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Studies on the antiplasmodial effects of Metaprim and Alaxin on some selected supplements

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Abstract

Malaria is one of the most serious health challenges facing the world today. It is a disease caused by plasmodium. Successful malarial control depends greatly on treatment with effective anti-malarial drugs. Countries have implemented many national malarial treatment policy, which specifies drugs for treatment of both uncomplicated and severe malaria in pregnancy and what to do if first line treatment fails. This investigation is based on the anti-plasmodial effects of Metaprim and Alaxin on some selected supplements such as grape juice, orange juice, super-malt and vitamin C. 80 patients (adults) infected with malaria parasites were chosen for this study. After which the anti-malarial drugs and the supplements were co-administered appropriately for 3 days. The result shows that the concomitant administration of the drugs with the multivitamin (super-malt) did not alter the efficacy and potency of the drugs, while grape juice, orange juice and vitamin C altered the efficacy and potency of the drugs. Therefore, the concomitant administration of these anti-malarial drugs with grape juice, orange juice and vitamin C as supplements should be avoided during the period of malaria treatment for the efficacy of drugs.

Keywords: Antiplasmodial , Alaxin, Metaprim, Plasmodium,Supplements

Introduction

Malaria is one of the most serious health challenges facing by the world today. It is a mosquito-borne infectious disease of humans and other animals caused by Plasmodia and is also definitely the single most destructive and dangerous infectious agent in the developing countries of the world (Greenwood *et al*., 2005; Winter *et al*., 2006).This disease results from the multiplication of Plasmodium parasites within red blood cells, causing symptoms that typically include fever and headache while in severe cases,it progresses to coma or death. Five species of plasmodium can infect and be transmitted by humans. Severe disease is largely caused by *Plasmodium falciparum* while the disease caused by *Plasmodium vivax*, *Plasmodium ovale*, (Sutherland, *et al.*, 2010) and *Plasmodium malariae* is generally a milder disease that is rarely fatal. *Plasmodium knowlesi* is a zoonosis that causes malaria in macaques which can also infect humans (Fong *et al.*, 1971; Singh *et al.*, 2004). Currently artemisinin-based combination therapy (ACT) is recommended for the treatment of *P. falciparum* malaria. Fast acting artemisinin-based compounds are combined with a drug from a different class. Other drugs include lumefantrine, mefloquine, amodiaquine, sulfadoxine/pyrimethamine, piperaquine and chlorproguanil/dapsone.

Malaria transmission can be reduced by preventing mosquito bites by distribution of mosquito nets and repellents, or by mosquito-control measures such as spraying insecticides and draining stagnating water in which they can breed. Despite a clear need, no vaccine

offering a high level of protection currently exists. Efforts to develop one are ongoing (Kilama & Ntoumi, 2009). A number of medications (antimalarial drugs) are also available to prevent malaria in travelers to malaria-endemic countries (prophylaxis).

There were an estimated 225 million cases of malaria worldwide in 2009 (WHO, 2011). An estimated 655,000 people died from malaria in 2010 (WHO, 2011), a decrease from the 781,000 who died in 2009 according to the World Health Organization's 2011 World Malaria Report, accounting for 2.23% of deaths worldwide. However, a 2012 meta-study from the University of Washington and University of Queensland estimates that malaria deaths are significantly higher. Published in the Lancet, the study estimates that 1,238,000 people died from malaria in 2010 .Ninety percent of malaria-related deaths occur in sub-Saharan Africa, with ~60% of deaths being young children under the age of five (Christopher *et al*., 2012).

Materials and methods

Experimental setup

A total of 80 persons (40 males and 40 females) infected with malaria parasite residing in Umuguma in Owerri west local government area of Imo state, Nigeria were used during the experiment after a general malarial test on all the individuals and their body weights were taking before and after drug administration (treatment).

Collection of blood sample

The subjects big thumb was swabbed with methanol as disinfectant and a lancet used to puncture it for blood collection. Two drops of blood were placed on grease free slide, a thick film was made and allowed to air-dry. The dried thick blood film slide was laid on a staining rack and stained with Giemsa , allowed for 30-40 minutes, washed off with clean water, drained and allowed to dry at room temperature. Then slides were viewed under the light microscope using 10X and 40X objective lens for focusing plasmodium. Blood samples of subjects were all confirmed to be malaria parasite infected via malaria parasite test as described by (Sibley, 2001). The research had the approval of the concerned institutional medicinal ethics boards.

Drugs and supplements administered

The drugs used were Metaprim purchased from SKG pharmaceutical and Alaxin (Dihydroartemisin) purchased from Bliss Gvs pharmaceutical Ltd. The supplements used were Grape juice, orange juice and vitamin C were purchased from Emzor pharmaceutical Ltd while multivitamin (Super-malt) was purchased from Geltec pharmaceutical Ltd.

Results and discussion

The results of the test on the blood samples before and after administration of the anti-malarial drugs to the patients are presented in Table 1.

The studies of the antiplasmodial effects of Metaprim and Alaxin on some selected supplements showed that, the administration of the single agent anti-malarial drugs such as Metaprim only and Alaxin from Table 1 and Table 2 cleared the malaria parasite after 3 days. Supporting the efficacy of such antimalarial drugs in the treatment of patients

Table 1. Effects of metaprim only on patients infected with malaria parasite

Patients	Weight(kg) Before Treatment	Malaria parasite Before treatment	Drug/ supplements	Malaria parasite/After Treatment	Weight(kg) After treatment	Remark
Female	54	+ +	Meta only	_	53	cleared
Female	59	+	Meta only	_	56	cleared
Male	55	+	Meta only	_	52	cleared
Male	56	+ +	Meta only	_	54	cleared

\+ = Positive (Malaria parasite present)
++ = Moderately severe parasite present
+++ = Severe malaria parasite
\- = Negative (malaria parasite absent)

infected with the plasmodium causative agent of malaria. This could also explain the safe use of the drugs by the local people, for the treatment of malaria, in the eastern part of Nigeria. This also suggests the findings of (Ajaiyeoba *et al.,* 2006) that the use of these drugs for the treatment of malaria was due to the presence of alkaloids. In addition, this is similar to the effect of the extract reported by previous studies on Alstonia boonei (Iyiola *et al.,* 2011).

The concomitant administration of the antimalarial drugs (Metaprim and Alaxin) with multivitamin (super-malt) from Table 1.3 and Table 2.3 did not alter the efficacy and potency of the drugs in the treatment of the malaria i.e. the super-malt did not affect the potency of the drugs in clearing the malaria parasite after 3 days of treatment. This infers that super-malt may play a significant role in antimalarial activity, which is similar to the report of Adesokan and Akanji (2010). This could be because of its ability to promote appetite, quick recovery and do not hinder the activity of the antimalarial drug. (Makarchikov *et al.,*2003). This report supports the finding of Basu et al. (2007) that this supermalt may possess health-promoting effects, at least under some circumstances.

Other supplements like grape fruit juice, orange fruit juice and vitamin C coadministerd with the antimalarial drugs (Metaprim and Alaxin) from Table 1.1 - 2.4 affected the efficacy and potency of the drugs by not clearing the malaria parasite after 3days of treatment, suggesting that these supplements altered the efficacy and potency of these drugs in the treatment of malaria (Talman *et al*, 2004; Bledsoe, 2005). This could be as a result of the anti-oxidant properties present in the supplement (Grape juice, orange juice and vitamin C) which may increase plasma concentrations of the drug and delays reaching peak drug concentration (Owira & Ojewole, 2010).Also it may be due to the presence of enzymes found in the various supplements that break down medications in the digestive system and cause more of the medications to stay in the body which may increase the risk of serious malarial problems (Stump, 2006).

Weight reduction was also observed in all the affected treated groups during the experimental period. This could be attributed to death of cells like red blood cells.

Conclusion

Multiple-drug therapies that include a nonantimalarial drug like Vitamin C, grape fruit and orange fruit juice to enhance the antimalarial effect of a blood schizontocidal drug are not considered as combination therapy. Therefore, co-administration of such antimalarial drugs with such supplements like grape juice, orange juice and vitamin c should be avoided during malaria treatment.

This findings also supports the use of multivitamin (super-malt) and antimalarial drugs as a combination therapy which is safe and possess potent antimalarial activity as found in its ability to suppress Plasmodium infection in patients.

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Table 1.1. Effects of Metaprim (Meta) and Grape juice (GJ) on patients infected with malaria parasite

Patients	Weight(kg) Before Treatment	Malaria parasite Before treatment	Drug/ supplements	Malaria parasite/After Treatment	Weight(kg) After treatment	Remark
Female	55	+	Meta/GJ	+	55	Not cleared
Female	51	++	Meta/GJ	+	51	Not cleared
Male	59	+ +	Meta/GJ	+	57	Not cleared
Male	52	+	Meta/GJ	+	51	Not cleared

Table 1.2. Effects of Metaprim and Orange fruit juice (OJ) on patients infected with malaria parasite

Patients	Weight(kg) Before Treatment	Malaria parasite Before treatment	Drug/ supplements	Malaria parasite/After Treatment	Weight(kg) After treatment	Remark
Female	67	+	Meta/OJ	+	67	cleared
Female	59	+	Meta/OJ	+	55	cleared
Male	64	+	Meta/OJ	+	64	cleared
Male	57	+	Meta/OJ	+	57	cleared

Table 1.3. Effects of Metaprim and multi-vitamin (multi) on patients infected with malaria parasite

Patients	Weight(kg) Before Treatment	Malaria parasite Before treatment	Drug/ supplements	Malaria parasite/After Treatment	Weight(kg) After treatment	Remark
Female	60	+	Meta/multi	_	59	Not cleared
Female	58	+	Meta/multi	_	58	Not cleared
Male	53	+	Meta/multi	_	53	Not cleared
Male	53	++	Meta/multi	_	50	Not cleared

Table 1.4. Effects of Metaprim and vitamin C (Vit.C) on patients infected with malaria parasite

Patients	Weight(kg) Before Treatment	Malaria parasite Before treatment	Drug/ supplements	Malaria parasite/After Treatment	Weight(kg) After treatment	Remark
Female	50	+	Meta/Vit. c	+	50	Not cleared
Female	56	+	Meta/Vit. c	+	56	Not cleared
Male	57	+ +	Meta/Vit. c	+	55	Not cleared
Male	54	+	Meta/Vit. c	+	52	Not cleared

Table 2.0 Effects of Alaxin only on patients infected with malaria parasite

Patients	Weight(kg) Before Treatment	Malaria parasite Before treatment	Drug/ supplements	Malaria parasite/After Treatment	Weight(kg) After treatment	Remark
Female	60	+	Alaxin only	_	58	cleared
Female	51	+	Alaxin only	_	49	cleared
Male	50	+	Alaxin only	_	50	cleared
Male	56	+ +	Alaxin only	_	53	cleared

Table 2.1.Effects of Alaxin and Grape fruit Juice (G.J) on patients Infected with malaria parasite

Patients	Weight(kg) Before Treatment	Malaria parasite Before Treatment	Drug/ supplements	Malaria parasite/After treatment	Weight(kg) After treatment	Remark
Female	50	+	Alaxin/GJ	+	50	Not cleared
Female	58	+	Alaxin/GJ	+	57	Not cleared
Male	61	+	Alaxin/GJ	+	61	Not cleared
Male	66	+	Alaxin/GJ	+	65	Not cleared

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Table 2.3. Effects of Alaxin and multi-vitamin (Super-malt) on patients infected with malaria parasite

Patients	Weight(kg) Before Treatment	Malaria parasite Before treatment	Drug/ supplements	Malaria parasite/After Treatment	Weight(kg) After treatment	Remark
Female	51	+	Alaxin/Multi	_	51	Not cleared
Female	53	+	Alaxin/Multi	_	50	Not cleared
Male	59	+	Alaxin/Multi	_	56	Not cleared
Male	54	+	Alaxin/Multi	_	53	Not cleared

Table 2.2.Effects of Alaxin and Orange fruit juice (OJ) on patients infected with malaria parasite

Patients	Weight(kg) Before Treatment	Malaria parasite Before treatment	Drug/ supplements	Malaria parasite/After Treatment	Weight(kg) After treatment	Remark
Female	55	+	Alaxin/OJ	+	51	cleared
Female	59	+ +	Alaxin/ OJ	+	59	Not cleared
Male	54	+	Alaxin/ OJ	+	54	cleared
Male	56	+	Alaxin/ OJ	+	53	cleared

Table 2.4. Effects of Alaxin and Vitamin C on patients infected with malaria parasite

Patients	Weight(kg) Before Treatment	Malaria parasite Before treatment	Drug/ supplements	Malaria parasite/After Treatment	Weight(kg) After treatment	Remark
Female	60	+	Alaxin/Vit. C	+	58	Not cleared
Female	69	+	Alaxin/Vit. C	+	63	Not cleared
Male	53	+	Alaxin/Vit. C	+	51	Not cleared
Male	58	+	Alaxin/Vit. C	+	56	Not cleared

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