such as treatment/prevention of malaria appear to reduce mortality among TB co-infected patients. Thus, adequate measures should be taken to free tuberculosis patients and all others from malaria infection.

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