Compliance with chloroquine is much better than that reported in other endemic countries. In Kenya Ruebush *et al.* [21], reported that chloroquine at a curative dose of > or = 25 mg /kg body weight was employed in only 12% of cases. However, use of extended course of chloroquine tablets in the present study reflects not only erroneous self-medication but a practice by health workers in this area that is not advisable [23] and should be targeted in official treatment policy statements.

In conclusion, the present study shows the significance of self-medication in malaria case management especially in rural areas where health services are deficient. Streamlining of self-medication could be achieved by health education and continuous monitoring. Malaria microscopy is a basic prerequisite for health services in endemic areas and should be given due priority. Interventions against overuse of injections should include both health education and retraining of health workers. Lastly, the formulation of a national treatment policy and wide dissemination of treatment information is urgently needed and should be based on continuous monitoring of the pattern of use of antimalarial drugs as described in the present survey.

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Table 1: Comparison of clinical and therapeutic variablesd in rural and urban populations.

Variables	Rural	Urban	Chi -Squares	P-values
Proportion receiving antimalarials	391/1556= 25.1%	539/1506 = 35.8%	41.14	0.0000
Proportion of cases receiving more than one course of treatment	17/391= 4.3%	86/539= 16.0%	31.00	0.0000
Treated by medical doctor	38/391= 9.7%	397/539= 73.7%	372.09	0.0000
Treated by paramedic	192/391=49.1%	13/539=2.4%	287.51	0.0000
Proportion of self-medication	161/391=41.2%	129/539=23.9%	31.4	0.0000
Obtaining antimalarial from official source	321/380=84.5%	515/539= 95.5%	33.26	0.0000
Treated, diagnosis confirmed microscopically	133/388 = 34.3%	432/529 = 81.7%	212.5	0.0000
Treated, with positive history of antimalarials in previous 2 weeks	71/391=18.2%	305/539 = 56.6%	138.94	0.0000
Hospitalized	17/391= 4.3%	28/539 =5.2%	0.35	0.5524

rural population received at least one course of antimalarial drugs. In the urban community diagnosis of malaria had been confirmed by microscopy in 81.7 % of the treated cases whereas in the rural community only 34.3 % of the treated cases were confirmed microscopically. A higher proportion of the rural population received self-medication than in the urban population (41.2% versus 23.9%). Of those treated by health professionals, medical doctors treated most patients in urban areas, whereas paramedical staff (nurse or medical assistant) treated most of the rural patients.

The frequencies of individual symptoms in treated cases are shown in Table 2. The frequencies of the most common

Table 2: Frequency of symptoms in all persons treated for malaria

Symptoms	No.	%
Fever	851	91.5
Headache	754	81.1
Vomiting	359	38.6
Bone and joint pains	334	35.9
Fatigue	246	26.5
Nausea	215	23.1
Chills	205	22.0
Diarrhoea	108	11.6
Jaundice	15	1.6
Other	189	20.3

N = 930

symptom combinations in microscopically confirmed and unconfirmed cases are shown in Table 3. There was no significant difference in the frequency of occurrence of these symptom combinations in microscopically confirmed and unconfirmed cases. The frequencies of these symptom combinations did not

Table 3: Most frequent symptom combinations among persons treated for malaria with and without confirmation by blood film.

Symptoms	Unconfirmed n = 352	Confirmed n = 565	Total n = 917
Fever + headache	37 (10.5%)	70 (12.4%)	107 (11.7%)
Fever + headache + bone/joint pains	25 (7.1%)	29 (5.1%)	54 (5.9%)
Fever + headache+ vomiting	24 (6.8%)	46 (8.1%)	70 (7.6 %)
Fever + headache+ fatigue	26 (7.4%)	23 (4.1%)	49 (5.3%)
Fever only	13 (3.7%)	28 (5.0%)	41 (4.5%)
Fever + vomiting	11 (3.1%)	26 (4.6%)	37 (4.0%)
Total	136 (38.6%)	222 (39.3%)	358 (39.0%)

differ significantly between three groups: self-diagnosed cases, cases treated by paramedics and cases treated by doctors (Kruskal-Wallis ANOVA $P > 0.05$). Chloroquine is the most commonly used antimalarial drug (86.7% of episodes), followed by sulphadoxine/pyrimethamine 12.1% and quinine 10.6% . In the rural community chloroquine is taken more frequently as parenteral than oral therapy. This preference for chloroquine injections is notable in cases treated by paramedics who used injections in 131/192 (68.2%) of cases they treated with this drug. Injections are also preferred in self-medication in rural areas where 82/156 (52.6%) of patients who had chloroquine as self-medication had the drug in the form of injections. Tables 4 and 5 show the doses of oral and parenteral chloroquine used for treatment by different providers. Of the other animalarials used, compliance with standard doses was best with sulphadoxine /pyrimethamine (81.2%) and lowest with quinine . Compliance rates with standard dose of quinine were 49.1% in oral treatment, 52.4% in patients treated by intravenous infusion and 57.9% in patients treated by intramuscular injections.

Table 4: Dosage of chloroquine tablets used by adults, distributed according to treatment provider

Dose	Treatment provider			
	Doctor N = 27	Paramedic N = 34	Self medication N = 94	All providers N = 255
Less than 10 tablets*	15 (11.8%)	8 (23.5%)	20 (21.3%)	43 (16.9%)
10 tablets	80 (63.0%)	18 (53.0%)	58 (61.7%)	156 (61.3%)
More than 10 tablets	32 (25.2%)	8 (23.5%)	16 (17.0%)	56 (22.0 %)

** Chloroquine phosphate tablets, 150 mg base*

Table 5: Dosage of chloroquine injections used for treatment of cases, distributed according to treatment provider

Dose	Treatment provider			
	Doctor N = 153	Paramedic N =139	Self-medication N =130	All providers N = 422
Less than 5 IM injections*	14 (9.1%)	18 (13.0%)	44 (33.9%)	76 (18.0%)
5 IM injections	123 (80.4%)	109 (78.4%)	75 (57.7%)	307 (72.7%)
More than 5 IM injections	16 (10.5%)	12 (8.6%)	11 (8.5%)	39 (9.2%)

** In all adults each injection is an ampoule of 5 ml chloroquine phosphate equiv. to 200mg base, in children the exact dose of the injection could not be ascertained.*

Discussion

Rural-urban differences are the most common sources of variation in the patterns of drug seeking behaviour in different

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Malaria case management at the community level in Gezira, Sudan.

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Summary
This study was done to investigate malaria case management at the community level in Gezira, Sudan, which is an area of unstable malaria predominantly due to *Plasmodium falciparum*. Questionnaire surveys were conducted at four consecutive weekly intervals in October 1995. A sample of 400 households (3062 persons) including 200 rural and 200 urban households was studied. Use of antimalarials was assessed in terms of diagnosis, types of antimalarial used, self-medication and compliance. During the four weeks of observation, 25.1% of the rural population and 35.6% of the urban population received at least one course of antimalarial drugs. Diagnosis was confirmed microscopically in 81.7% of treated persons in the urban community and in only 34.3% those treated in the rural community. Chloroquine is the most frequently used antimalarial in both communities with notable overuse of injections in rural patients and in patients treated by paramedical health workers. Self-medication was commoner in rural than in the urban population (41.2% versus 23.9%). Compliance with the standard therapeutic doses was poorest with quinine and best with sulfadoxine/pyrimethamine. It is suggested that interventions to improve the use of antimalarials should include health education, training of health workers and dissemination of national treatment policies.

Keywords: *Malaria, management community, Sudan*

Résumé
Cette etude a ete faite dans le but de l'investigation manageriale des cas de paludrsme an nivean communautaire a Gezira an Soudan, qui est une zone paludeenne instable, cause par le plasmodium falciparum des questionnaires ont ete distribute durant quatre semmaines consecutive d'interval en Octobre 1995. Un echantillon de 400 familles (3062 personnes) incluant 200 families rurales et 200 urbaines ont ete etudies. L'usage des antipaludisms a ete evalue enterme du diagnostic, type de medicaments utilises, baitement par soimem et conformite. An cours des quatre semaines d'observation, 25% de la population rurale et 35.6% de la population urbaine ont recu an moins un cours sur les medicaments antipaludeen. Le diagnostic a ewte confirme microscopiquement dans 81.7% des personne traitees dans la communaute urbaire et sentment 34.3% de ceux trantes en zone rurale. La chloroquine est le medicament frequemment utilise dans les deux communinautes avec un abus d'injections en zone paysomne et les patients traites par le personnel paramedical. Le traitement par soi-mene etait plus commun dans les communites villageoises, contrairement a lo zone urbaine (42.2% contre 23.9%) Conformite avec le standard therapeutique etait mediocre avec la quimne et meilleur avec la sulfadoxone/ pyrimethamine. Il est surgere que l'intervention dans le but d'ameliorer l'mage des medicaments antipalustres doit incorporer l'education la formation du personeel de sante et la dissemination de la politique nationale de traitement.

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Introduction

Early diagnosis and appropriate treatment is a key strategy for control of malaria. In communities with limited access to health care facilities, most patients resort to self-medication [1,2]. Unrestricted access to drugs and non-compliance are major factors creating drug pressure that leads to drug resistance. Home is the setting where diagnosis and treatment of most cases of malaria take place in most endemic areas [3]. In this setting, identification of the symptoms of the disease and decisions on seeking rapid and appropriate care and treatment are taken. These decisions eventually affect the prognosis and outcome of the disease.

In the Sudan , strains of *Plasmodium falciparm* resistant to chloroquine are already prevalent [4,5] , and resistance to pyrimethamine/sulfadoxine has been reported [6]. This heterogeneous pattern of drug susceptibility and the absence of strict control over distribution of drugs have lead to haphazard and irrational use of antimalarial drugs. Self-diagnosed cases of malaria have unrestricted access to several antimalarial drugs: chloroquine, quinine, pyimethethamine/sulfadoxine and mefloquine, including parenteral preparations . The present study was done in Gezira State, which is the main area for irrigated crop-producing agricultural schemes in the Sudan. This is an area of unstable malaria due to *Plasmodium falciparum* with a seasonal peak in October following the rainy season. The pattern of antimalarial drug use was investigated at the community level. A better understanding of this aspect of malaria in the community is needed for more effective interventions to improve malaria case management. The present study aimed at exploring community practices in malaria case management.

Materials and methods

Two urban and two rural localities were surveyed. The urban communities were residents of two blocks in Wad-Medani town, the capital of Gezira State, with relatively high socio-economic standards and easy access to pharmacies, hospitals and private clinics. The rural communities were residents of two villages: Ganneb and Shukkaba, located at 16 kilometers and 12 kilomters, respectively, south of Wad-Medani. These rural communities represent areas with lower socio-economic standards and limited access to health care facilities. In each locality, selection of households for the study was done by random selection of the households. The selected households were interviewed at weekly intervals for four consecutive weeks, ,starting at the beginning of October 1995,using a standard questionnaire. Interviews were conducted by trained field workers who filled the questionnaire according to responses of the head of the household. The questionnaire covered the identification of family members treated for malaria in the previous week, and details on how malaria was diagnosed and particulars about the treatment given.

Data analysis was done using SPSS and EpiInfo 6.

Results

The house survey covered a sample of 200 rural households (1556 persons) and 200 urban households (1506 persons). A summary of clinical and therapeutic variables in the rural and urban communities is shown in Table 1. During the 4 weeks of observation, 35.8% of the urban population and 25.1% of the

endemic areas in Africa and Asia [7]. Moreover, in Sudan, rural communities represent about 80% of the population. Thus, for accuracy of assessment we need to distinguish between the two communities in several aspects related to management of malaria. With the known deficiency in laboratory services in endemic areas, clinical diagnosis is the main method for identification of malaria cases for self-medication as well as in patients served by health institutions. The need for improvement in case identification is increasingly being felt for appropriate malaria case management. To meet this demand, several workers have attempted to set clinical criteria for identification of cases of malaria. These attempts were met with several difficulties. A fundamental question to be addressed in tackling this problem is how to define a case of malaria. It appears that there is no gold standard and different workers have adopted different definitions. Several factors should be considered in evaluation of the validity of clinical diagnosis of malaria, including age of the patient, the level of endemicity and seasonality of malaria and other febrile illnesses. [3]

Luxemburger *et al.* [8] studied clinical predictors of malaria in an area of low and unstable transmission in Thailand. They found that clinical symptoms or signs associated with a final diagnosis of malaria were: confirmed fever, (headache,muscle and/or joint pain, nausea), clinical anaemia, palpable spleen,palpable liver, absence of cough and absence of diarrhoea . However, none of these signs alone or in combination proved a good predictor of malaria. Therefore best clinical diagnostic algorithms would result in prescription of antimalarial drugs in 28-29% of the non-malaria febrile episodes, and only 49% of the true malaria cases.. In India, Govardhini *et al.* [9] reported that although fever alone could detect 74.4% of the parasite positive cases, the inclusion of other symptoms like headache, vomiting, nausea, bodyache and diarrhoea marginally increased the efficiency of discrimination to 74.7%. In areas of unstable malaria in African Sahel the practice of presumptive diagnosis and treatment of fevers with antimalarials is reported to present a particularly significant risk of mistreatment especially in children [10].

In the present study most patients had fever (91.5%) and/or headache (81.1%). However all symptom combinations occurred at too low frequencies to be reliable as discriminating in the diagnosis of malaria. Taking a positive blood film as a reference test, the symptom complex of fever or fever in different combinations with headache, vomiting, fatigue and joint/bone ache occurred with positive predictive value of 39%. There was no significant difference in the pattern of symptoms between self-diagnosed cases and cases diagnosed by doctors or paramedical staff. This underscores the importance of supporting clinical diagnosis by blood film examination. Several studies have been carried out in different epidemiological settings in attempts to improve validity of clinical diagnosis of malaria in Tanzania [11,12], Papua New Guinea [13], Nigeria [14], Malawi [15], Zimbabwe [16] and Niger [17] .The findings of these studies only supported the need for improved microscopy services as essential aid to clinical diagnosis at the primary care level.

The concordance between the frequency of different clinical symptom in cases treated by doctors, paramedics and in self-treated cases points to the fact that the community perception of the clinical symptoms of malaria is not far from that of health workers. In Gabon Phillipps *et al.*[18] reported that, taking a thin blood film as standard, the positive predictive of clinical diagnosis in self-diagnosed patients was superior to that of paediatric and adult cases diagnosed clinically by doctors.

The marked discrepancy between urban and rural communities in the proportion of microscopically confirmed cases is due easy access to laboratory diagnostic services in the urban areas and the lack of such services in rural areas. The high rate of utilization these facilities in urban areas also points to the fact that even for self–medication people in urban areas tend to go directly to private laboratories to seek confirmation of diagnosis by blood film.

Self-medication with antimalarials is widespread in many endemic areas worldwide [19]. It is reported to be as high as 71.1% in a sample in Dar Es Salaam, Tanzania [20]. In a rural area in Kenya , Ruebush *et al* [21] reported that of 138 episodes of febrile illness only 18% receive treatment in a health-care facility while 60% were treated at home with herbal remedies or with medicine purchased at shops. The practice of selling antimalarials in shops and groceries and other unofficial sources is prevalent in many African countries [2,20]. In Gezira most antimalarial drugs, even those used for self-medications are purchased from official sources, including injections and intravenous fluids. This is because pharmacies and health centres in the study area sell antimalarials without prescription. The advantage in this situation is that self-medication could be streamlined by appropriate instruction of workers in these health facilities.

Injections are regarded as more effective than oral medications in Kenya [21] and in Guatemala [22]. In the present study, over-use of injection is most notable in cases treated by paramedics compared to those treated by medical doctors. It is interesting that self-medication in rural areas, where most health care is delivered by paramedics, is characterized by greater use of injections. Conversely self-medication in urban areas, where medical doctors see most patients, is predominantly by oral medications. It seems that patient and their attending clinicians tend to influence each other in this context. Thus the patients tend to follow the practices of their attending clinicians and at the same time clinicians tend to submit to the wish of their patients where there are strong public convictions in favour of injections over oral medications. In this area paramedics are generally underpaid and their income depends to a large extent on fees they gain for dressing wounds and giving injections. This creates a vested interest in giving more injection. Another factor contributing to greater use of injection in rural areas is cultural belief that injections are more potent than tablets. Traditionally medical treatment had been associated with pain in many practices, which are still popular, e.g., cautary and phlebotomy. Painful injections probably lend themselves more in a culture that still tends to lean towards traditional medicine. The overuse of injections is an unnecessary burden to the meager health resources; it puts the patient under greater risks of side effects and is more frequently given in sub-therapeutic total dose.

A striking finding in the present study is the high proportion of patients who had antimalarials in the two weeks previous to the survey (56.6% of treated urban population) and those repeating treatment during the 4 weeks of observation (16.0% of treated urban population). The successive use of antimalarials by the same patient could be explained by multiple factors. Treatment failures could explain some cases, these failures may be due to low therapeutic efficacy of antimalarials or use of sub-therapeutic doses. In others, malaria could have been a misdiagnosis from the beginning. Failing to get a favourable response the patient usually resorts to another course of antimalarials. For better understanding of the situation we need to have clear information about accuracy of laboratory diagnosis and therapeutic efficacy of antimalarials in the study area.

Compliance with standard doses of antimalarials is poorest with quinine due to its unpleasant side-effects.