Introduction

Malaria is one of the most important causes of death worldwide, and 90% of the deaths are estimated to occur in sub-Saharan Africa. Estimates of the total mortality have ranged between 700,000 and 2.7 million deaths per year (Snow et al. 1999; Breman 2001) and there are indications that childhood mortality due to malaria has been rising in Africa over the last decade (Snow et al. 2001). Malaria has re-emerged in some areas where it had been controlled (Nchinda 1998; Sleigh et al. 1998) and epidemics have occurred in areas previously free of transmission (Lindsay and Martens 1998). In addition, indigenous transmission of malaria in the United States has been documented 24 times since 1985, with a recent episode among young children at a summer camp in New York (Bradley et al. 2000).

After more than two decades of neglect, which followed the failure of the Global Malaria Eradication Campaign in 1969 (Brown 1997), malaria control efforts began to receive new attention in the early 1990s (Trigg and Kondrachine 1998). The demonstration that interventions utilizing insecticide-impregnated bednets were associated with decreased mortality (Alonso et al. 1993) was an important factor in a renewed willingness on the part of the international donor community to devote resources to malaria. In 1998, Dr Gro Harlem Brundtland became the new director of the World Health Organization (WHO) and made malaria one of WHO’s top priorities. The Roll Back Malaria Initiative was launched in the same year. In April 2000, an African Summit on Roll Back Malaria met in Abuja, Nigeria and the heads of state of the 53 countries of Africa adopted a plan to cut the number of malaria deaths in half by the year 2010 (Yamey 2000). Adoption of this ambitious goal might be considered reminiscent of the original 1955 proposal to eradicate malaria.

Prompt treatment with an effective antimalarial drug is considered the most important method of preventing deaths from malaria. Because the highest mortality is in young children in areas where laboratory facilities are limited, presumptive treatment of childhood fever has been adopted widely as a strategy in health care facilities in endemic areas. However, in many of the countries where malaria occurs, health care systems are poorly funded and a large majority of the population has difficulty in accessing services. The summit in Abuja recognized this problem and called upon member states to ‘make diagnosis and treatment of malaria available as far peripherally as possible, including home treatment.’

Self-treatment raises policy issues that are exceptionally problematic. One issue concerns regulation of drugs. In many areas, obtaining antimalarials without a prescription is illegal. However, in spite of such legislation, antimalarials are widely available in a variety of settings. In some cases, medications from the government health sector are sold by health workers and find their way into the informal sector (McPake et al. 1999). Self-treatment is often viewed negatively by health workers, who fear that giving it recognition would encourage...

Review article

Self-treatment for malaria: the evidence and methodological issues

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Malaria remains an important cause of death, especially in sub-Saharan Africa. Self-treatment with antimalarial drugs is a common practice that raises important issues for policy-makers. A number of important questions concerning factors related to self-treatment, adequacy of self-treatment and the role of self-treatment in malaria mortality remain unanswered. Although there are some common patterns, there is considerable diversity in treatment practices, even within a single country. Social science research on malaria treatment needs to move beyond description to evaluation of interventions. This will require a greater degree of methodological rigour and more attention to the generation of data that can be compared across time periods and studies. Definitions of malaria cases and the role of local disease categories in identifying cases need to be made more explicit. Illnesses should be classified by severity, using measures of perceived severity as well as biomedical signs of severity. Each treatment step should be considered in terms of four levels of analysis: who provided the treatment or advice, what the treatment was, where it was obtained and when it was taken in relationship to onset of illness.

Key words: malaria, self-treatment, methods
its use (Whyte and Birungi 2000). Even in the scientific litera-
ture, self-medication is often associated with undertreating and
blaming for treatment-resistant strains, although the evidence for
these relationships is not clear.

In many areas, chloroquine has been the first line of treat-
ment for many years. Chloroquine is a safe and inexpensive
drug, and because it is already used widely for self-treatment, it
is reasonable to propose interventions designed to improve its
use in the home. However, in many areas, chloroquine
effectiveness has reached such low levels that some countries
have abandoned its use and even banned the drug, and others
are struggling with the issue of whether to change to a
different drug (Bloland et al. 1998; Winstanley 2000; Trape
2001). Most of the alternative drugs are more expensive and
have higher rates of side effects. Because it is also inexpensive and
reasonably safe, sulphadoxine-pyrimethamine (S-P) is the
drug commonly chosen to replace chloroquine in Africa.
However, resistance to S-P seems to develop very quickly
(Schapira et al. 1993), which is one factor that may be related
to more reluctance to promote its unsupervised use. Another
issue in that chloroquine has an antipyretic effect independent
of its antimalarial effect, and there is concern that alternatives
like S-P, which do not reduce fever quickly, will be perceived
as less effective (Williams et al. 1999).

Where resistance is widespread and chloroquine use as a first-
line treatment is abandoned, some hope that susceptible
strains will ultimately reappear because of reduced drug
pressure (Butcher et al. 2000). But because of its antipyretic
effect and the treatment of some physiologic symptoms as
well as side effects, researchers have expressed concern that if
other illnesses such as rheumatoid arthritis and lupus, it may
be difficult to limit its use. In addition, a study in Cameroon has
suggested that chloroquine may have beneficial effects for
someone suffering from malaria even when the strain is resis-
tant (Picot et al. 1997). Another complicating factor is concern
about whether interventions involving use of antimalarials in
endemic areas will prevent the development of immunity and
result in delayed morbidity and mortality (Menendez et al.
1997; Bloland et al. 1999; Owusu-Agyei et al. 2002). Clearly,
developing policies regarding self-treatment for malaria is
plagued by a number of areas of uncertainty.

Most malaria cases are already treated outside the official
health care system (Foster 1991). Use of modern medicines in
some form is high, as is the use of specific antimalarial drugs
such as chloroquine. Although it varies across geographic
areas, self-treatment of malaria with cosmopolitan drugs
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areas, self-treatment of malaria with cosmopolitan drugs
such as chloroquine, and the density of the parasite in a blood smear
is important in increasing certainty about the clinical diagnosis
(Bloland et al. 1999). In Uganda, doctors classified 92% of
children presenting with fever as having malaria, but only
64% tested positive (Lubanga et al. 1997). A high rate such as
this justifies presumptive treatment of fevers in children.
However, among adults and in areas where malaria is less
common, a policy calling for treatment of all fevers results in
substantial overtreatment (Nwanyanwu et al. 1997).

Unfortunately, many studies of treatment-seeking do not
describe how malaria was defined, or what steps were taken to
identify appropriate local disease categories to use in inter-
views. In some local classification systems, the term ‘malaria’
is used to describe an illness compatible with the biomedical
definition of malaria. For instance, in the Philippines, the term
malaria is used to describe an illness characterized by fever,
severe headache and chills (Espino and Manderson 2000); and
‘malignant malaria’ is associated with severe headache and
convulsions and is seen as more serious (Miguel et al. 1999).

In many areas, there is no specific illness category that
approximates malaria. A common pattern is a single term
that approximates ‘fever’, for example omuujju among the
Baganda of Uganda (Kenegya-Kayondo et al. 1994). In some
places, there are a number of different illness categories, and
malaria may be divided into different types. For instance, in
Calabar, Nigeria, the term uotoyin refers to yellow eyes, and
is considered to include malaria. There are a variety of types
of uotoyin, one of which is uotoyin ekpo (ghost malaria),
which is associated with hallucinations and or ghost dreams
(Ezedinachi et al. 1986–7). Similarly, in Ghana, among the
Dangme, arsu is used to denote fever, while aramka refers to
a high fever (Agyepong and Manderson 1994). Another
concept found among the Dangme of Ghana is hiorwe (sky
illness), which was characterized by convulsions. Some
related to malaria, but others attributed it to a number of other causes, including evil spirits and witchcraft flying in the sky (Ahorlu et al. 1997). This distinction is similar to the pattern found among Swahili speakers in Tanzania and Kenya, where homa is used to describe fever. Some people recognize a specific form of homa – homa ya malaria. However, severe anaemia and cerebral malaria are not associated with malaria (Mwesesi et al. 1995). Degedege is the term used to describe convulsions in young children, and the illness is usually considered to have a spiritual cause such as a bird (or witch) flying over the child (Makeba et al. 1996; Winch et al. 1996; Tuzimo et al. 1998; Oberlander and Elverdan 2000). Similarly, in Uganda, eyabwe has been described as a supernatural illness characterized by convulsions (Labanga et al. 1997).

It is important to investigate illness categories that are related to symptoms of severe malaria but are not associated with malaria by lay people, because they may involve different treatment decisions. In Kenya, the response to convulsions was more likely to involve a traditional healer, and less likely to involve shop-bought drugs (Molyneux et al. 2002). In Zambia, while many caretakers did associate convulsions with malaria fevers, there was also an association with the supernatural, and children with convulsions were more likely to receive traditional treatments (Baume et al. 2000).

Another important consideration that is often overlooked is individual variation in classification systems. Not all members of a culture share the same understanding of disease categories, but many have recognized this. A study of traditional healers representing several different ethnic groups in Tanzania found that most differentiated between different types of malaria, which represented a more complex classification than has been reported for the lay population of the area. Four illnesses that corresponded to different types of malaria were found: malaria ya kawaida, which corresponded to ordinary malaria; malaria ya kichwa or malaria of the head, which corresponded to cerebral malaria; malaria ya tumbo or malaria of the abdomen; and ndegedege, which was associated with convulsions in children (Geisler et al. 1995).

Even when a disease concept that approximates or seems broad enough to include malaria exists, episodes of malaria may be classified as other illnesses for a variety of reasons. For instance, in Malawi, malungo is considered equivalent to malaria, although it incorporates a broader range of conditions. However, when treatment with S-P fails, the illness episode may be redefined as another illness such as munka, which refers to female genital swellings that can affect a nursing infant (Kachur 2000). Using the response to treatment as a diagnostic tool is common among laypersons as well as medical practitioners (Nichter and Vuickovic 1994).

Defining and characterizing self-treatment in general

The term self-treatment is frequently used in the literature on treatment-seeking, but often not well defined. Some studies combine home treatment with traditional remedies. Many studies note proportions who self-treated or treated at home, but do not discuss what kind of treatment was given. When it is described, self-treatment may involve a number of behaviours with very different potential to have a spiritual cause such as a bird (or witch) flying over the child (Makeba et al. 1996; Winch et al. 1996; Tuzimo et al. 1998; Oberlander and Elverdan 2000). Similarly, in Uganda, eyabwe has been described as a supernatural illness characterized by convulsions (Labanga et al. 1997).

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was more likely with slight pain or discomfort (43%), than with severe pain or discomfort (39%). People were asked about reasons for not going to a clinic, and the responses were very different depending on whether the illness was reported to involve restriction of activities. For episodes that involved restriction, 45% of the reasons for not going to the clinic involved distance, transport and costs, versus only 28% of the responses that did not involve restriction. Conversely, cases with no restriction were more likely to say that clinic care was unnecessary or ineffective or that the staff was rude (65% versus 45% for those with restriction). This suggests that distance and cost are more important limiting factors for serious illness, and may explain why they are unrelated to treatment choices in some studies.

Socioeconomic and demographic factors are often related to self-treatment, but these are reported with less consistency than time, cost and severity, and tend to vary more across geographic sites. For example, in Bombay, India, people from high socioeconomic areas were more likely to engage in self-diagnosis and self-medication (Kamat and Nichter 1998), while in Kerala State, India, obtaining medicines without a prescription was associated with low education and perception of the expense of visiting a doctor (Saradamma et al. 2000). In Nigeria, self-treatment was more common among males and among single people (Brieger et al. 1986). Similarly, in a study of medicine use by 11-17 year olds in Kenya, boys were more likely to self-treat and to use Western medicines (Geissler et al. 2000).

Self-treatment for malaria

What prompts action?

As noted earlier, perception of severity is one of the most important factors related to taking a treatment action. Fever usually prompts action. A number of studies have found overall treatment rates of 80% or more for fever (Mwabu 1986; Neuvi et al. 1988; Deming et al. 1989; Louis et al. 1992; Mwenesi et al. 1995; Nyongeni et al. 1998; Molyneux et al. 1999). In a survey in Uganda, fever was the symptom that had the highest treatment rate (74% versus 54% for diarrhoea) (Adome et al. 1998). A prospective study in Kenya found a rate of 78% (Ruebush et al. 1995), as did one in the Philippines (Espino and Manderson 2000). Study design influences the estimates of treatment rates. Mild illnesses are more likely to be forgotten, especially if they were not treated. As a result, prospective studies and those that use shorter recall periods generate lower treatment rates. In addition, variation in the choice of terms to designate fever or malaria can result in different episodes of illness being recalled. A term that indicated high fever would generate recall of more severe cases, leading to apparently higher treatment rates.

In Ethiopia, mothers reported that high fever, shivering, vomiting and inability to feed were cues for action (Yenebach et al. 1993). In Kenya, number of symptoms was related to taking action (Ruebush et al. 1995). However, in Uganda perceived severity was more important than number of symptoms in reaching a decision to go to the hospital (Lubanga et al. 1997). Many studies find that treatment actions are more likely to be taken for illnesses of longer duration, which is logical since illness is not likely to be treated after it disappears. Finding an association between duration of illness and treatment rates is somewhat tautological. Associations between visiting health care facilities and duration of illness are also reported frequently, and authors often note a tendency to seek health care when home remedies have failed.

Considerable concern centres on the treatment of severe malaria, especially in light of studies that have found that childhood convulsions are often not associated with malaria, and are sometimes classified as a supernatural disease more likely to be treated by traditional healers. In a study in Tanzania, 87% of women with children under 5 years said they would go to a health centre if their child had convulsions, while only 9% said they would go to a traditional healer. However, 76% believed injection in a child with high fever would precipitate convulsions or cause death, which might indicate why some might be reluctant to go to health facilities in these cases (Tarimo et al. 2000). The study was done among mothers who brought their children with fevers to a health facility, and thus suffers from selection bias. Studies using clinic-based populations may seriously misrepresent the prevalence of beliefs and behaviours among the general population, and can lead to spurious conclusions (Brown 1976). This bias can be especially serious if the belief is related to a decision to seek care from a clinic.

Socio-demographic factors

Indirect evidence that age of the patient may be related to self-treatment comes from studies of health facility use. Three studies in Africa have found that younger children are more likely to be taken to health facilities (Kaseje et al. 1987; Slutsker et al. 1994; Molyneux et al. 1999), while a study of mortality in Myanmar found that delays in being taken to a hospital were more common for those older than 15 (Ejov et al. 1999).

Educational level is consistently found to be associated with health behaviours, and malaria treatment is no exception. In Tanzania, higher educational level was associated with promptness in seeking care from a health care provider (Tarimo et al. 1998) and with higher knowledge about anti-malarials (Tarimo et al. 2001). In Malawi, higher educational level of the household head was associated with attending a clinic (Slutsker et al. 1994). In a comparison of two communities in Accra, Ghana, the poorer community with lower educational levels was more likely to engage in self-treatment (Biritwum and Welbeke 2000).

Educational levels are virtually always higher in urban areas. In 1991, Brinkman and Brinkman noted that self-treatment rates were higher in urban areas, although they were increasing in rural areas (Brinkman and Brinkman 1991). A study in Eastern Kenya involved a comparison of rural and urban areas and showed that although the mothers differed greatly in a number of demographic variables including educational level, the response to uncomplicated fevers was similar. The
initial response amongst both groups was to buy drugs from shops (Molyneux et al. 1999). Earlier studies in Ghana and Nigeria also did not show substantial differences in treatment-seeking patterns between rural and urban areas (Gardiner et al. 1984; Odebiyi 1992). However, a later study in Ghana indicated that self-treatment with drugs was more common in rural areas (Ageypong and Manderson 1994). It is likely that when rural-urban differences in responding to illness are found, they reflect geographic access to services as well as educational and other socioeconomic differences in the populations. However, little is currently known about the relative effect of these factors, and the pattern varies considerably depending on the location.

Prior experience with the disease is another factor that influences treatment choices. In Burkina Faso, the most common reason for choosing self-treatment was confidence in treating the disease (Mugisha et al. 2002). In a study of pregnant women in Uganda, women who were experiencing their first pregnancy were more likely to use the formal sector for treatment, while multigravidae were more likely to use the informal sector (Nyongumweyi et al. 1998). This suggests that prior experience may have taught women that they could treat themselves. Past experience with malaria has also been related to higher rates of self-treatment in the Philippines (Espino and Manderson 2000) and Thailand (Hongsivatana et al. 1985). The level of endemicity in a population is an important factor to consider in designing studies of treatment-seeking for malaria (Tanner and Vlassoff 1998).

Use of antimalarials

Many studies of treatment-seeking do not report on what therapies were actually used or for an episode of illness; whether it was treated at a health facility or not. Some studies reported that ‘most’ treatments obtained from shops were anti-malarial. In a few studies, percentages of antimalarial use are reported, but it was not possible to determine whether they represented a percentage of all cases or a percentage of those who self-treated. Overall about a third to a half of illnesses appear to be treated with antimalarials. Interestingly, this is similar to the proportion of illnesses that are actually due to malaria, and it would be comforting to think that actual malaria cases were more likely to receive antimalarials. However, in the Philippines, only one of the 20 confirmed malaria cases was treated with an antimalarial in spite of the high frequency of antimalarial use for malaria cases treated at home (Espino and Manderson 2000).

In Kenya, 37% of children tested for chloroquine in a community survey were positive, and these children were more likely to be parasitaemic, suggesting that chloroquine was more likely to be used in cases of malaria (Verhoef et al. 1999). The study also found that fever was over-reported and antimalarial use was under-reported. This may have been due to the fact that the research team was providing treatment, and people exaggerated illness and downplayed prior use of chloroquine in order to receive free medicines. In a health facility study in Tanzania, virtually all of those who denied using chloroquine had detectable levels in their blood (Nsimba et al. 2002). Another study using biochemical markers conducted in a hospital setting in Malawi suggested that prior treatment was both under-reported and over-reported in this setting (Nwankwo et al. 1999). Self-reports can never achieve 100% validity, and simple forgetting and confusion about the names of drugs is likely to be important in both under-reporting and over-reporting. Where suspected antimalarial use is illegal or disapproved of, it is likely to be under-reported. The factors related to reporting prior antimalarial use need to be carefully considered when conducting research and while engaging in clinical practice.

There is some evidence that those who practice self-treatment begin treatment earlier than those who seek care in the official sector. In Togo, 83% of all fever cases were treated with an antimalarial at home, and 97% began treatment on the first day, while only 17% of those taken to a health centre were taken on the first day (Deming et al. 1989). Similarly, in Kenya, 91% of children treated at home with an antimalarial drug received it within the first 2 days of illness, while only 51% of children taken to a health care facility were taken in the first 2 days (Hamel et al. 2001).

In contrast, in a nationwide study in Malawi, clinical attendance was the strongest predictor of taking an antimalarial (78% versus 42%). Higher educational level was related to using an antimalarial among those who did not go to a clinic (Slutsker et al. 1994). Clinic attendees were more likely to receive an antimalarial within 2 days than those who self-treated (58% versus 36%), and more likely to complete the proper dose in a timely fashion (10% versus 5%). However, this optimal situation occurred rarely in either group. An association between perceived severity and clinic attendance was also noted in this study but was not controlled for in the analysis. It may be that more of the fevers treated at home were due to other causes, resolved quickly and did not require anti-malarials. It is not yet possible to reach conclusions about whether self-treatment as currently practised is associated with more or less delay in beginning treatments with antimalarials, and this may vary across sites. Most studies do not consider delay to treatment, and many of those that do are clinic based and focused on duration of symptoms before coming to clinics.

It is logical to expect that prompt treatment is more likely to occur when antimalarials are available in the home. In Nigeria, 56% of households had chloroquine in the medicine cabinet (Isah et al. 1995), while 80% of households in Congo (Brazzaville) had antimalarials (Carme et al. 1992). In Dar es Salaam, Tanzania, 68% of men and 77% of women reported using home reserve drugs for treatment in the past (Mnyika et al. 1995). In the Solomon Islands, 25% of respondents reported that they had chloroquine in the home, but the drug was observed in households that said they had none. Home stocks may have been under-reported because it was evidence that treatments were not being finished or pregnant women were not complying with prophylaxis (Dulhunty et al. 2000).

In one study in Kenya, 28% of those who treated fevers used home stocks of medicine as the first treatment step (Ruebush et al. 1995). A quarter of treated cases reported a second...
treatment step, and the study recorded up to five treatment steps. Self-treatment including home stocks and shops fell from 85% of treatments in step one to 74% in step two, but rose again to 85% in the small percentage (7%) who took a third treatment step. In a study in another region of Kenya, self-treatment rates were much lower, and only 5% of initial treatment choices involved shops. However, this rose to 10% in the second step, and 16% in the third step. Public health facilities were the most important first step (74%), but declined (to 13%) in the third step (Munguti 1998). In a third study in Kenya, 83% began with self-treatment with pills (Nyamongo 2002). The variation evident in results from these studies illustrates the importance of considering variation within a single country.

In their study from Ghana, Agyepong and Manderson (1994) report that the common pattern was to try medicines and go to a health facility if symptoms did not improve. The complexity of the treatment-seeking process is evident in their description:

For example, 143 of 256 rural respondents undertook two first actions concurrently (self medicating with chloroquine and paracetamol, for instance), and 46 out of the 143 who took a second action took a third one at the same time, such as having an enema and taking a combination of drugs.’ (Agyepong and Manderson 1994: 325)

Although many report a tendency to begin with self-treatment and progress to use of health facilities, self-treatment clearly remains an important option at all stages of illness.

**Dosage patterns**

The widespread pattern of stopping medication when symptoms resolve is well known. Drugs may be saved for future episodes, or given to family and friends. Reports of correct dosing vary widely, partially because of the variation in methodology, which ranges from asking someone to report the correct dose for an adult or a child (knowledge), to reports of usage for a recent episode (recall), to reports of usage in general (hypothetical). Knowledge of the correct dose for a child is likely to be less accurate, since it varies by age and body weight. Unfortunately, many studies do not specify whether they asked about adult or child doses, and do not define what is considered a ‘correct’ dose. There is little information on the amount of medication taken, or how antimalarials are combined with other drugs.

Given these limitations, Table 1 shows reports of dosage patterns. Knowledge of correct dosage was high (58%) in Kisii District, Kenya, especially with prepackaged brands (Nyamongo 1999). However, a ‘gap’ between knowledge and behaviour is illustrated by another study among Kenyan schoolchildren, which found that dosages of antimalarials were typically inadequate, even though the correct dose was known (Brooker et al. 2000). Much lower rates of correct dosing were found in Malawi, where people were asked about treatment for a specific illness (Shuteker et al. 1994). A detailed study in Uganda involved observation and follow-up at three points in time, with comparisons of dosages prescribed and actually taken (Nshakira et al. 2002). Less than half of the dosages prescribed in health units (39%) and drug shops (28%) were accurate to begin with. Thirty-eight per

### Table 1. Antimalarial dosage patterns

<table>
<thead>
<tr>
<th>Country</th>
<th>Comment</th>
<th>% correct</th>
<th>% underdose</th>
<th>% overdose</th>
<th>Author/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burkina Faso</td>
<td>Two week recall Before intervention</td>
<td>3</td>
<td>83</td>
<td>14</td>
<td>Pagioni et al. 1997</td>
</tr>
<tr>
<td></td>
<td>After intervention</td>
<td>49</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colombia</td>
<td>One year recall Self-treatment</td>
<td>71</td>
<td>33</td>
<td>20</td>
<td>Nieto et al. 1999</td>
</tr>
<tr>
<td>Congo</td>
<td>Knowledge</td>
<td>47</td>
<td>33</td>
<td>20</td>
<td>Carme et al. 1992</td>
</tr>
<tr>
<td>Guatemala</td>
<td>Knowledge</td>
<td>10</td>
<td></td>
<td></td>
<td>Ruruboo et al. 1999</td>
</tr>
<tr>
<td>Kenya</td>
<td>Knowledge</td>
<td>58</td>
<td></td>
<td></td>
<td>Nyamongo 1999</td>
</tr>
<tr>
<td>Kenya</td>
<td>Two week recall Before training shopkeepers</td>
<td>4</td>
<td>83</td>
<td>14</td>
<td>Marsh et al. 1999</td>
</tr>
<tr>
<td></td>
<td>After training shopkeepers</td>
<td>65</td>
<td>29</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Kenya</td>
<td>Two week recall</td>
<td>62</td>
<td></td>
<td></td>
<td>Hamel et al. 2001</td>
</tr>
<tr>
<td>Malawi</td>
<td>Two week recall Self-treatment within 2 days</td>
<td>14</td>
<td></td>
<td></td>
<td>Shuteker et al. 1994</td>
</tr>
<tr>
<td></td>
<td>Clinic treatment within 2 days</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mali</td>
<td>Knowledge (adult)</td>
<td>3</td>
<td>97</td>
<td>30</td>
<td>Djininde et al. 1998</td>
</tr>
<tr>
<td>Mali</td>
<td>Five month recall</td>
<td>34</td>
<td>36</td>
<td>30</td>
<td>Thera et al. 2000</td>
</tr>
<tr>
<td>Nigeria</td>
<td>Knowledge</td>
<td>24</td>
<td></td>
<td></td>
<td>Ejiove et al. 1999</td>
</tr>
<tr>
<td>Uganda</td>
<td>Prospective follow up Adherence to prescription</td>
<td>38</td>
<td>24</td>
<td>38</td>
<td>Nshakira et al. 2002</td>
</tr>
<tr>
<td></td>
<td>Actual intake</td>
<td>28</td>
<td>33</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>Zambia</td>
<td>Knowledge adult – urban</td>
<td>28</td>
<td></td>
<td></td>
<td>Makubalo 1991</td>
</tr>
<tr>
<td></td>
<td>Knowledge child – urban</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
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<td>Knowledge adult – rural</td>
<td>39</td>
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<td>Knowledge child – rural</td>
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338 SC McCombie
cent of the caretakers administered what was prescribed, while 24% gave less and 38% gave more. The end result was only 28% receiving an appropriate dose, and overdosing was essentially as common as underdosing. The results from Mali (Thera et al. 2000) and Congo (Carme et al. 1992) also suggest that overdosing may be almost as common as underdosing.

Clearly knowledge of correct doses is an important variable, and correct dosages are unlikely to be given if they are not known. In many areas, there are a wide variety of brand names and pill types that lead to confusion among consumers about whether the drugs are the same or not. Nymongo (1999) noted that knowledge of correct dosages was associated with reading ability. This corresponds well to results of an early study of general self-medication in Zimbabwe, where urban respondents were more likely than rural respondents to say they determined the dose of over-the-counter medications by reading package instructions (80% versus 39%), while 48% of rural respondents said they did not know how to determine the dose (Stein et al. 1989).

The type of medicine used also appears to influence adherence to correct doses. In Kenya, underdosing for children was more common when syrup was used rather than tablets (Hamel et al. 2001). In Ghana, a clinic-based study of children showed that adherence to the correct dose was more frequent when prepackaged tablets were given rather than syrup. Variation in the devices used to measure syrup was partially responsible for this result (Anshs et al. 2001).

Discussion

Should efforts be made to encourage more people to obtain treatment from official sources? Is delay in seeking treatment the cause of deaths from malaria? It seems obvious to many that the answer to both of these questions is yes. However, in Guinea-Bissau, 93% of children aged 1-30 months who died from any cause had been treated at a health centre or hospital prior to death (Sodemann et al. 1997). Fifty-two per cent of probable malaria deaths in children in the Gambia occurred within the first 2 days of illness (Greenwood et al. 1987). In South Africa, while 33% of malaria deaths had delays of 3 or more days before seeking treatment, delays in diagnosis, incorrect choice of drugs and dosages, and unavailability of drugs were also noted as problems contributing to the deaths (Durheim et al. 1999). These studies illustrate that the problem is more complicated than simple failure to seek care from official sources.

A disconcerting number of studies have revealed inadequacies in the treatment practices of public and private providers (deZoysa et al. 1998; Kamat 2001; Kelly et al. 2001; Rowe et al. 2001). In the Central African Republic, where only 50% of fevers were treated correctly in health facilities, correct treatment was not associated with training or supervision of health care workers and curiously was less likely to occur when there was a fever treatment chart in the consultation room (Rowe et al. 2000). In an intervention study involving malaria treatment by medical assistants in Ghana, incorrect dosages continued to be prescribed in spite of the fact that knowledge increased after the intervention (Ofori-Adjei and Arhinful 1998). Clearly there is a need to improve practices in the official medical sector, but this does not always occur even when interventions and resources are directed at health facilities. In a review of studies of the cost-effectiveness of malaria control in Africa, Goodma and Mills (1999) noted that there were no studies of the cost of improving case management.

A number of interventions to improve malaria treatment by training community-based distributors of various types have been implemented (Kaseje et al. 1987; Spencer et al. 1987; Menon et al. 1988; Pison et al. 1993; Delacollette et al. 1996; Okanurak and Ruebush 1996; Pagnoni et al. 1997). One study in Ethiopia demonstrated a reduction in mortality (Kidane and Morrow 2000). Further research of this type is needed, as most other studies have not been able to link the interventions to changes in mortality. In the Congo, a number of problems typical of ‘community-based’ interventions were noted, including the failure to secure genuine community participation and progressive loss of enthusiasm. The malaria workers wanted more than a token financial reward and further training. They were marginalized because their care was not comprehensive and they could not provide treatment for other diseases (Delacollette et al. 1996).

Interventions to improve compliance with full doses have included the use of prepackaged drugs (Gomes et al. 1998; Qingjun et al. 1998; Shwe et al. 1998) and educational programmes directed at drug vendors (Marsh et al. 1999). The latter approach often raises issues for policy-makers. In Uganda, researchers encountered difficulties in organizing training for shopkeepers because medical authorities felt it would legitimize an illegal and dangerous practice. As a result, the training has been confined to official pharmacies (van der Geest 1999). There is also concern about the frequent administration of injections by traditional healers and individuals with no medical background (Birungi 1998), especially in light of the high risk of transmitting HIV and other bloodborne infections.

Self-treatment or home treatment is often seen as a form of treatment that represents an alternative to care from a provider, and in some cases an antagonistic relationship is implied. Medicines have been described as ‘democratic’ by Nichter and Vukovic (1994) in that they ‘have powers of healing in and of themselves which anyone can mobilize’ (p. 1516). Similarly, while Geissler et al. (2000) discuss the potential dangers of self-treatment among children, they note that their appropriation of Western medicines gives them ‘autonomy’. Both discussions lead one to a conclusion that issues surrounding self-treatment have something to do with empowerment. In a study of attitudes to self-treatment in Nigeria, Adeniyi and Ramakrishna state that ‘Self treatment was justified not so much from the standpoint of a being an alternative or temporary substitute resorted to for lack of professional treatment as from the right of the individual to have responsibility for and to take active part in the maintenance of his/her health.’ (Adeniyi and Ramakrishna 1984-5: 125)
Discussions among researchers and policy-makers often centre on questions such as ‘How important is self-treatment?’, ‘What proportion of cases are treated in the home?’, and ‘Does home management work?’ Others respond with answers, such as ‘Self-treatment was the first resort in 90% of cases’, ‘Eighty per cent of cases are treated in the home’, and ‘We don’t know’. However, it is important to recognize that 100% of cases are treated in the home. The only difference is that in some proportion of cases, advice from providers outside the home is also sought. People may visit health facilities to obtain treatments that they have already decided are necessary, or bring medicines they have obtained elsewhere to be injected by providers. Situations where patients act as active agents in their health care encounters could also be considered a form of ‘self-treatment’. The distinction between self-treatment and treatment by a provider is not always clear. At some level, ‘self-treatment’ is universally practiced, even if the treatment is ‘waiting’.

Conclusions and recommendations

Attempts to compare the evidence across studies are difficult because there are many differences in methods, sampling, the types of questions asked, and in the way the data are classified and presented. Similar problems have been noted with respect to research on bednets (Meek et al. 2001). It is difficult to interpret data from many studies, even when tables are presented that give treatment rates. Some studies classify by type of provider consulted, for example: self, doctor, traditional healer, pharmacist. However, many mix types of providers or the type of treatments, for example: neighbour, herbs, drugs, clinics, traditional healers. There are almost as many ways of categorizing treatments as there are studies. Treatment for malaria involves at least four important questions. First, who was consulted? Secondly, what was done and/or what medication was taken? Thirdly, where was the medication obtained? And finally, when was the medication taken in relationship to onset of illness?

The time has come to move beyond simple descriptions of treatment-seeking for malaria and focus on the evaluation of interventions. This will require a greater degree of methodological rigour and more attention to the generation of data that can be compared across time periods and studies. Descriptive research will remain important in designing interventions that are locally appropriate, as many of the results from studies so far may not apply outside the specific contexts in which the research was conducted. The extent of self-medication with antimalarials varies from place to place, and while there are some common patterns, it is unwise to assume that there are many findings that can be generalized outside the country, culture and socioeconomic context in which they were generated. Several important questions remained unanswered. What proportion of people with malaria complete an appropriate treatment regimen, and what are the determinants of this outcome? How are treatment patterns related to age, gender, level of endemicity and personal experience with malaria? How effective are interventions to improve the use of antimalarials? How much of malaria mortality is actually due to delay in beginning treatment and inadequate dosing?

In order to answer these questions and evaluate treatment interventions, a better classification system for the presentation of data regarding malaria treatment needs to be developed. Identifying source of treatment is not enough. It is important to distinguish between who, what, where and when, and be specific about each level of analysis for each treatment step. Definitions of malaria cases and the role of local disease categories in identifying cases need to be made more explicit. Illnesses should be classified by severity, using measures of perceived severity as well as biomedical signs of severity. Whenever possible, recall periods should be short (within the last 2 weeks) and prospective studies should be considered. Questionnaires and other methods of data collection should be designed so that the timing, dose and types of medication used can be determined.

Clinic-based studies and hypothetical questions have a role in research on health-seeking behaviour, but their limitations need to be recognized and considered when interpreting results. The impact of selection bias is especially problematic in settings where less than half of cases attend health care facilities. In addition, the difference between hypothetical, usual and most recent behaviour must be made explicit when data are reported. Concerns about the validity of self-reports are valid, but biochemical testing is not necessary for all studies. Attention to the context in which questions are asked is also important. Evaluation of the impact of interventions usually involves data from at least two points in time. In order to demonstrate change, reports of behaviour that are consistent over time (i.e. have high reliability) are important. Even if the behaviour is under-reported or over-reported (i.e. validity is not perfect) the data can be useful in demonstrating change. Improvement of the potential for research on health-seeking behaviour will require careful attention to a number of methodological issues. These include identification of key illness terms, back-translation and pre-testing of survey instruments, awareness of biases in sample selection, and consistency in the categorization and presentation of data.

Endnotes

1 It is interesting to note that chemotherapy with chloroquine was not a strategic element in the Global Eradication Campaign, due to lack of an infrastructure to ensure widespread distribution and concern about poor drug compliance (Desowitz 1999).

2 From the Roll Back Malaria website: [http://www.who.int/rbm/RBM/Abuja/abuja_declaration.htm].

3 Most sources give the dosage for oral chloroquine as 25 mg/kg over 3 days.

References


Biography
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