MANAGEMENT OF CHILDHOOD MALARIA USING ARTEMISININ MONOTHERAPY BY PRIVATE RETAIL PHARMACIES IN DAR-ES-SALAAM.

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A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS OF PUBLIC HEALTH IN THE UNIVERSITY OF DAR ES SALAAM

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CERTIFICATION

The undersigned certifies that he has read and hereby recommends for acceptance by the University of Dar es Salaam a dissertation titled; MANAGEMENT OF CHILDHOOD MALARIA USING ARTEMISININ MONOTHERAPY BY PRIVATE RETAIL PHARMACIES IN DAR ES SALAAM in partial fulfillment of the requirements for the degree of Masters of Public Health.

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Date 14. Oct. 2005

DECLARATION

I hereby solemnly declare that this dissertation is my original work, and that it has never been submitted for a diploma or degree in any other university.

Candidate's signature: _____

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Date 14-10-2005

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DEDICATION

This work is dedicated to my lovely wife Joyce

And my loving daughter Brenda.

ABSTRACT

A cross section survey was undertaken during June –July to assess how drug sellers manage both prescription and non-prescription clients for Artemisinin Monotherapy for management of childhood malaria from private retail pharmacies in Dar es Salaam. The study involved a total of 200 drug dispensers as respondents interviewed of whom 66.5% were females and the rest were males. Also, a total of 60 encounters as Simulated Clients were performed from which 61.7% of drug dispensers were females the rest being males. Results indicated that 75.0 % of the drug sellers mentioned vomiting and diarrhea as the common symptoms of malaria in children while only 41.0% mentioning fever, 62.5% headache and 45.5% loss of appetite. Over 90.0% of all drug dispensers mentioned ITNs as the key measure in prevention of malaria. Of the interviewed drug dispensers, 75.0% were aware of the current malaria treatment guideline from which 61.3% and 42.0% gave a correct first and second line drug respectively while only 28.0% of all drug dispensers were able to come out with the correct dose of artesunate tablet for the child.

In simulated customer interview, 73.3% of all encounters did not ask for prescription before dispensing the drug. More than 75.0% of all drug dispensers gave correct instruction on dispensing the drug. The findings show that dispensers do not conform to the required regulations in the management of childhood malaria according to national malaria treatment guideline. There is a need for education provision to dispensers to add knowledge and improve practice.

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ACRONYMS AND ABBREVIATIONS.

ACT	Artemisinin-based Combination Therapy
AM	Artemisinin monotherapy
CQ	Chloroquine
DSM	Dar es Salaam
MOH	Ministry of Health
MUCHS	Muhimbili University College of Health Sciences
NMCP	National Malaria Control Programme
OTC	Over the Counter
RBM	Roll Back Malaria
SCM	Simulated Client Method
SP	Sulfadoxine-Pyrimethamine
TFDA	Tanzania Food and Drug Authority

CHAPTER 1.

1.1 INTRODUCTION

Malaria is a disease caused by a protozoan parasite called *Plasmodium*. There are four species namely; P.*falciparum,* P.*ovale,* P.*vivax* and P *malaria*e. Among the four, P. *falciparum* is the commonest in most parts of Africa accounting up to 98% of all malaria cases (Mohamed, 2003). The disease is transmitted by the bite of an infective female Anopheline mosquito.

Malaria is a major public health problem, killing at least one million people each year, mostly in sub Saharan Africa (MOH, 2003). It is estimated that 300-500 million cases of malaria occur in the World, 90% of which comes from Sub Saharan Africa. Approximately 30-50% of all admissions in Africa are recorded due to malaria (MSF, 2003). In Tanzania more than 30 million people are at risk of developing malaria and approximately sixteen million cases occur each year, about 100,000 people die due to malaria. It is a major cause of under fives mortality particularly children aged under two years, and inflicts a huge burden of disease due to anemia especially in pregnant women. (Daily News, 2005).

Malaria is endemic in most parts of Tanzania because of favorable climatic condition which favors breeding of Anopheles mosquitoes, there is both high rainfall and temperature, this has attributed to persistence of malaria in Tanzania.

Low social economic status of resource-poor countries like Tanzania has contributed largely to malaria persistence in the country simply because people can not easily access health facilities, lack of laboratory equipment for diagnosis, shortage of drugs which in totality leads to poor case management of malaria (Nsimba et al, 2002). Thus, recording high malaria specific mortality.

In Tanzania like in any other Sub Saharan country, health facilities are not very accessible, about 50% to 80% of people will first visit private drug outlets or practitioners for malaria treatment (Paula et al, 2003).The emergence of private sector in health perhaps has an advantage of complementing the Government in the provision of health services if appropriately regulated.

In Tanzania the pharmaceutical products are classified into two major groups namely; part I poisons. These are to be stored and dispensed upon presentation of a prescription from a qualified physician, dentist or a veterinary surgeon; these are found in what is commonly referred as pharmacy. All antibiotics and Artemisinin single and combination therapy fall under this group (TFDA, 2003).

The second group is the part II shops (maduka ya dawa) which includes all pharmaceutical products which do not necessarily require a prescription (over the counter) and are of common use like analgesics and anti- malarials like SP and

amodiaquine which are the first and second line anti- malarial drugs respectively in malaria treatment guidelines in Tanzania (MOH, 2002).

Currently, treatment of malaria in Tanzania is governed by the treatment guideline whereby SP is the first line drug, amodiaquine is the second line and quinine third line for severe and complicated malaria, however there are other drugs which are reserved for cases which do not respond to the above therapy, these are Artemisinin monotherapies and combinations popularly known as Chinese medicine. Artemisinin drugs are extracted from a plant know as Artemisia *annua*. Though this class of artemisinin derivatives are prescription drugs, observation shows that there is a wide spread use from private drug outlets even without prescription. This trend may be a threatening and a drawback to malaria control strategies as far as malaria cases management is concerned since the quality of services in malaria management by drug outlets in Dare es Salaam has previously been reported as being not convincingly good (Massele et al, 1993), the attributing factors being poor dispensing practice and low knowledge of drug sellers. The question of knowledge of dosage to children with malaria is even worse for artemisinin drugs whereby only 2% of drug sellers from drug sellers in drug shops from Kinondoni municipality could tell the correct dose of artesunate for children (Mohamed, 2003).

With the current practice where the artemisinin are dispensed with incorrect dose especially in children, there is a fear that resistance to artemisnin will arise, but it is impossible to predict when. The increasing use of artemisinin and its derivatives is likely to be a risk factor (WHO, 1998). Tanzania will soon adopt Artemisinin-based combination therapy (artemether +lumefantrine= Coartem) as first line drug substituting SP. The combination therapy is more expensive than single monotherapies, for this reason in private drug outlets the monotherapies brands of artemisinin will continue to be used (personal communication). Therefore it is important to study the way how Artemisinin monotherapy are managed by drug sellers in malaria treatment indicated for children from pharmacies where these drugs are legally allowed to be dispensed. There is a need to identify deficiencies and correct them so that these drugs can be used over long period of time in order to achieve the goals of malaria control in Tanzania.

1.2 LITERATURE REVIEW.

Malaria is the major public health problem in the world. Its statistics reads like a road map where no one would like to go; about 300-500 cases per year, 90% of which is from Sub –Saharan Africa, 1-2 million deaths per year most from Africa and 30% t0 50% cause of African admissions.(MSF, 2003). In Tanzania, over 30 million population are at risk of developing malaria (MOH, 2003), sixteen million cases of malaria annually killing approximately 100,000 people. It is a major cause of under fives mortality particularly aged under two years, and inflicts a huge burden of disease due to anemia especially in pregnant women. (Daily News, 2005).

Malaria is worsening in Tanzania which accounted 11-13% of all diseases in 1978 while in 1997 malaria was responsible for about 34% of all disease conditions in the country (Mohammed, 2003)

Among the many factors which attribute to worsening situation of malaria in the country include lack of laboratory equipment. The prevailing method for diagnosing malaria in Tanzania and almost all Sub Saharan countries is by clinical impression, which in turn typically amounts to treating all fevers as malaria. Laboratory –based diagnostic tests can improve treatment dramatically; however, access to laboratory diagnosis is rare (Bloland et al, 2003).

In Africa over 70% of all malaria cases do not present initially to health facilities but diagnose and manage 'malaria' (i.e. fever) at home with traditional remedies or drugs bought at local shops. At peripheral, individuals wrongly diagnosed with malaria will be exposed to unnecessary side effects of drugs and true cause of the problem will not be recognized or treated.(Amexo, 2004).

Poor supply of drugs and lack of recognition of population at risk in drug development, the very young children and pregnant mothers are the disadvantaged groups in this respect. Drug companies often do not conduct the appropriate research to establish safety to these groups before marketing their products. For example, Coartem, the ACT recommended by WHO/RBM to be used by all countries experiencing resistance with SP, is not approved to be used by the very groups that are likely to need it at most, children <5kg in weight and pregnant women, making a drug of limited value or forcing drug sellers and other health care providers (and patients) to bear the risk of off-label use (Bloland et al, 2003). Similarly for most artemisinin monotherapy drugs preparations are for adults which when used for children there is a problem of knowledge on the correct dose. (Mohamed, 2003).

Drug resistance is another factor which makes malaria control in Tanzania a problem. When drug choroquine was first introduced to treat malaria, it was fast, effective and cheap, managing the disease effectively.

But uncontrolled and widespread use contributed to rapid emergence and spread of resistance, where in the country in 1999 was reported to be 66-87% (MSF, 2003).

This forced the country to substitute CQ by SP which also has shown resistance up to 34% in some parts of Tanzania (MSF, 2003).

The above weaknesses observed in health facilities including lack of qualified staff led into under utilization of these facilities. This has been one of the reason why people opt for self treatment where (Nsimba et al, 2002) found that 75% people buy drugs from private drug outlets and majority of this being for children. The popularity of private pharmacies in selling ant malarial drugs, in part, is a poor state of public sector but also because private drug outlets tend to be numerous, closer to home, have drugs in stock, and involve less time to obtain the desired service, also they do interact with customers in a friendlier fashion than health care workers (Bloland et al, 2003). Unfortunately, it has been established that the private drug outlets are poor at providing appropriate advice, complete dose or even the correct drug for the problem (Syhakhang, 2002).This in totality leads into wide spread ineffective treatment of malaria especially in children and accelerates drug resistance (Marsh et al, 1999)

In Tanzania the quality of services in malaria management by drug outlets has previously been reported as being not convincingly good (Massele et al, 1993), the attributing factors being poor dispensing practice and low knowledge of drug sellers. The question of knowledge of doses to children with malaria is even worse for artemisinin drugs (Mohamed, 2003) whereby only 2% of drug sellers from drug

sellers in drug shops from Kinondoni municipality could tell the correct dose of artesunate for children.

The study on knowledge and management of malaria in Dar es Salaam (Massele et al, 1993) showed that only 20% of drug store sellers knew the correct dose of CQ, while 50% said they give advice to patient when dispense ant malarial

If the drug sellers are not trained to improve their knowledge and practice on dispensing the artemisinin monotherapy ,it is feared that there is likely that majority of children will be getting either suboptimal dosages or overdosed, this may lead to high levels of resistance to those drugs to develop rapidly.

Intervention through training of drug sellers has shown to improve malaria management in children, for example, in a study conducted in Kenya, the percentage of childhood fevers where an adequate dose of chloroquine was given to the child rose from 3.7% before the training to a minimum of 65.2% afterwards, also, .the percentage of ant malarial drug sales where an adequate amount of drug was purchased rose from 31.8% to a minimum of 82.9% (Marsh et al, 1999).

1.3 STATEMENTOF THE PROBLEM.

It is estimated that 70-80% of malaria cases in Tanzania are managed at community level (Mohamed, 2003). Most early treatment for fevers in children occurs through self- medication at home, the medication is bought from private drug outlets (Lekashingo, 2003). It is important that the drug outlets dispensers are considered and promoted through proper understanding and support.

Currently Tanzania is planning to implement the new ant malarial treatment policy. In this policy there will be a change from SP as a first line drug to Atremisinin – based Combined Therapy (ACT), *Coartem* which is a combination of two drugs, artemether and lumefantrine is a proposed combination therapy (Daily News, 2005). This combination is expensive and it will be stored and dispensed from public health facilities only at subsidized prices of Tshs.1000/= and 2000/= for children and adults respectively for complete dose. (Personal communication). In the private sector especially in pharmacies and other drug outlets, monotherapy preparations of artemisinin derivatives found today will continue to be sold to those people who will seek ant malarial treatment from these shops since they are cheaper than the proposed combination therapy. This is indeed a common practice and will remain so.

Monotherapy formulation packages are mostly for adult's dosage, hence for children dosage regimens to follow is difficult. For example for intramuscular

injection one vial of artemether of strength of 80mg/ml for adult might not be easy to get a correct dose for a child. This is even more difficult when a drug seller knowledge and practice on dispensing the drug is not adequate enough to give a right dose and proper instruction (Mohamed, 2003). The increasing widespread use of artemisinin monotherapy, particularly with unsupervised and incomplete regimens may lead to emerging resistant strains to this class of effective anti-malaria drugs (WHO, 1998).

In view of the above considerations that artemisinin monotherapy will continue to be found and sold in private pharmacies and the fact that the dosage of these drugs given to children by most dispensers is incorrect (Mohammed, 2003) suggests that most children do not comply with the correct dose leading either to sub optimal dosages or over dosage. Thus, there is a need to study how both clients with prescriptions and those without prescriptions are managed by drug sellers when seeking for Artemisinin monotherapy for malaria management in children. The level of knowledge and practice in general of drug sellers are the areas to be studied to identify deficiencies which should be corrected in order that the artemisnin monotherapy can be used long as effective agents of malaria treatment.

1.4 RESEARCH QUESTION.

The research question intends to investigate the level of knowledge of drug sellers on Artemisinin monotherapy for managing malaria in children in private retail pharmacies. Also, it will find out the current practice of drug sellers in management of malaria in children using different brands of artemisinin monotherapy looking on such aspects as dosage and instruction given upon dispensing this class of anti-malarial drugs. Therefore, the research question intends to address the following, first do drug sellers in private retail pharmacies manage or handle Artemisinin monotherapy sales to both, those with and without prescription accordingly? or do private retailers have adequate knowledge on artemisinin monotherapy when dispensing to children in areas like correct dosage based on weight, side effects and important instruction aiming at rational use of those drugs? Secondly are they aware of the regulation regarding the dispensing of such drugs? Hence, in management of malaria in children by private retail pharmacies it is the knowledge and practice which forms a key to malaria control as far as prompt treatment is concerned.

1.5 RATIONALE OF STUDY

Management of childhood malaria in public health facilities is typically poor due to reasons covered by poverty, hence lack of laboratory equipment leading to false diagnosis, no effective drugs, lack of current and comprehensive information on ant malaria drug treatment guidelines (Mohammed, 2003).

In Tanzania a high proportion of children with fever are managed at home by their care givers and will present at health facilities only when home management has failed or when severe complications occur. Self medication is on increase, the sources of drugs being from private stores, 75% home stored drugs 17% while 16% obtain from neighbors and other people (Nsimba et al, 2002). The major reason leading to mothers or caretakers of children to decide for self- medication is the perceived susceptibility of malaria as illness that can be treated with traditional remedies especially when it is severe. It is a culturally constructed perception among tribes in Tanzania (Nsimba et al, 2002).

Today with health sector reforms, private pharmacies have become an important source of health care, in fact often functioning as front line health delivery especially in developing countries, Tanzania being one of them. In practice, private pharmacies do not just provide over the counter (OTC) or drugs based on prescription, but also deal with case management including malaria in children (Massele et al, 1993).

The quality of services offered by private pharmacies in management of such cases in Dar es Salaam has previously been reported as not convincingly good (Phare et al, 1999). The poor performance being due to low knowledge and malpractice by drug sellers in pharmacies.

If the trend of unsupervised dispensing, the wide spread use and incorrect regimes of Artemisinin monotherapy is left to continue with no deliberate intervention to rescue the situation, emergence of resistance will occur like it has been the case for other previously used drugs like chloroquine (WHO, 1998).

This study will contribute to reveal the current knowledge and practice of drug sellers on Artemisinin monotherapy for managing malaria in children from their daily encounters. The information may be used by responsible stakeholders like the National Malaria Control Programme (NMCP) and the Tanzania Food and Drug Authority to formulate feasible malaria control policies to improve management of malaria to our children at informal sector.

1.6 BROAD OBJECTIVES.

To assess how drug sellers manage both prescription and non prescription clients for Artemisinin monotherapy for treatment of malaria in children from retail pharmacies in Dar es Salaam region.

1.7 SPECIFIC OBJECTIVES.

1. To determine the socio-demographic characteristics of drug dispensers.
2. To investigate the quality of instruction and information drug sellers provide on dispensing Artemisinin monotherapy for children.
3. To assess the knowledge of drug sellers regarding the use of Artemisinin monotherapy for managing malaria in children.
4. To describe the dispensing practice by drug sellers of Artemisnin monotherapy for children.

CHAPTER 2

2. METHODOLOGY.

2.1 The study area.

The study was carried out in the city of Dar es Salaam. Administratively the city is divided into three municipalities namely: Kinondoni, Ilala and Temeke. It is the largest city in Tanzania and is the main business centre in the country. It is allocated along the Indian Ocean bordered by the Coast region on the West North and South. The total population is 2m (Bureau of statistics, 2003). The city has a mixture of people mainly being Tanzanians from different tribes who reside in Dar es Salaam. The city experiences a modified equatorial climate; it is generally hot and humid throughout the year with an average temperature of 29^0.C there are two rainy seasons, which starts from October to December and long rains between March and May. The climate favors malaria transmission almost throughout the year. The major economic activities in these municipalities are, industry, fisheries, retail business and subsistence agriculture. The city has a total of 192 operating privately-owned retail pharmacies

2.2 The study design.

It is a descriptive cross sectional study conducted from mid June to end of July 2005.

2.3 The study population

The study involved all drug dispensers in private retail pharmacies which stock the Artemisinin monotherapy of any brand.

2.4 Calculation of sample size.

The sample size was determined using this formula;

$\mathbf{n = z2pq/e^2}$

Where n= the desired sample size.

z = standard normal deviate, usually set at 1.96 which corresponds to 95% confidence interval

p = proportion in the target population estimated to have a particular characteristics. In this case is estimated to be 40%

q = 1-p

e = maximum likely error set at 0.07(7%)

Therefore,

$n = (1.96)^2(0.4(1-0.4)/ (0.07)^2$

$= 188$

A total of 200 respondents were involved in order to cater for missing and other unexpected problems during data collection.

2.5 Selection of the study sample.

A list of all privately – owned retail pharmacies from each municipality in Dar es Salaam was obtained from the Tanzania Food and Drugs Authority. The number of pharmacies to give the required drug dispensers from each municipality was selected randomly using systematic sampling technique. The dispensers from the selected pharmacies were included as the study population.

The part II shops popularly known as "maduka ya dawa baridi" were not included in this study simply because Artemisinin monotherapy which is currently classified as part I poison is not legally allowed to be stored and dispensed from this group of shops.

2.6 Data collection tools.

Two research assistants with the principal investigator did data collection using a structured questionnaire consisting of open –ended and close-ended questions. This aimed basically at measuring knowledge of drug sellers on Artemisinin monotherapy drugs in management of malaria in children on areas like dosage calculation, interpretation of symptoms of malaria and also answered the socio-demographic characteristics of drug sellers.

A simulated client method (SCM) was also performed whereby a research assistant with a fictitious case scenario of a child with malaria at home visited selected pharmacies and requested for Artemisinin monotherapy.

A specific recording sheet for simulated clients containing information regarding the drug, questions and advice was developed. The simulated client filled the sheet not more than 15 minutes after leaving the particular shop in order to minimize recall bias.

The SCM was primarily meant to describe the dispensing practice looking at aspects like request for prescriptions, instruction and information provided on dispensing the drug.

Simulated Client Method as a practical and consistent way to measure actual practice, has become increasingly common throughout the world (Chuc, 2002). Because of its nature, the interviewee can not have consent with the interviewer, this can have some implications as far as ethical issues are concerned. However, up to now ethical issue is still a debate.

2.7 Data management.

For consistency purpose all written information were re- checked for completeness and data validation each day after field work. Brief discussion and feedback with research assistants was done often. After the completion of data collection from the field, analysis using EPI-INFO PACKAGE was done.

2.8 Ethical clearance

The ethical clearance permit was requested from Muhimbili University College of Health Sciences (MUCHS) ethical committee. Permission for data collection was asked from the Tanzania Food and Drug Authority (TFDA). Informed consent after explaining the purpose of the study and ensuring confidentiality was sought before administering the questionnaire to the drug dispenser.

2.9 Pre-testing.

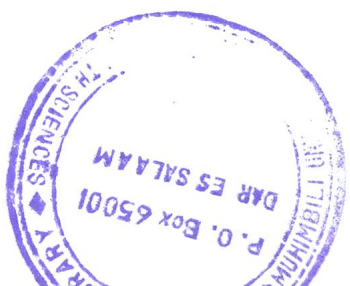
Pre-testing of the questionnaires and the simulated client record sheet was conducted at Kinondoni district in pharmacies which were excluded from the study.

2.10 Study limitation.

In some instances drug dispensers and the owners of the pharmacies were showing a cold cooperation when a researcher presented to them a permission letter from TFDA as they lost trust thinking that we were inspectors, with assured confidentiality and clear aim of the study we managed to interview them. In simulated client method as anticipated, recall bias was a limit. Whenever a client had doubt on a particular response, initiatives were to go to another pharmacy with emphasis being attentive to what the dispenser says and fill the form immediately after leaving the pharmacy. Since the AM drugs are expensive, some drug dispensers were hesitating to give all instruction whenever they realized that a simulated client was not going to pay for the drug, however they turned to be



cooperative when the simulated client assured them that he would definitely come back to buy the drug.



3: RESULTS

3.1 Social demographic characteristics of the study population

A total of 80 (42%) out of all 190 operating registered privately owned retail pharmacies in Dar es Salaam were covered. In this 42% of pharmacies 200 drug dispensers were included in the study as envisaged. Selection of pharmacies was done randomly from a list of all pharmacies obtained from the Tanzania Food and Drug Authority. Of the studied drug dispensers 133 (66.5%) were females and 67 (33.5%) were males .Majority of drug dispensers, 127 (63.5%) aged between 25-35 years. Regarding marital status, 119 (59.5%) of all drug dispensers interviewed were married, a reflection that majority of them are young adults, thus receptive to health education campaign if formulated. (Table1). When asked about their education background, about 67% of drug dispensers were secondary school leavers, 22% had a University education while those with primary education and below amounted to about 11 % (Table 2)

Table 1: Demography characteristics of drug dispensers in three districts.

District	No. of Shops	Sex		Age (yrs)			Marital status	
		M	F	<25	25-35	>35	Yes	No
Kinondoni	35	26	65	10	58	23	51	40
Ilala	35	35	53	10	51	27	52	36
Temeke	10	6	15	1	14	6	16	5
Sub-Total		**67** (33.5%)	**133** (67.5%)	**21** (10.5%)	**123** (61.5%)	**56** (28.0%)	**119**	**81**
Total		**80**	**200**		**200**			**200**

For the professional background, only 32.5% had pharmaceutical training, majority of drug dispensers (46.5%) were trained as nurses at different levels as Nurse assistants, Nurse midwives and Nursing officers. The other professions were as follows: Clinical officers contributed to about 11.5%, while 9.5% with no training at all. (Table 3)

Table 2: Distribution of the level of education of the drug dispensers.

Education status	Frequency	Percentage
No education	5	2.5%
Primary education	27	13.5%
Secondary education	135	67.5%
University education	33	16.5%
Total	**200**	**100%**

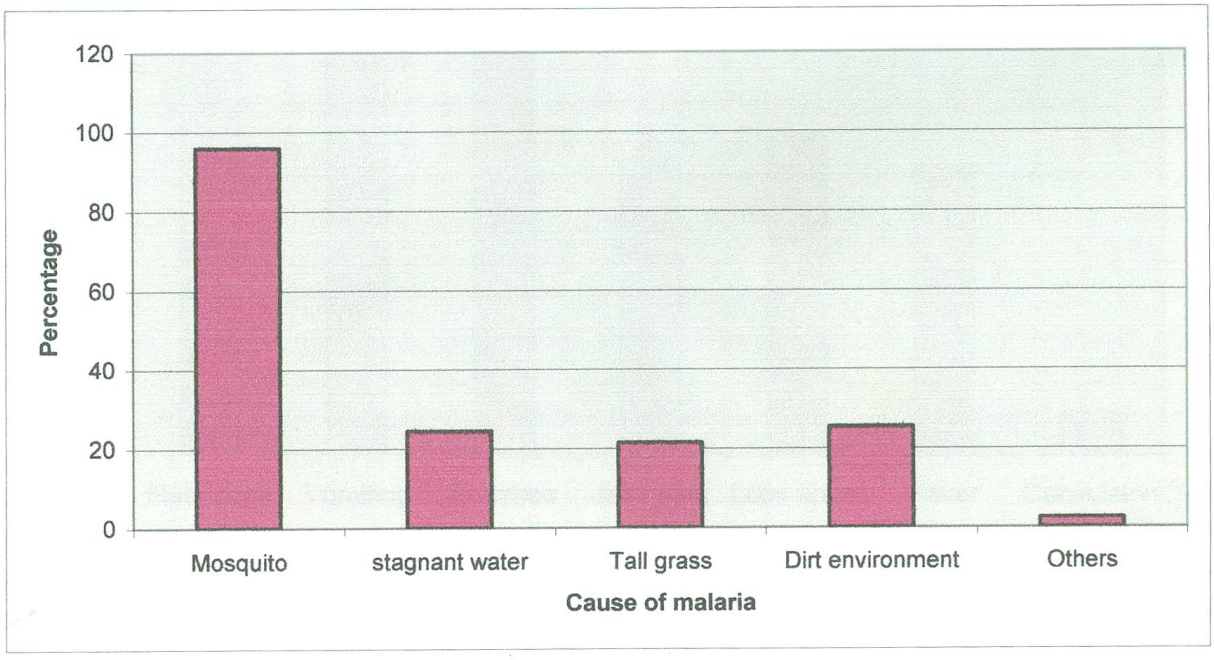
Table 3: Percentage distribution of dispenser's professional background

Profession	Frequency	percentage
Nurse assistants	62	31.0%
Nurse midwives	21	10.5%
Nurse Officer	10	5.0%
Clinical Officer	23	11.5%
Pharm./technician	23	11.5%
Pharm./assistants	9	4.5%
Pharmacist	33	16.5%
None	19	9.5%
Total	200	100

3.2: Dispensers knowledge of the causes, symptoms and preventive measures of malaria.

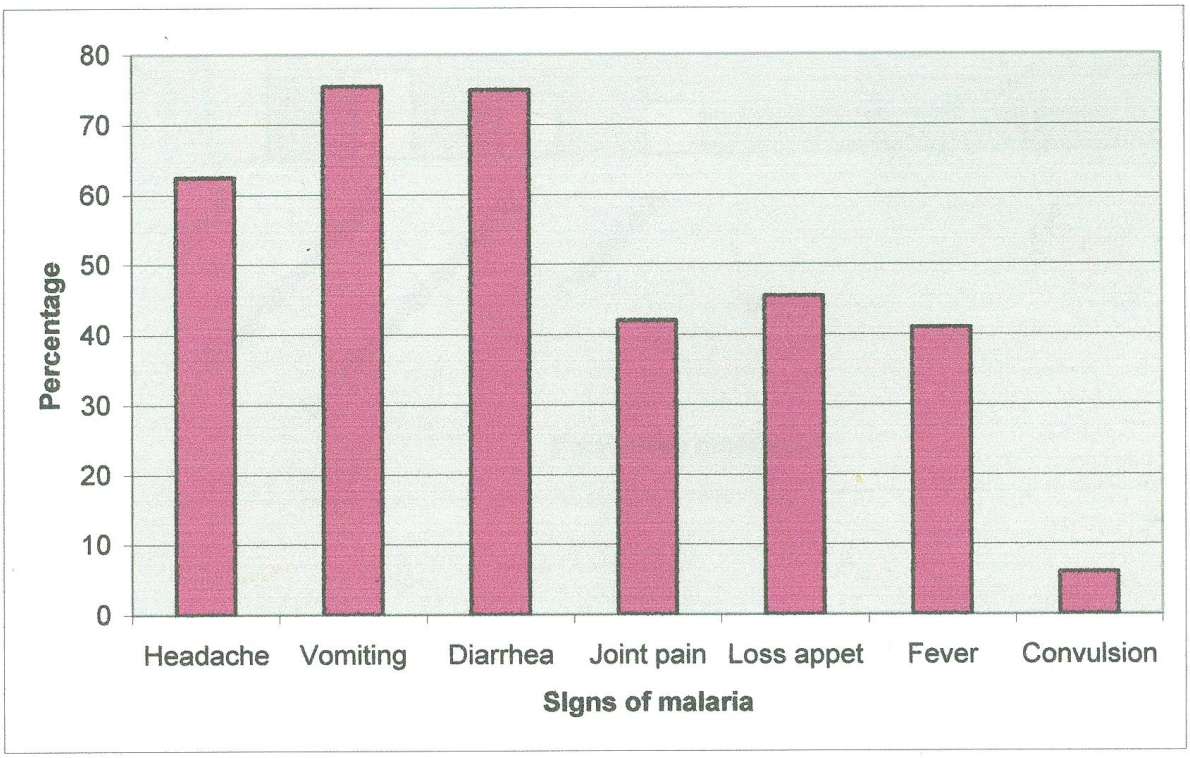
It is known that the female Anopheline mosquito causes malaria, other associated factors for mosquito to breed are; dirty environment, stagnant water and bushes around our homes. When asked if they knew what causes malaria, the majority (96%) mentioned mosquito as a direct cause and few mentioning the indirect cause like dirt environment (25.5%) while other causes in this group like poverty and lack of health-related knowledge were responses accounting up to 2.5% of all drug dispensers interviewed. (Figure 1)

Figure 1: Knowledge of the causes of malaria as reported by drug dispensers



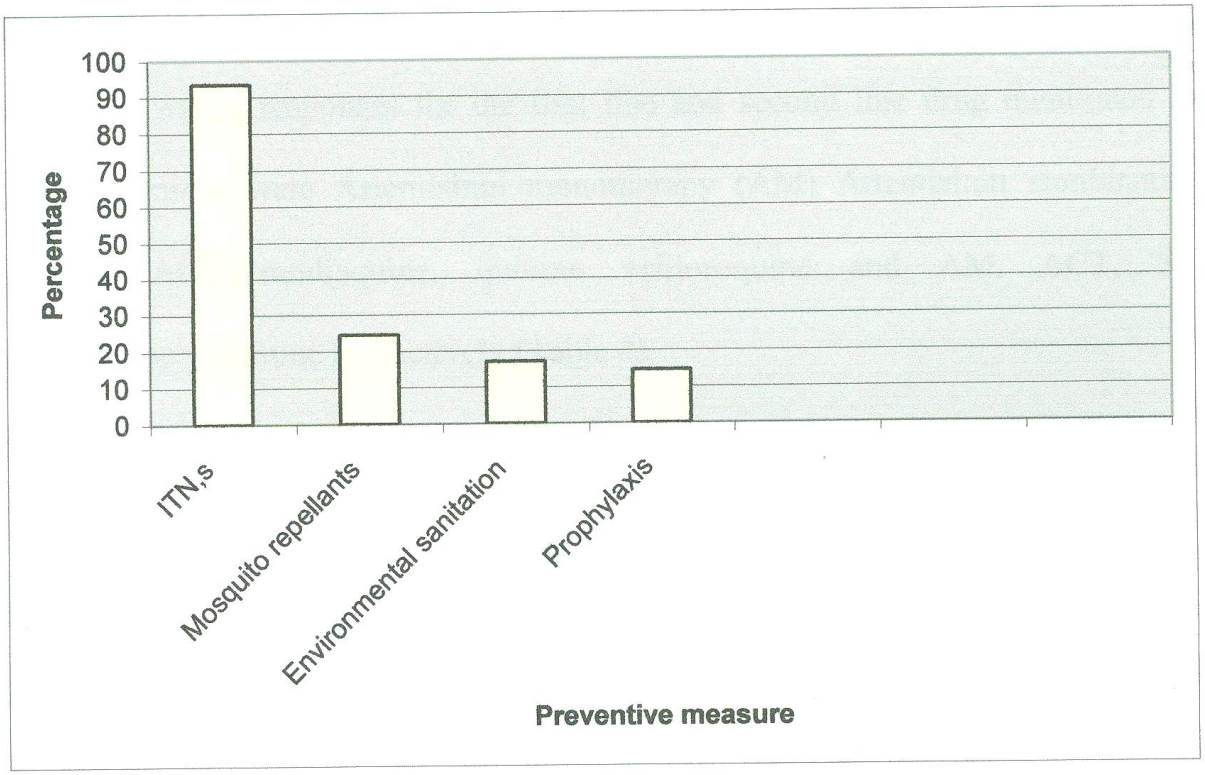
The knowledge on symptoms of malaria is vital as far as malaria diagnosis is concerned, this enables a dispenser to be able to tell if the presenting symptoms by a child reflect malaria and not something else for a decision take AM. Of the interviewed drug dispensers, majority mentioned vomiting and diarrhea (75%) as the commonest symptom of malaria in children, followed by headache (62.5%), loss of appetite (45.5%), joint pain and fevers accounting to about 42% while convulsion was mentioned by 6.0 % of all drug dispensers. (Figure 2)

Figure 2: Knowledge on the symptoms of malaria as reported by drug dispensers.



As regards to preventive measures against malaria in children, the majority (93.5%) of drug dispensers mentioned the use of ITN's. Other preventive measures mentioned are; use of mosquito repellants (24.5%), environmental sanitation (17.0%) and use of ant malarial as prophylaxis were mentioned by 14.5% of all drug dispensers. (Figure 3)

Figure 3: Knowledge on preventive measures of malaria by drug dispensers



3.3: Dispensers' awareness of the current Tanzania malaria treatment guideline

Treatment of malaria of in Tanzania is guided by the malaria treatment guideline in which SP and amodiaquine are the first and second line drugs respectively while quinine is the third line drug. It is worth for drug dispensers to know this for clients who visit their pharmacies before going to the official health facility. When asked if they know the existence of malaria treatment guideline 75% of all drug dispensers were aware out of whom only 92 (61.3%) mentioned SP as first line drug and only 63 (42.0%) respondents mentioned amodiaquine as a second line drug. The wrong responses for the first line and second line drug mentioned by drug dispensers were Artemisinin monotherapy (AM) Artemisinin combination therapy (ACT)Amodiaquine, quinine +chloroquine and AM, ACT, SP, Halofantrine + quinine respectively.(Table 4)

Table 4: Dispensers awareness of the current malaria treatment guideline

	Yes	No	Total
Aware of Malaria TG	150(75%)	50(25%)	200
1st line drug correct	92(61.3%)	58(38.7%)	150
2nd line drug correct	63(42.0%)	87(58.0%)	150

3.4: Knowledge of dispensers on dosage calculation of artemisinin monotherapy for children.

The administered drug at a given concentration will kill malaria parasites. Sub optimal dose or overdosing a child both has negative impact as far as malaria treatment is concerned. It is of paramount importance for a drug dispenser to dispense the required dose and should be administered accurately.

When asked on what are the basis for calculating the dose of AM for a child, 76.5% of all drug dispensers mentioned weight as base for dosage, 21.0% mentioned age while 2.5% said that they would consider the health status of a child. (Table 5)

Table 5: Knowledge of drug dispensers on what is the basis for calculating the dosage of artemisinin monotherapy

Basis	Frequency.	Percentage
Weight	153	76.5%
Age	42	21.0%
Health status of child	5	2.5%

Of the studied drug dispensers, only 50 (28.1%) were able to give a correct dosage of artesunate tablet to be given to a child with malaria. Those with pharmaceutical background who mentioned the dose correctly were 42.9%, Nurses 25.0%, Clinical officers 18.2% and those without training giving correct dose were 13.9%. (Table 6)

Table 6 : Reported percentage of correct dosage of artesunate tablet by profession (n= 50)

Profession	Frequency	Percentage
Nurses	13	25.0%
Clinical officers	9	18.2%
Pharm.tech/assists/ pharmacists	21	42.9%
None	7	13.9%
Total	50	100.0%

3.4: Pharmacies dispensing practice

When interviewed on what advice they normally give to a client asking for Artemisinin monotherapy (AM) drug for a child before seeing a doctor, 63.5% of drug dispensers said that they advice their clients to see the doctor first who will prescribe the drug, that is to say this represents the number of dispensers who sell AM only when prescribed. 29.4% said they sell without prescription while 7.1% do sell provided that the clients has been examined and has malaria positive results from the laboratory. (Table 7)

Table 7: Reported responses on what advice drug dispensers give a client asking for AM before seeing a doctor (n=197)

Advice	Frequency.	Percentage
Advices see doctor first	125	63.5%
Sell without prescription	58	29.4%
If has B/S +ve result I sell	14	7.1%
Total	**197**	**100.0%**

When asked on what they would do for the client who is not able to pay for the full dose as a matter of common experience in pharmacies, 64.5% would be ready to sell a drug, from which 44.0% substituting for a cheaper brand and 20.5% selling half dose of the requested drug while 35.5% would advice for more money to cover the full dose (Table 8).

Table 8: Reported advice drug dispensers give to clients who cannot pay for the full dose (n=200)

Advice	Frequency	Percentage
Send back for more money	71	35.5%
Substitute cheaper one	88	44.0%
Sell half dose	41	20.5%
Total	**200**	**100.0%**

Drug dispensers were also asked on which criteria under which AM drugs are to be given to children and their responses were: only when other ant malarial seem to have failed to cure a child (57.8%), when prescribed (30.2%) and 12.0% mentioned that if a child is allergic to SP. (Table 9).

Table 9: Percentage distribution of responses from drug sellers on when do they dispense AM to children. (n=192)

Response	Frequency.	Percentage
Only when others fail	111	57.8%
Only when prescribed	58	30.2%
Allergic to SP	23	12.0%
Total	**192**	**100.0**

Regarding the quality information ad instruction given to the clients after buying AM drugs, 63.0% gave instruction on how to use the drug, 62.5% insisted on completing the dose, 25.5% reminded them to report to the hospital if there were no improvement when taking drugs, 24.0% insisted on keeping medicine in safe place, 20.0% advised the care takers of children to give food before administering the drug and 9.5% reminded that the interval between one dose and the next is 24 hours. (Table 10)

Table 10: Percentage distribution of instruction give to clients when dispensing AM for children.

_ Instruction	Frequency.	Percentage
Explained how to use	126	63.0%
Insist to complete dose	125	62.5%
Report to hospital If no improvement	51	25.5%
Keep med. In safe place	48	24.0%
Take food before	40	20.0%
Dose interval is 24hrs	19	9.5%

AM drugs unlike other ant malarial like SP have to be taken not as a single dose but for 5 days, likewise some brands in this group are in a tablet formulation which demands dividing a tablet for a child. When dispensers were asked if they experience any difficulties in the whole process of dispensing this class of ant malarial, this is what they said: majority of parents/guardian do no know the weight of their children (49.6%), time consuming to instruct how to use, (24.0%), these are

drugs in the market no enough information known, (20.6%), while 7.8% plained on the difficulties of getting an exact dose from dividing a tablet, other iculties (6.0%) were reported to include, some clients have their own preference a particular brand and others can not follow instruction accordingly.(Table 11)

ble 11: Percentage distribution of difficulties experienced by dispensers on dispensing AM to children. (n=129)

ficulty	Frequency.	Percentage
ight of child not known	64	49.6%
ne consuming to explain w to use	31	24.0%
ese are new drugs, enough information	16	20.6%
viding tablet to get exact dose ot easy sometimes	10	7.8%
ers	8	6.0%
tal	**129**	**100.0**

3.5: Simulated Clients observations

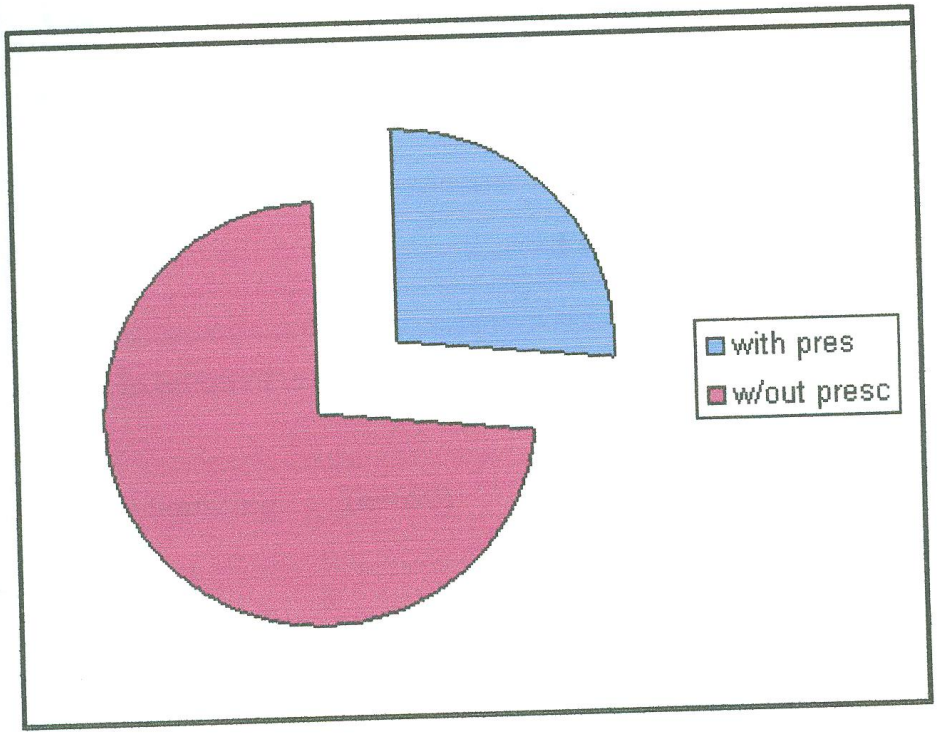
The Simulated Client Method (SCM) was used to measure the provider behavior and practice. A research assistant with a fictitious case scenario of a child with malaria at home visited the selected pharmacies and requested for assistance. A total of sixty, (60) pharmacies were visited. A specific recording sheet for simulated clients containing information regarding the drugs, questions and advice from the drug dispenser was filled by the researcher immediately after leaving the shop. The demography of drug dispensers and the number of visited pharmacies from each district are shown in the (Table 12)

Table 12: Demography of drug dispensers in each district

District	Male	Female	Total
Ilala	8(34.8%)	15(65.2%)	23(38.3%)
Kinondoni	11(42.3%)	15(57.7%)	26(43.3%)
Temeke	4(36.4%)	7(63.6%)	11(18.3)
Total	**23(38.3%)**	**37(61.7%)**	**60**

A total of 60 SCM encounter were conducted: Of these encounters, only 26.7% requested for prescription from the research assistant when asked for AM for his child. (Figure 4)

Figure 4: Percentage distribution of drug dispensers who requested for prescription



Key: with prescription = 26.7%

Without prescription = 73.3%

Of the visited pharmacies, extremely few drug dispensers asked on the symptoms of malaria in order to be sure that the client's child real had the problem. They responded as follows: 8.3% asked if a child experienced convulsion, only 5.0% asked whether there was rise in temperature and 1.7% asked if a child was vomiting. (Table 13)

Table 13: Percentage distribution of drug dispensers who asked about symptoms of malaria.

Variable	Frequency.	Percentage
Rise in temperature (n= 60)	3	5.0%
About vomiting (n= 60)	1	1.7%
About convulsion (n= 60)	5	8.3%

Of the performed SCM encounters, drug dispensers (71.7%) dispensed drugs calculating dosage basing on the child's body weight, while 68.3% of all dispensers were ready to dispense the drug and only 56.7.0% of all encounters coming out with the correct dose of the dispensed drug.

The majority of the visited pharmacies dispensers (78.3%) issued instruction on how to use the drug correctly, the same number of dispenser insisting the importance of completing the dose given. Some drug dispensers (21.1%) suggested alternative drug particularly the formulation strictly for children apart from the one requested by the simulated client the reason given being ease with which a dose can be obtained. (Table 14)

Table 14: Percentage distribution of drug dispensers who gave instruction on dispensing the drug.

Variable	Frequency	Percentage
How to use correctly (n= 60)	47	78.3%
Advice on completing the dose (n= 60)	47	78.3%

Of the visited pharmacies drug dispensers only 25% advised the clients on preventive measures against malaria for the sick child out of which 15% advised

use of ITN's and 10% suggesting use of other means like use ant malaria drugs as prophylaxis weekly and dressing the child with long dresses to minimize mosquito bite especially evening hours.

Table 15: Reported advice dispensers gave on preventive measures against malaria

Advice	Frequency	Percentage
Use of ITN's (n=60)	9	15%
Others (n=60)	6	10%

4: DISCUSION

The selected pharmacies, 35 from each, Ilala and Kinondoni and 10 from Temeke districts in Dar es Salaam forms an adequate representation. The age range of drug dispensers was from 18 years, which was the youngest to 65 the oldest, the mean age distribution of all drug dispensers was 31.4 years. In terms of sex distribution there were more females (66.5%) than men (33.5%). This dominance of females in this business could be explained from the fact that about 46.5% of all dispensers were nurses in which majority carriers of this profession are females. Of the studied drug dispensers, 59.5% were married.

Only 10.5% of all drug dispensers had education background below secondary education, the difference ranging from secondary school leavers to university graduates from which 90.5% had a medical background.

The graduate dispensers contribute to unexpectedly high percentage (16.5%). The reason behind such representation could be due to a good number of pharmacists from public health facilities and intern pharmacists who work as part time dispensers in private retail shops after official hours. Hence were interviewed during data collection.

In developing countries like ours drug outlets can not have trained pharmacists however the majority of drug sellers have a medical related training. Majority were nurses (46.5%) followed by dispensers with pharmaceutical training

background (pharmacists, pharmaceutical technician and pharmaceutical assistants) contributing up 39.0% of all drug dispensers. With such a group of dispensers it is quite possible to carry education campaigns as an intervention for malaria control. In this study, majority (96%) of drug dispensers knew that the direct cause of malaria is mosquito while the indirect causes were mentioned by few, (25.5%) and others like tall grass around our residential areas plus stagnant water were mentioned by less than a quarter of all drug dispensers. The level of knowledge of the drug dispensers on what role of these indirect causes of malaria play in malaria causation reflects little contribution as far as malaria prevention and control is concerned particularly in children who are the most hit group.

The Integrated management of childhood illness (IMCI) recommends that fever can be used as a screening diagnostic test during peak malaria seasons even in areas where as little as 5% of febrile children actually have parasites on blood smear (Bloland et al, 2003). In this study however, only 41% of all drug dispensers mentioned fever as a primary symptom of malaria in children. Vomiting and diarrhea which are common symptoms in children had a positive response being mentioned by 75% of drug dispensers. Headache (62.5%) and joint pain (42.0%) were also mentioned though are predominant in adults than is the case in children. Convulsion was also mentioned by 6.0% of drug dispensers as a symptom of malaria. This is very common in severe stage of malaria especially in children; however a mention was made as a symptom of uncomplicated malaria. Fever in

Swahili known as *homa* carries a different interpretation whereby majority will define fever as any physical malfunction (Lekashingo, 2003). It is of vital importance for drug dispensers to know thoroughly symptoms and signs of malaria so that they can be able to rule out malaria from other diseases with almost similar presentation.

This is very important because pharmacies now serve more as front line health delivery whereby about 50%-80% of people visit private drug outlet or practitioners for malaria treatment before being attended at health facility (Paula et al, 2003).

The results of the study show that the knowledge as far as symptoms for malaria is concerned is not convincingly good thus perhaps there's a need of continued education package for the dispensers, otherwise if this is not intervened, there is likely that most children will continue to be either overdosed or get suboptimal doses worse enough some will be misdiagnosed and receive artemisinin monotherapy drugs while they do not suffer from malaria per se. Such education as an intervention has proved to be useful in improving knowledge of drug dispensers in Pharmacies whereby in a study to improve private pharmacy practice in Vietnam, there was a significant improvement in management of Acute Respiratory Infection in children before and after intervention (from 11% to 30% correctly managed) as compared to control pharmacies which dropped from 10% to 7.0% (Chuc, 2002)

The misdiagnosis and over treatment due to inadequate knowledge of drug dispensers has impact at different levels.

First, this subjects a client to unnecessary expenditures; secondly, it promotes drug resistances due to widespread use and lastly, other diseases miss a chance of being treated as they are wrongly diagnosed as malaria.

As regards to preventive measures against malaria, the use of ITN's was mentioned by 93.5%. The high response to this could probably be due to a massive public promotion of the use of ITN's, however good as it is, the strategy of using the treated nets, there is a problem of affordability though the burden has been reduced to some extent to pregnant mothers under the so called "Discount Voucher scheme" whereby such mothers receives a discount of up to 30% (personal communication). The use of ant malarial prophylaxis was also mentioned by 14.5% of all drug dispensers. The national guideline however does not emphasize on this except for pregnant mothers when visit ant natal clinics. Only few (24.5%) of all drug dispensers mentioned environmental sanitation as another preventive measure. The low number of respondents in this area is suggestive of inadequate knowledge of drug dispensers on the indirect causes of malaria; there is a need to have continuous education to dispensers to inform them on the necessity to educate parents of various preventive methods against malaria in children.

SP which is the first line drug for malaria a treatment in Tanzania soon will be replaced by Artemisinin-based Combination Therapy (ACT), the changes are due to parasites showing resistance to SP up to 34% (MSF, 2003). The factors which led into parasites resistance to chloroquine like the wide spread use and lack of professional supervision might have also applied to SP. From malaria treatment guideline Amodiaquine is the second line drug. From the results of this study, three quarters of all drug dispensers were aware of the current malaria treatment guideline from which more than half mentioned SP as the first line drug, while few knew that Amodiaquine is the second line drug.

With such unawareness of the guideline it indicates that artemisinin monotherapy when dispensed without prescription there is no guide followed, this is a threat to malaria case management in children particularly when the level of knowledge of drug dispensers on symptoms and signs are considered as revealed in this study to be relatively low. There is a need for the responsible authority to see to it that the informal sector especially in pharmacies and other drug outlets the drug dispensers are made aware of the malaria treatment guideline through provision of education packages.

The knowledge on what is the basis for dosage calculation among drug dispensers was found to be relatively high since more than three quarters of the interviewed drug dispensers mentioned weight of a child as the basis for getting a required dose.

If this is put into practice gives accurate dose and with good quality of instruction on dispensing the compliance expected is high. Contrary to what could be expected, when asked for a dose of a tablet of Artemisinin monotherapy drug to a child, only 28.7% of all drug dispensers were able to give a correct dose.This is common practice in other parts of Africa whereby in a study conducted in Gezira state, 44.7% of all cases received an incorrect dose of anti- malarial drugs the reason being failure of dispensers to conform to standard treatment regimens.(Yousiful et al, 1999). It is known that children are more vulnerable to malaria than it is the case in adults, the findings of low level of knowledge on dosage calculation of AM to children implies that a lot of them are either under dosed or over dosed. This practice encourages emerges of resistant parasites to this class of ant malarial drug which is currently efficacious.

The practice of selling AM without prescription was reported by 29.4% of all drug dispensers who were interviewed. The national malaria guideline however classifies AM as the prescription - only drug.

This unethical practice may be a profit –driven since these drugs are expensive with the cost range between Tshs.4500 to 6000. For a full dose of a child, this cost is almost ten times that of SP. With such a cost the poor majority end up buying half dose as noted in this study where 20.5% of drug dispensers were ready to sell half

dose to their clients who were not able to pay for a full dose, practically this is under dosing the child.

Of the interviewed drug dispensers, 44.0% would be ready to substitute for a cheaper brand for a client who he is not able to pay for the prescribed drug. Substitution of the prescribed drug may end up coming with over prescribing. A study conducted in Kenya (McCombie, 1999) revealed that the majority of malaria cases receiving multiple drugs are common phenomenon. The net results of combination of under dosing and over prescribing for the child is the emergence of resistant strains of malaria parasites to these drugs. Due to inadequate knowledge on symptoms and dosage of AM among majority of drug dispensers as pointed out in this discussion, it is very likely that these classes of anti- malarial drugs are grossly misused to the detriment of public health aspects of occur. Contrary to others, 30.2% of drug dispensers said that they would not be ready to dispense AM for the child but ask to see the doctor first. This is the accepted practice as far as malaria management for children is concerned.

Regarding the quality of information and instruction given to the clients on dispensing AM, all dispensers gave instruction on how to use; however 78.3% of all drug dispensers came out with correct instruction. Areas of emphasis in their instruction were; insisting on completing the full course (62.5%) and dose interval

between a dose and the succeeding one is 24 hours (9.5%). The AM drugs are taken once a day, thus the interval between doses should be made clear that is 24 hrs.

On the course of dispensing AM drug dispensers experience some difficulties whereby 49.6% complained that when the weight of a child is not known it becomes difficult to calculate the dose, similarly, dividing a tablet to get an exact dose for a child becomes a problem as a result of which doses for majority of children are estimated and not accurately given. Failure to comply with the required dose may delay recovery or fail completely to cure the child, at the same time causing development t of resistances.

Artemisnin monotherapy drugs are new in the market to some dispensers (20.6%). There is a need to have short training to dispensers on how to handle clients who need AM from pharmacies in order to improve competence in managing malaria in children. Of the interviewed drug dispensers, (24.0%) complained of the complicated dosage regimen of these drugs which takes time to instruct which lead to failure to grasp information by their clients leading to low compliance.

The SCM was also performed to substantiate the findings from the interview. There was a significant difference ($P<0.01$) between the stated dispensing of AM (29.0% of interviewees) and the actual dispensing (73.3%). This reveals a discrepancy between knowledge and practice. Other studies also observed

almost similar results whereby in a study of management of childhood Acute Respiratory Infections at private pharmacies in Vietnam, only 20% of the interviewees said that they would dispense antibiotics for a child while in practice 83% did dispense antibiotics. (Nguyen et al, 2002). The practice of dispensing AM without prescription for children by dispensers with low knowledge on dosage calculation and symptoms to malaria is a threat to malaria control strategies.

Almost only 15% of all drug dispensers asked about the symptoms of malaria of the said sick child at home but 68.3% agreed to dispense the drug requested by the client. This signifies that drug dispenser's knowledge on symptomatology was insufficient. The finding may indicate a focus on business rather than on the health of a child. Regarding to instruction on dispensing drugs, 78.3% of all drug dispensers gave correct instruction.

Of the sixty encounters, 71.7% asked about the weight of a child before dispensing a drug while only 56.7% coming out with the correct dose. This reflects that a substantial amount of children are either under dosed or over dosed by the drug dispensers on dispensing AM. Therefore a lot of effort is needed to educate the drug dispensers on the proper dispensing of AM to children.

Less than 20% of drug dispensers could give advice on any preventive measure against malaria to the child whose parent (client) complained of a frequent attack

by malaria. 15% mentioning the use of ITN's. There should be deliberate efforts to have a comprehensive education package on improving practice in informal sector involved in drug dispensing, this should cover such areas like prevention, symptomatology of malaria, treatment and general health education as far as malaria case management in children is concerned so that only a child with malaria be given AM at desired dose and parent acquire knowledge on how can prevent the child from frequent attack, by so doing AM will continue to serve lives of children and no resistance to these drugs will occur for decades.

Artemisinin-based combination therapy (ACT) are more expensive than the monotherapy preparations, however the former have the potential to slow the development of resistance and is an attractive and promising strategy for the treatment of malaria in areas where sulfadoxine-pyrimethamine (SP) is the first-line drug, and where there is already evidence of resistance. Based on these facts and from the latest WHO guidelines, promoting the use of monotherapy through training should be discourage and switch over to combination therapy. (MSF,2003)

5.1 CONCLUSION

i. This study has shown that the demographic characteristics and education background from a reasonable number of drug dispensers in pharmacies is receptive to health education campaigns.

ii. The drug dispensers knowledge on dosage calculation of Artemisinin monotherapy for children was insufficient.

iii. The knowledge of drug dispensers on malaria symptomatology was not convincingly good.

iv. The quality of instruction given by drug dispensers on dispensing AM was adequate.

v. The majority of drug dispensers were aware on weight as the basis for dosage calculation of AM for children but still there were high incorrect dosage responses.

vi. The tendency of selling AM for children without prescription from health workers is extreme.

vii. Despite the efforts made by drug dispensers in instructing when dispensing AM for children, yet majority of clients find it difficult to understand due to complicated and long course of these drugs

viii. Unknown weights of children and difficulties in dividing tablets for children results into estimating dosage of AM hence compliance becomes questionable and motivates drug resistances.

ix. Majority of drug dispensers were not advising clients on which feasible preventive measures against malaria they should adopt.

5.2 RECOMMENDATIONS

Since private and informal health sector now do not just provide OTC and prescription –based drugs but also deals with case management including childhood malaria and the findings from this study revealed that majority of drug dispensers do not conform to the required regulation for malaria management in the country either by being not aware of such regulations or practicing unethically with a clear intention of profit making, the author recommends to the responsible authority the following;

i. There is a need of provision of a comprehensive health education package to all drug dispensers regarding malaria case management using Artemisinin monotherapy preparations.

ii. With the current ongoing health sector reform, the Ministry of Health through the National Malaria Control Program should put into practice the real partnership with private pharmacies as part of informal sector in a fight against malaria in children

iii. The national malaria treatment guidelines should not be regarded as a property of the public health facilities only but all stakeholders of malaria case management should have an access to it.

iv. There should be a frequent supportive supervision in all drug outlets by professional boards to insist on ethical practices.

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