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Improving ability to identify malaria and correctly use chloroquine in children at household level in Nakonde District, Northern Province of Zambia

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Abstract

Background: This study investigated causes of malaria and how cases were managed at household level, in order to improve the ability to identify malaria and ensure correct use of chloroquine. It was conducted in Nakonde District, Northern Province of Zambia, between 2000 and 2001. Nakonde district is in a hyperendemic malaria province, where *Plasmodium falciparum* is predominant. The district has a total population of 153, 548 people, the majority of whom are peasant farmers. The main aim of the post intervention survey was to establish the proportion of caretakers of children five years and below, who were able to identify simple and severe malaria and treat it correctly using chloroquine in the home.

Methods: A baseline survey was conducted in five wards divided into intervention and control.

Intervention and control wards were compared. Village health motivators and vendors were identified and trained in three intervention wards, as a channel through which information on correct chloroquine dose could be transmitted. A total of 575 carers, who were 15 years old and above and had a child who had suffered from malaria 14 days before the survey commenced, were interviewed. The two control wards received no intervention. 345 caretakers were from the intervention wards, while 230 came from the control wards. Identification of malaria and correct use of anti-malarial drugs was assessed in terms of household diagnosis of malaria in children under five years, type and dose of anti-malarial drugs used, self medication and the source of these anti-malarials.

Results: The majority of respondents in the study were females (81%). Chloroquine was the most frequently used anti-malarial (48.5%) in both the intervention and control wards. There was no difference between the intervention and control wards at pre-intervention ($P = 0.266$ and $P = 0.956$), in the way mothers and other caretakers identified simple and severe malaria. At baseline, knowledge on correct chloroquine dosage in the under five children was comparable between intervention and control wards. Post-intervention revealed that mothers and other caretakers were 32% and 51%, respectively, more likely to identify simple and severe malaria. There was a 60% increase on correct chloroquine dosage in all age groups among carers living in post-intervention wards.

Conclusion: Compliance with standard therapeutic doses and correct identification of malaria was poorest in control wards, where no motivators and vendors were trained.

Background

Malaria is a major cause of morbidity and mortality among under-five children in most countries in Africa [1]. However, the various strategies that have been established by national malaria control programmes do not seem to have produced any successful results to reduce morbidity and mortality in the under-fives, particularly in sub-Saharan Africa [2]. Although currently over-advocated, insecticide-treated bed nets, have been effective in places like The Gambia [3], they do not seem to reduce the incidence and mortality rates due to malaria in countries such as Zambia. Factors such as acceptability, cultural values and costs appear to affect universal use of nets [4]. Lack of knowledge on correct usage of drugs reduces further the number of children that could be saved, especially in rural communities of tropical Africa [5]. Malaria vaccines, although receiving much attention, still have a long way to go before being available.

It has been shown by many studies [6], that treatment with anti-malarial drugs was the major way of reducing morbidity and mortality due to malaria in endemic countries. In Zambia, as in most other countries in the sub-region where medication is provided through the established health institutions, there has been little success in reducing both infant and child mortality. The reasons for this vary, but the most common one is that *Plasmodium falciparum* develops very quickly in children which makes it difficult for caregivers to acquire treatment fast enough to counteract the parasites [7,8].

Although malaria transmission varies according to zones in Zambia, it is holoendemic in the Northern Province, the area where this study was conducted. Between 1984 and 1987, a primary healthcare project was conducted in Nakonde district, with a view to increasing quick identification of malaria and correctly treating it within the community. However, by 1998, it was established, that malaria treatment in most rural Zambia was carried out in households rather than at community level [1].

The anti-malarials were obtained from different sources, including drug sellers, pharmacies, health facilities, community based distributors and private practitioners. The official malaria control programme accounted for 25–30% of chloroquine distribution in Zambia. A study in rural Zimbabwe found that despite the availability of free health services, over-the-counter purchase of drugs without a prescription was highly prevalent [9]. The programme was reinforced by training Community Health Workers (CHWs) who did not receive any payments for the work they did. They were, however, given drug kits by government. Being a community-based project, it was well received and accepted by the Nakonde people. The major limitation of this programme was that there was a

reduction in the number of CHWs after only two years of the project success. Secondly, due to conservatism of our rural communities, most of the cadres were men who were located about 10 kilometers radius of their villages. An assessment of the programme later revealed that the main users of the facility were those living very close to the CHWs. Not many villagers had received information on prevention of the disease and correct use of chloroquine, which was a drug of choice at the time, especially for the children who were five years and below.

The baseline results had shown various places where anti-malarial drugs could be obtained [10]. Further, results from the Nakonde study revealed that in Zambia, anti-malarial drugs were distributed through a variety of channels in both the private and the public sector. Long distances to official sources of anti-malarial supplies were identified as the root causes that led people to seek unofficial sources, which sometimes sold single tablets instead of a complete course of treatment. In addition, results showed that people were resorting to self-medication for malaria, which caused delays in seeking specialized treatment, especially when treatment failed. Measures to restrict illicit sale of anti-malarial drugs have been unsuccessful. The study also noted that all anti-malarial drugs had no cautioning and instructions in the local language [11]. Raynal had stressed the importance of training rural store-keepers to enable them to advise their clients on the appropriate use of anti-malarial drugs [9]. The Nakonde study focused on training anti-malarial drug sellers and Village Health Motivators (VHMs).

The study explored the impact of an intervention on people's ability to:

- (1) Recognize malaria
- (2) Administer the standard treatment for malaria in line with the current National Malaria Treatment Guide (NMTG).

After a careful review and long discussions with policy makers and community leaders, a new system was proposed, designed to overcome the problems of drug shortages and meet the needs of villages health workers.

The new method was based upon selection and training of VHMs, to teach caregivers of children five years and below, how to recognize malaria and treat it correctly with chloroquine purchased from vendors using the NMTG. They were further trained to refer children to health facilities as soon as dangerous signs were identified. In order to assess the effectiveness of the method, an intervention project was set-up with funds from Applied Research in Child Health (ARCH), to determine the impact of the cor-

rect dosage of chloroquine at home on children under five years and below, as compared to the current methods where treatment was community- or health facility-based. This paper provides a report of results derived from the intervention.

Methods

This study was conducted in Nakonde District in the Northern Province of Zambia between 2000 and 2001. The district lies over 1, 200 meters above sea level and is in a high malaria transmission area. Malaria due to *P. falciparum* is hyperendemic, with main transmission during the rainy season, which begins in November and ends around April. Most of the malaria cases occur during this time of the year. In this district, chloroquine resistance was reported by TDRC around 1994, though it has remained the recommended drug in the district.

The Nakonde district had a population of 153, 54812, of which 20% were below the age of five years. It had seven rural health centers; though more than 60% of the population was found outside the government recommended 12-kilometre radius of the rural health center. The District Health Management Board (DHMB) was running the health services in the district.

Baseline

Before implementing an intervention, a cross-sectional baseline survey was conducted with 575 carers of children five years and below, who had suffered from malaria 14 days prior to the interview. To select a village for participation in the study, simple random sampling was applied. Five villages were selected from each of the five wards. In total, the intervention wards had 15 villages, while 10 were in the control. Within each village, 23 mothers or Carers were identified and interviewed. Questionnaires to assess knowledge on identification of simple and severe malaria, correct dosage of chloroquine in the under five years children and information networks and materials on malaria were administered on carers who were 15 years old and above.

Intervention

Selection of intervention wards

Five wards out of 17 were selected to participate in the study. Three of the five wards in the study area were selected as intervention wards, while the other two were selected as control wards. Villages in each of the selected wards were classified as "Health Centre Villages" (with a health centre or within a 12-km radius of a health centre) or as 'Non-Health Centre Villages'. Most villages, even non-health centre villages were expected to have an anti-malarial drug seller in the village or within a 5-km radius of one. All villages in each ward were listed and a number assigned to them. To select a village for participation in

the study, simple random sampling was applied. Five villages were selected from each ward. In total, the intervention wards had 15 villages, while 10 were in the control. Within each village, 23 mothers or carers, with children aged five years and below, were identified and interviewed. Any household with a child less than five years old and having had fever in the past two weeks was eligible for an interview. In polygamous households, all mothers with eligible children were interviewed, because any mother with children would have felt slighted if left out. During the main analysis, only one respondent from each multi-respondent household was randomly selected for the sample.

Selection and Functions of VHMs

A total of 27 VHMs from each intervention village attended a seven-day course, which focused on general knowledge of malaria: cause, prevention, treatment using NMTG and referral of severe cases to health centres. The VHMs were provided with a VHM manual for reference, in case they forgot some basic facts. They made house-to-house visits once a week, informing mothers and other caretakers about both correct administration of chloroquine and identification of malaria in under-five children. VHMs encouraged mothers to obtain treatment guides each time they bought chloroquine from a vendor. Any child suffering from suspected malaria was immediately referred to the rural health centre. They took records of children who complained of fever and recorded any deaths that occurred in each household within their villages.

Description of the intervention

Three wards consisted of rural health centres and the semi-urban Nakonde Zonal Health Centre. The intervention wards had 15 villages, some of which were very close to the health facilities. However, there were three villages, which were between 20 and 50 kilometres away from the health centre. The types of health facilities varied in size and staff capacity. The largest was Nakonde, which served over 20% of the district's total population. There were 325 respondents. Both male and female aged 15 years and above participated in the study. These intervention villages had anti-malarial drug vendors and VHMs.

Similarly, a sample of 10 villages was drawn from two control wards. Households were selected for interviews. The control wards had neither vendors nor village health motivators. Most of the villages were situated within the 12-km radius of the rural health centre. There were 250 respondents, who participated in the study from these wards.

Table 1: Demographic characteristics of caretakers who participated in the study

Characteristic	Pre-Intervention ¹			Post-Intervention		
	Intervention Group N (%)	Control Group N (%)	p value	Intervention Group N (%)	Control Group N (%)	p value
Age group (Years)						
15–19	18 (5.3)	10 (4.5)	0.952	32 (9.3)	22 (9.6)	0.405
20–24	73 (21.7)	50 (22.7)		107 (31.0)	64 (27.8)	
25–29	103 (30.6)	59 (26.8)		73 (21.2)	65 (28.3)	
30–34	57 (16.9)	40 (18.2)		66 (19.1)	36 (15.7)	
35–39	41 (12.2)	27 (12.3)		34 (9.9)	23 (10.0)	
40–44	19 (5.6)	16 (7.3)		21 (6.1)	9 (3.9)	
45+	26 (7.7)	18 (8.2)		12 (3.5)	11 (4.8)	

Supervisory visits

The District Health Management Board in Nakonde assigned two environmental health technicians to check on the operations of the VHMs. They were also responsible for distributing dose guides to vendors in case the stocks ran out. These regular supervisory visits by district health personnel were for their routine operations.

The investigators conducted regular monitoring visits at least once every month. Meetings with village health motivators, anti-malarial drug vendors who were distributors of dose guides and some carers of malaria patients in the community and the environmental health technicians were held to get feedback.

Results

Demographic characteristics of caretakers

A total of 345 caretakers in the intervention group and 230 caretakers in the control group, were recruited. The sample size for the intervention group and control group was held constant at post-intervention assessment.

In both the baseline and post intervention surveys, the majority of caregivers were females: 74.8% in intervention group and 71.7% in control group at baseline, and 84.1%

in intervention group and 77.8% in control group in post-intervention phase. The age distributions between the intervention and control groups were similar at baseline and post-intervention phase (Table 1).

Identification of malaria and knowledge of correct treatment

Analyses of knowledge on the identification of simple and severe malaria were strikingly similar in both the intervention and control groups at baseline (pre-intervention). Comparing the knowledge on correct dosage using chloroquine in all age groups, no differences were observed (Table 2).

Table 3 summarises the results on the effects of the intervention regarding knowledge for the identification of simple and severe malaria and correct dosage of chloroquine in the post-intervention and control groups. Caretakers in the intervention arm were 1.32 times more likely to identify simple and 1.51 times more likely to identify severe malaria compared with their counterparts in the control arm. Rates on correct malaria treatment knowledge using chloroquine strongly differed in the post-intervention and control areas. The intervention group was 60% more

Table 2: Knowledge Levels of correct CQ dosage and correct identification of malaria in the intervention and control groups at baseline

	Intervention group Total = 345 N (%)	Control group Total = 230 N (%)	P value
Correct knowledge on CQ dosage in age group			
Less than 6 months	58 (16.8)	36 (15.7)	0.712
6–11 months	25 (7.2)	16 (7.0)	0.895
1–3 years	80 (23.2)	46 (20.0)	0.365
4–5 years	64 (18.6)	40 (17.4)	0.723
Correct identification of malaria			
Simple	146 (42.6)	86 (37.9)	0.266
Severe	102 (29.7)	68 (30.0)	0.956

Table 3: Knowledge Level of correct CQ dosage and identification of malaria after the intervention

Age Group (Years)	Correct Knowledge		Incorrect Knowledge	
	N = (%)	N (%)	Total (%)	RR ¹ (95% CI)
Less than 6 months				
Intervention	207 (60.0)	138 (40.0)	345 (100)	4.60 (3.26, 6.49)
Control	30 (13.0)	200 (87.0)	230 (100)	
6–11 months				
Intervention	173 (50.1)	172 (49.9)	345 (100)	5.49 (3.60, 8.37)
Control	21 (9.1)	209 (90.9)	230 (100)	
1–3 years				
Intervention	203 (58.8)	142 (41.2)	345 (100)	3.98 (2.88, 5.50)
Control	34 (14.8)	196 (85.2)	230 (100)	
4–5 years				
Intervention	156 (45.2)	189 (54.8)	345 (100)	5.47 (3.50, 8.55)
Control	19 (8.3)	211 (91.7)	230 (100)	
Identification of malaria				
Simple malaria				
Intervention	220 (63.8)	125 (36.2)	345 (100)	1.32 (1.13, 1.54)
Control	111 (48.3)	119 (51.7)	230 (100)	
Severe malaria				
Intervention	149 (43.2)	196 (56.8)	345 (100)	1.51 (1.19, 1.91)
Control	66 (28.7)	164 (71.3)	230 (100)	

likely to give the correct chloroquine dosage to their under-five children, than those in the control group.

Discussion

The results of this study have shown that it is possible to increase both knowledge on identification of malaria and correct use of anti-malarial drugs in the treatment of children five years and below in rural communities where the majority of the people are illiterate. It has further been demonstrated that malaria is a common illness and a major cause of death in children five years of age and below. Mothers and other caregivers can ably and correctly give their children a correct dose of chloroquine or any other anti-malarial drug if they are appropriately taught and guided on how to use the drugs at household level. The technique, which the Nakonde study adapted, was based upon impact evaluation principles. After discussion with the community leaders and policy makers, it was agreed that the District should train VHMs selected in the villages by village residents themselves. These were trained to teach caregivers how to recognize symptoms and signs that were common in children five years and below in the district, and treat malaria promptly and appropriately.

Improving knowledge of correct chloroquine dosage

The results have shown that anti-malarials can be given effectively and correctly to the under-fives by illiterate but well-trained and motivated care-givers at household level

with little or no supervision at all. There was a tendency in all villages for VHMs to be ordinary members of the community who were respected by their own people. Female VHMs were as knowledgeable as their male counterparts. The study has emphasized the concerns about increasing drug resistance because of indiscriminate and incorrect use of anti-malarial drugs such as chloroquine.

The studies that were conducted in Ethiopia and Kenya [12] had examined programmes that were community-based and intended to control malaria. These have tried to show effects on overall mortality rates and malaria-specific mortality rates. Another study from the West African country, Burkina Faso [13], confirmed that community based programmes for training mothers to make presumptive diagnosis and provide treatment to their under-fives were feasible and affordable. The present study did not consider the community affordability of malaria drugs but has indicated that it may be cheaper to provide information to households using the village based health workers. These results were consistent with results from the Gambian study, which revealed that anti-malarial prophylaxis given by the care-givers of the under-fives achieved a higher coverage than what was provided by the health facility.

Increasing knowledge on identification of severe and simple malaria

Identification of simple and severe malaria included local terminologies such as *impepo* and *inzekema*, respectively. Symptoms of simple malaria were mostly fever (55%) or commonly reported as body hotness in both intervention and control wards. However, *inzekema*, which is called severe malaria in English, included signs and symptoms of fever, vomiting, loss of appetite and diarrhoea (39.8%).

The results from the Nakonde study showed three patterns in health seeking behaviour: the first one was self-diagnosis and treatment; the second was the vendors and village health motivators' consultation; and the last one was the use of rural health centres.

Care-givers of children five years and below suffering from malaria, mentioned a hierarchy of health seeking behaviour.

The most predominant care option was the rural health centre, which was mentioned by over 80% of the care-givers. The interesting finding in this community was that care-givers never expressed stigma against anyone suffering from malaria. 'It is natural, anyone can get sick', they said. The implication of this could be that the communities may not take preventive measures seriously, as they consider the disease natural, hence needing no attention.

Although chloroquine was the only anti-malarial that could be purchased over-the-counter in Nakonde at the time of the survey, care-givers mentioned septrin and Fansidar as common anti-malarials that were available in the community. This was not surprising as the neighbouring countries such as Tanzania and Malawi had changed their drug policy and had adopted SP as drug of choice, which made most Nakonde residents start looking upon chloroquine as an ineffective drug. The other important point to note is that Fansidar and septrin were both prescribed by unqualified personnel, who had no regard for the emergence of drug resistance. A large number of care-givers repeatedly reported that health facilities were inadequate in relation to the treatment of malaria. They cited factors such as lack of drugs, bad attitudes of health care providers and long distances to the rural health centres.

The limitations of VHMs in teaching the communities how to diagnose malaria have been documented by other studies. This study managed to promote household anti-malarial use by the training of VHMs.

It is vital to concentrate on what families and community-based efforts are able to achieve when a properly designed project is implemented and communities are well trained to carry out the tasks. This approach should also be tried

in urban communities where there are several anti-malarial supply routes. The use of motivators who claim no payments at the end of their work, has given high impetus to the Nakonde project.

Conclusions

Compliance with standard therapeutic doses and correct identification of malaria was poorest in control wards, where no motivators and vendors were trained. A major conclusion of the Nakonde study is that VHMs should be regarded as critical partners in efforts to promote compliance with a full course of malaria treatment.

Authors' contributions

F.A.D. K was Principal Investigator to the project. He was responsible for the design and implementation of the study, as well as the management of the project throughout the study period. He drafted the manuscript and made all the necessary corrections that were required. MT was responsible of fieldwork during data collection and supervised data entry. She was a co-author of the manuscript. Both authors have read and approved the final manuscript.

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