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Assessment of patient knowledge and adherence to anti-malarial drugs at Boditi Health Centre in Wolaita Zone, Southern Ethiopia

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Abstract

The adherence level of patients determines the effectiveness of drugs taken by the patient. Non-adherence of medication to infective diseases causes both treatment failure and drug resistant. The objective of this study was to assess patient knowledge, adherence to anti-malarial drugs and associated factors at Bodit health centre in Wolaita zone, Southern Ethiopia. Patient-exit interview was conducted with 384 patients to assess patient understanding of malaria and anti-malarial drug use. They were interviewed on 3rd and 4th days of anti-malarial drug prescription from November 01/2016 to April 30/2017. About 75.6% of respondents have adequate knowledge on how to take anti-malarial drugs and patient adherence was 62.0%. The major reasons for non-adherences to anti-malarial drug use were taking drugs more or less duration (10.7%, n=41), drug sharing within families and neighbour (6.5%, n=25), keeping drugs for future use (4.9%, n=19), not replacing after vomiting (4.4%, n=17), stopping taking drugs after relieve of malaria symptoms (11.5%, n=44). Patients with adequate knowledge (AOR: 1.97 95% CI: 1.17, 3.33), patients previously treated for malaria (AOR: 2.53 95% CI: 1.56, 4.10), and urban residents (AOR: 1.83 95% CI 1.07, 3.12) were more likely to adhere to anti-malarial drugs. Malaria patients with diploma and above academic level are more than two times (AOR: 2.46 95% CI: 2.20, 2.89) more likely to adhere to anti-malarial drug treatment than non-educated. In conclusion, the patient knowledge about malaria is adequate but adherence to anti-malarial drugs is not adequate. Interventions such as patient education and patient counselling are important to improve patient knowledge and adherence.

Keywords: Adherence, Anti-Malarial Drugs, Health Centre, Malaria

Introduction

Malaria is a disease caused by protozoan parasites that belongs to the genus *Plasmodium.* The five species of the parasite in human are *P. falciparum, P. vivax, P. malariae, P.ovale and P. knowlesi* account for more than 95% of the cases of malaria in the world (Cox-Singh et al., 2008). Malaria is transmitted by the bite of infective female anopheles mosquitoes. It is a

major human health threat in tropical and subtropical regions of the world. Malaria kills about 1 million people each year. From the total deaths of malaria in the world, about 90% occurs in Africa (WHO, 2015).

The majority of infections in Africa are caused by *P. falciparum* which is the most dangerous of the four human malaria parasites transmitted by the vector female *Anopheles mosquitoes.* Malaria constitutes a major public health problem and impediment to socioeconomic development in Ethiopia. It is estimated that about 75% of the total area of the country and 65% of the population is estimated to be at risk of infection. The switch from the previously predominant *P. vivax to P. falciparum* has been reported in some areas of Ethiopia. Currently the P. *falciparum* accounts for about 60% of the cases of malaria and *P. vivax* accounts for about 40% in Ethiopia (FMOH, 2007).

Ethiopia is among the few countries with unstable malaria transmission. Consequently, malaria epidemics are serious public health emergencies. Malaria is mainly seasonal in the highland fringe areas and of relatively longer transmission duration in lowland areas, river basins and valleys (FMOH, 2012). In Ethiopia, malaria control has an integrated approach that is vector control with long lasting Insecticide Treated Nets, Insecticide Residual Spray, early diagnosis and treatment, environmental modification and education that help to reduce malaria (FMOH, 2007). The major clinical features of malaria include, severe anemia due to reduced production and increased destruction of red blood cells (RBCs), cerebral complications due to micro-vascular obstruction in the brain, which causes impaired consciousness, convulsions and long term neurological deficits of metabolic acidosis, reduced tissue perfusion, hypoglycemia, hypoxia due to respiratory distress and pulmonary pathology and placental infection during pregnancy. Whereas severe headache, fever, vomiting, sequestration of RBCs, anemia and loss of appetite are the clinical features of uncomplicated malaria (WHO, 2006a).

Malaria treatment with effective anti-malarial drugs is one of integrated approaches of malaria control. The effectiveness of anti-malarial drugs administered to the patients mainly depends on the patient adherence. Non-adherence to medication such as anti-infective drugs causes both treatment failure and drug resistant parasites (Yeung and White, 2005). Ensuring adherence to drugs is very essential to minimize drug resistance (Steel et al., 2007). The overall efforts made during availing drugs and medical supplies, diagnosis process, prescription and dispensing process and overall expenses of patients during the treatment process, will be useless if the patient does not adhere to the treatment schedule (Rigby, 2007; Quick et al., 1997).

Therefore, patient adherence to appropriate drug administration, which includes an appropriate dose of drugs, time/interval of drug taking and duration of full treatment, directly affects the response to anti-malarial drugs (Amin et al., 2004). Poor adherence to medication regimens contributes to a worsening of diseases, and death due to inadequate dose regimen. Poor adherence to medication also contributes to increased healthcare costs, by promoting resistance to available low cost drugs. Furthermore, some studies indicate that about half of those patients for whom medicines are prescribed, do not take them correctly (WHO, 2003).

Patient adherence to malaria medication is influenced by many factors. According to Joint Formulary Committee (2019), inadequate follow up, poor provider patient relationship, unclear instructions for administration and patient lack of belief in benefit of treatment are major predictors of adherence to medication. The type of drug packages also affects the adherence of patients. Easy to handle and use packages such as blister packs encourage completion of the treatment course and correct dosing (WHO, 2010). Duration in terms of the number of days and doses of the drug administered to the patient also affect the patient adherence. Amin et al indicate that a single dose of sulphadoxine–pyrimethamine (SP) was found to be "adequately adhered" by 66.7% of patients, but that a three day dose of amodiaquine (AQ) was adhered to by only 13.8% of patients. The patient's treatment adherence is also determined by factors such as perception of the disease and perception of treatment (such as taste, cost, and complexity of the schedule and side effects) (Souares et al., 2009).

The benefit of medicines to treat health problems not only depends on the effectiveness of medicines, but also on appropriate use of those medicines i.e. patient adherence (Osterberg and Blaschke, 2005). Particularly in treatment of life threatening diseases such as malaria, patients' appropriate compliance with health workers instruction and appropriate use of efficacious medicines not only minimizes the incidence of drug resistance, but also prevents the development of severe malaria (WHO, 2006).

The WHO indicated that, in most countries of the world that previously have effective drugs such as sulphadoxine-pyremethamine and chloroquine, which were used for long time to treat malaria, are now out of use due to resistance of malaria parasites (WHO, 2010). Poor adherence by the patient is among the main reasons contributing to the resistance of malaria parasites to antimalarial drugs. Hence, effective management of malaria requires not only appropriate diagnosis and prescription, but also appropriate patient use of anti-malarial drugs. According to the WHO, the correct use of anti-malarial drugs by patients is an important part

of malaria treatment. The WHO also emphasizes that the effectiveness of anti-malarial drugs against malaria is most significantly determined by patient adherence (WHO, 2006).

The adequacy of information or explanation given during prescribing or dispensing to patients or caregivers also determines the adherence level of patients. Prescribers and dispensers should, therefore, give a clear and comprehensible explanation of how to use the medicines (WHO, 2010; Osterberg and Blaschke, 2005). Providing adequate information by health workers about malaria and anti-malarial drugs during prescription and dispensing is important to promoting adherence and increasing cure rates (WHO, 2006).

Methods

Study area and study period

Boditi Health Centre is one of health centres in Wolaita zone. Boditi Health Centre is located 18 km north of Sodo town (the capital city of Wolaita zone), 362 km south of Addis Ababa, the capital city of Ethiopia and 132 km west from Hawassa, the capital city of Southern Nation, Nationalities and Peoples' Region. Boditi city administration has one health centre, 11 private clinics and 8 drug retail outlets. Boditi is one of the highest malaria prevalent areas of Wolaita zone. The study was conducted from November 01/2016 to April 30/2017.

Study design

Health facility based cross sectional study design was employed to assess patient knowledge and adherence to anti-malarial drugs.

Source population

The source populations were those patients treated malaria in two months period at Boditi Health Center from November 01/2016 to April 30/2017.

Study population

The study populations were those malaria patients selected systematically from Boditi Health Center during study period.

Sample size determination

The sample size was calculated using a single population proportion formula with the assumptions of 95% confidence interval, 5% margin of error and 50% adherence based on different studies which indicate about half of those patients for whom medicines are prescribed, do not take them correctly (WHO, 2003). So, the sample size was 384.

Sampling techniques and data collection

Systematic random sampling method was used to select patients for exit interview and patient adherence assessment from March 1/2017 to April 30/2017. The malaria patient's registration book and patient records were used to check whether the patients were prescribed with appropriate drug, dose and duration. Those patients who were prescribed with appropriate drug (chloroquine or Coartem), adequate dose and duration were included in the study. Those patients who were prescribed under dose and incorrect duration were excluded from the study. The exit interview to assess the patient knowledge was conducted at health centre and patients were interviewed for assessment of adherence at home after completion of treatment.

Exit interview was conducted to assess patient understanding of anti-malarial drug use. During exit interview the patients were asked to answer the name of drugs prescribed, dose, duration, and consequences of not completing anti-malarial drugs. During adherence assessment, the patients were requested to respond how they used drugs, the reason why they didn't use the drugs according to the guideline and also asked to show the package of anti-malarial drugs. Data was analyzed using statistical package for social sciences (SPSS) Version 23. The analysis was done as frequency table, proportions and also means with standard deviation to measure the descriptive statistics of the study. To identify factors associated with patient adherence to anti-malarial drugs, logistic regression model was used. Using Bi variable logistic regression model, candidate variables with P value < 0.25 were identified for multi logistic regression. Adjusted odds ratio (AOR) with 95% CI was estimated to identify the associated factors.

Operational definitions

Patient adherence: the compliance of malaria patients to the prescribed medicine (anti-malarial drug). It was measured in two ways: the patient report how they used drugs (time, duration, and dose) and the package of drugs that was checked by data collectors.

Patient knowledge: the understanding or awareness of patients about the seriousness of malaria, names of drugs, dose, and duration which the anti-malarial drugs were prescribed for.

Adequate patient knowledge: Those patients who know the name of drug prescribed, dose, duration of anti-malarial drug administration, and awareness of patients about the seriousness of malaria were considered to have adequate knowledge

Data quality assurance

The data from patients about knowledge and adherence were collected using standardized questionnaire which was used in different related studies. Pre-test was conducted at Gacheno Health Centre, which is 11 km far from Boditi Health Centre, to assess the adequacy and validity of questionnaire. Data collectors were trained for two days and two supervisors including principal investigator were assigned to check the data quality.

Ethical considerations

Ethical clearance was obtained from research and publication office of Wolaita Sodo University ethical review board and permission letter was obtained from Wolaita Zone Health Department.

Results

The average age of participants was 36 (SD=9.8) and 42% of participants were females. About 67% of malaria patients interviewed were from rural area (Table 1). This assessment was focused on those patients prescribed with chloroquine or Coartem. From the total study participants, about 35% (134) were prescribed with chloroquine and 65% (250) were prescribed with coartem.

Patient knowledge about malaria and anti-malarial drugs

From the total of 384 patients interviewed during exit interview about 66.5% (332) correctly answered the name of drugs which were prescribed to them. But 33.5% (52) did not know the names of drugs prescribed to them. From the total of exit interview participants, 75.6% (290) knew the dose of drugs and duration of treatment. The exit interview also indicated that most of malaria patients (89%) are aware of seriousness of malaria and about 80% of malaria patients mentioned the major signs and symptoms of malaria. The majority (97%, 373) of the patients knew fever is the major sign of malaria (Table 2).

Table 1: Socio-demographic characteristics of malaria patients for exit interview at Boditi Health Centre

Variables	Frequency	Percentage (%)
Age categories		
18 to 27	76	19.7
28 to 35	114	29.7
36 to 45	89	23.2
46 to 55	55	14.3
Above 55	48	12.5
Marital status		
Single	69	18
Married	285	74.2
Divorced	15	3.91
Widowed	25	6.51
Religion		
Muslim	58	15.1
Protestant	222	57.8
Catholic	24	6.25
Orthodox	80	20.8
Occupation		
Government employed	67	17.4
Private employed	73	19
Farmers	150	39.1
Merchants	75	19.5
House wife	19	4.95
Education		
Illiterate	94	24.5
Grade 1 to 8	63	42.4
Completed 9 to 12	127	20.1
College Diploma and above	100	13.0
Residence		
Rural	260	67.0
Urban	129	33.0

Table 2: Patient knowledge to malaria and anti-malarial drugs at Boditi Health Centre

Variables	Frequency	Percentage (%)
Knows name of drug prescribed	255	66.4
Knows the dose of drug prescribed	290	75.5
Aware of seriousness of malaria as a disease	341	88.8
Knows major sign and symptom of malaria	307	79.9
Has adequate knowledge	234	60.1

Patient adherence to chloroquine and coartem drugs

From the total of 384 patients, about 35% (134) were prescribed with chloroquine. From those patients prescribed with chloroquine, about 58.2 % (78) patients reported that they used chloroquine correctly according to the advice given to them. About 19.4% (26) finished the drug but in wrong duration (used in 4 days) and about 12.7% (17) of the patients finished the drug in less than the duration required. About 9.7% (13) of patients reported that they didn't replace the vomited amount of drugs and these patients told the interviewer that they do not know what to do after vomiting (Table 3). The reasons for not adhering to the prescription were, drug sharing with family members, stopping drug taking after relieve of sign and symptoms, forgetting the time of drug taking. From total of 384 patients, about 65% (250) were prescribed with coartem. From those patients prescribed coartem, 64% (160) patients reported that they used Coartem according to the prescription and advice of the health workers. About 36% (90) did not use Coartem according to the prescription. The reason for not using according to the prescription were, drug sharing with family members, stopping drug taking after relieve of sign and symptoms, forgetting the time of drug taking (Table 3).

Table 3: Patient adherence to chloroquine and coartem at Boditi Health Centre

Patient adherence	Variables	Frequency	Percentage
Patient adherence to chloroquine	Used chloroquine appropriately (completed chloroquine in 3 days)	78	58.2
	Used chloroquine in 4 days	26	19.4
	Used chloroquine in 2 days	17	12.7
	Not replaced chloroquine after vomiting	13	9.7
Patient adherence to coartem and both drugs	Adherence to coartem	160	64
	Adherence to both drugs	238	62

From total of 384 patients, about 65% (250) were prescribed with coartem. From those, 64% (160) patients reported that they used coartem according to the prescription and advice of the health workers. The reason for not adhering to the prescription were, drug sharing with family members, stopping drug taking after relieve of sign and symptoms, forgetting the time of drug taking.

About 62.0% (238) malaria patients reported that they used anti-malarial drugs appropriately as health workers' advice. However, significant numbers of patients (38.0 %, n=146) did not use anti-malarial drugs as indicated in guidelines. The findings in table 4 indicate that about 38% (146) malaria patients were not using anti-malarial drugs according to malaria treatment guidelines. The reason why they didn't follow health workers' advice are taking drugs more or less attained duration (10.9%, 42), drug sharing with in families and neighbour (6.5%, 25), keeping drugs for future use (4.9%, 19), not replacing after vomiting (4.5%, 17), stopping taking drugs after relieve of malaria symptoms (11.7%, 45). Missing the 5^{th} and 6^{th} doses of coartem is a problem encountered by some patients who fail to use the drugs as indicated by health workers. The main reason mentioned by the patients for missing 5^{th} and 6^{th} doses was the relief of symptoms after three or four doses of chloroquine or coartem.

Association of variables with patient adherence to anti-malarial drugs

Multivariate analysis revealed that those patients with adequate knowledge about malaria and anti-malarial drugs were about two times (AOR=1.973, CI=1.168, 3.334) adhering to anti-malarial drugs than those without adequate knowledge. Those patients who were treated for malaria previously were more than two times (AOR=2.528**,** =1.558, 4.103) adhere to anti-malarial treatment than those not treated for malaria case. Malaria patients from rural area were less adheres to anti-malarial treatment compared to those patients from urban area. Regarding educational backgrounds, those malaria patients with diploma and above in their education level are more than two times (AOR=2.46, CI=2.20, 2.89**)** adhere to anti-malarial drug treatment than non-educated (Table 4).

Table 4: Association of variables with patient adherence to anti-malarial drugs at Boditi

Variables	Adherence status		Crude OR	Adjusted OR
	Yes	No		
Education				
Illiterate	55	39	1	1
Grade 1 to 8	32	31	0.86 (0.45,1.63)	0.9 (0.41, 1.88)
Grade 9-12	70	57	1.0 (0.49,2.05)	1.17 (0.51,2.70)
College Diploma and above	81	19	2.4 (2.20. 2.79)	2.46 (2.20, 2.89)*
Residence				
Rural	150	110	1	1
Urban	88	41	1.79 (1.12, 2.86)	1.83 (1.07, 3.12)*
History of malaria treatment				
Not treated malaria before	115	86	1	1
Treated malaria before	123	60	3.56 (2.48, 5.12)	2.528 (1.56, 4.10)*
Knowledge				
No Adequate knowledge	69	81	1	1
Adequate knowledge	169	65	2.17 (1.51, 3.13)	1.97 (1.17, 3.33)*

Discussion

Ensuring prompt and effective treatment will prevent most cases of uncomplicated malaria from progressing to severe and fatal illness. Effective malaria treatment not only requires improved diagnosis of malaria but also access to effective anti-malarial drugs and patient adherence. The patients also should be aware of the importance of seeking early diagnosis and treatment and adhering to prescribed drug regimens for malaria (FMOH, 2012).

Patient knowledge about anti-malarial drugs use is very important for adherence to anti-malarial drugs. The study conducted by Agyepong et al. (2002) in Ghana indicated that, the clarity and the quality of client-dispenser communication are important to improve adherence. A study done by Souares et al. (2009) also indicated that information given to the patients at the time of prescribing and dispensing consultation is important to improving adherence and to preventing the emergence of rapid drug resistance.

Knowledge about the seriousness of the disease also determines the adherence of patients to drugs. During data collection the patients' interview revealed that most (88.8%) of the patients knew about the seriousness of malaria and are actively involved in malaria prevention activities. The majority (79.9%) of patients also correctly mentioned the sign and symptoms of malaria, the causes of malaria, and the prevention methods. The study conducted in south western Ethiopia indicated that caregivers have adequate knowledge about the signs and symptoms of malaria (Delenasaw et al., 2010). This finding is supported by a study conducted by Legesse and Deressa on community awareness about malaria, its treatment and mosquito vector in rural highlands of central Ethiopia (Mengistu and Wakgaria, 2009).

In this study about 75.5% (290) of participants correctly mentioned the dose of Coartem and chloroquine. This is low performance compared to the finding of Kachur et al. (2004) which indicated that the knowledge of patients about correct dosage is 89.8%. Therefore, the patients' knowledge about their drug regimen is inadequate. Kamat and Nyato (2010) in their study also found that the mother knowledge and reporting of the dosage schedule was not consistent with recommended doses.

About 58.2% (78) of malaria patients adhere to chloroquine in the study area, This better performance compared to a study conducted in Thailand which indicated that about 76.2% of patients diagnosed with *P. vivax* did not adhere to chloroquine medication for two reasons: low knowledge score about malaria and lack of access to adequate information on antimalarial medications (Khantikul et al., 2009). But, in this study, it was found that about 40% of patients didn't take their drugs appropriately. Therefore, it needs intervention to improve patient adherence to anti-malarial drugs.

The study indicated that, 62.0% (238) of malaria patients adhered to anti-malarial drugs. This is low performance compared to the study conducted in Uganda which found that 90% of malaria patients' adherence to anti-malarial drugs (Fogg et al., 2004). About 24.5% (94) did not know the dose of drugs and duration of treatment. This contributed for low patient adherence to anti-malarial drugs. Patient knowledge about drugs prescribed and awareness about the consequences of inappropriate use are important factors that promote patient adherence. The knowledge of patients about correct dosage is directly related to the patient adherence to medication regimen. It is also reported by Kachur et al. (2004) that, good communication between health workers and patients create understanding and knowledge of the seriousness of malaria for patients and stresses the importance of medication adherence.

Multivariate analysis revealed that those patients with adequate knowledge about malaria and anti-malarial drugs are about two times more likely to adhere to anti-malarial drugs than those without adequate knowledge. Those patients previously treated malaria are more than two times adhere to anti-malarial treatment than those not treated for malaria case previously. Malaria patients from rural areas are less likely to adhere to anti-malarial treatment compared to those patients from urban area. This may be due to low access to information in rural areas compared to urban. Regarding educational backgrounds, those malaria patients with diploma and above in their education level over two folds likely to adhere to anti-malarial drug treatment than non-educated. This might be due to the fact that more educated people have relatively good awareness about drug resistance and consequences of non-adherence. Adherence to malaria treatment is necessary for successful malaria treatment outcome. Poor adherence to treatment is one of the factors associated with the development of malaria drug resistance and can contribute to ongoing transmission of malaria (FMOH, 2012).

Conclusion

This study revealed that most of study participants have adequate knowledge about the seriousness of malaria but the patient adherence to anti-malarial drugs is not adequate. Patient knowledge, education status, residence and malaria treatment experience are associated with patient adherence to anti-malarial drugs. Therefore, to improve patient adherence to anti-malarial drugs and effectiveness of malaria treatment interventions such as patient education and patient counselling are important.

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