ASSESSING THE IMPACT OF EDUCATIONAL INTERVENTION FOR IMPROVING MANAGEMENT OF MALARIA AND OTHER CHILDHOOD ILLNESSES IN KIBAHA DISTRICT-TANZANIA.

Stephen E. D Nsimba[1]

Abstract

Objective: The study was carried out to evaluate short term effects of one to one educational intervention approach, conducted with 40 drug sellers in order to improve the private sector's practices, compliance and performance in using the national treatment guidelines for malaria and other common childhood (diarrhoea, acute respiratory tract infection-ARI) illnesses in Kibaha district-Tanzania.

Methods: The training took place one month after baseline data collection. Data collection was undertaken eight months after training and the effects of training was evaluated. The 40 drug stores were divided into 20 intervention and 20 control facilities. Trained nurses were used as clients who posed as caretakers of sick under-five children needing medication. The drug dispensers/sellers knowledge of anti-malarials and other drugs and their dispensing practices was assessed.

Results: The intervention seemed to have had a significant impact on knowledge pattern for prescribing and dispensing practices of drug stores for some common childhood illnesses but not in other control drug stores/shops. About 90% (n = 18) of shops prescribed to clients, the approved first-line anti-malarial drug for uncomplicated malaria (sulfadoxine-pyrimethamine), as compared to only 55% (n = 11) of the control shops.

Conclusion: Changing the private sectors' knowledge, behaviour and practices/performance may be a slow and difficult process. The intervention approach applied in this study seems to be feasible at district-level. This strategy can be applied in all districts of Tanzania with the aim of achieving significant improvements in knowledge, behaviour, compliance, improving performance and practices of drug sellers in drug stores/shops. However, other alternative strategies are needed to influence drug sellers'/dispensers' compliance and performance. Thus, the overall impact on performance and practices in these facilities will remain at moderate level for quite sometime unless national policies, other programs and stakeholders are involved actively.

Key Words: Private sector/facilities, drug stores, compliance, performance, malaria, diarrhoea, ARI, under-five children, dispensing of drugs, national treatment guidelines, interventions

Introduction

Malaria is a major public health problem, killing at least two to three million people each year, mostly in sub-Saharan Africa (1-3). Current strategies to combat malaria, led by the World Health Organization's "Roll Back Malaria" initiative, include early prompt and effective treatment (4, 2). This strategy is hampered by a lot of difficulties that accompany other mimicking symptoms that delay recognition of malaria. These mimicking signs and symptoms include those of other childhood conditions like acute respiratory tract infections (ARI), diarrhoea and urinary tract infections (UTI). Other problems include distance to and inaccessibility of health facilities, lack of efficacious and affordable anti-malarial drugs. Furthermore, treatment is compromised by the widespread use of anti-malarial drugs for all fevers and by incorrect dosing (5). These factors contribute to drug resistance, which necessitates continued change in malaria treatment guidelines/policies in Tanzania and other sub-Saharan countries (6).

In sub-Saharan Africa, malaria is endemic and public health facilities are not very accessible, about 50% to 80% of people first visit private drug stores/shops or traditional practitioners for malaria treatment (7-9). However, the majority of drug sellers/dispensers in private facilities have inadequate knowledge (i.e. drug stores, ordinary shops and vendors) (4, 10-11). Drug stores/shops are numerous in Tanzania and they may be outside of the Tanzanian Food and Drugs Authority (TFDAs) capacity. Thus, monitoring these drug shops may be difficult because of lack of trained staff and poor infrastructure to reach all these places especially during the rain seasons. Thus, close monitoring and supervision is reported to influence good performance of private facilities which is an important element for effective, appropriate malaria case management and other childhood illnesses (12).

It has previously been reported that it may be difficult to achieve rational prescribing/dispensing in the private facilities because of demands imposed by patients, advertisements from drug companies and motives for achieving profit margins (4). Even communicating new standards of diagnosis and treatment to private practitioners in developing countries poses challenges to the National Malaria Control Programs within the Ministries of Health in sub-Saharan Africa due to limited resources available. Thus, innovative approaches are needed to achieve good performance in the health care system from both the private and public sectors in the country.

The purpose of this study was to evaluate the short term effects of using an individual to individual educational intervention approach. This approach was applied to 20 drug sellers/dispensers in the intervention group of drug stores in order to improve the drug sellers/dispensers performance and compliance in using the recommended national treatment guidelines for malaria and other common

Correspondence to: Stephen E.D. Nsimba, P. O. Box 65010, Muhimbili University College of Health Sciences (MUCHS). E-mail:snsimba@muchs.ac.tz

[1]from Department of Clinical Pharmacology, MUCHS, Dar-es-Salaam-Tanzania.

childhood (diarrhoea, acute respiratory tract infection-ARI) illnesses in Kibaha district-Tanzania. These recommendations for prescribers and drug dispensers/sellers include; rational prescribing, dispensing, correct/proper labeling and correct information or instructions on how to use or administer anti-malarials, antibiotics, anti-diarrhoea and other drugs in a rational way according to diagnostic indications.

Materials and Methods

Study setting

This cross-sectional study was conducted in the Kibaha district. The district is located 40 km north west of Dar-es-Salaam, Tanzania. It is one of the rural poor district and was selected because malaria is holo-endemic and accessible from Dar-es-Salaam. Malaria transmission is perennial (i.e. occurring 7-12 months of the year) but with peaks after the long rain seasons of March – July and after the short rains of October – December (13). Furthermore, the district has one designated District Hospital, the Tumbi Hospital. Other public health facilities at the time of the study were two health centres and 13 dispensaries.

At the time of the study, this district had four pharmacies and more than 59 drug stores in the district. Kibaha is among the six districts of Coast region. Kibaha is the capital town of Coast region. The district has a total population of 132,045 (66,291 males and 65,754 females) and 30,477 households (14). The majority of the inhabitants are small-scale farmers growing mainly maize and cassava as well as coconut palms, cashew nuts and mango trees. This study district does not differ very much from other coastal districts of Tanzania in terms of geographical features and culture.

The study was performed in urban and peri-urban areas (Kibaha and Mlandizi towns) of Kibaha district along the highway from Dar-es-Salaam to Morogoro regions. The intervention and the control groups were identified through a simple random allocation of the drug shops.

Research design

Post-intervention and control drug shops

Six months after training the drug sellers/dispensers and other counter attendants. The study team employed eight trained nurses who posed as clients and one supervisor who was also the Principal Investigator to assess the implementation and impact of the program. This client approach was chosen because it has been used elsewhere to assess the quality of drug sellers/dispensers in most developing countries (i.e. in assessing the dispensing practices for fever, diarrhoea, respiratory infections and colds) without observation bias (15).

Baseline data were collected for twenty eight days. Four trained nurses and one supervisor visited each drug store/shop which was included in the sample. The females presented a scenario having a two years old child who was left at home but she believed the child had either malarial fever or diarrhoea or respiratory infection. They asked the drug seller/dispenser for advice on what drug to purchase.

They specifically asked for anti-malarials such as shellyquine and dawaquine (popular brands of chloroquine), sulfadoxine/pyrimethamine and amodiaquine. These trained nurses provided to the drug sellers information on age and sex of the child and duration of the illness if they were asked. Immediately after leaving the drug shop while still having fresh memories, the researchers/data collectors filled the record form including any particular interactions encountered with the drug seller. In most cases, after the nurses had left a particular drug shop then the supervisor/PI entered in the drug shop also asked questions to the drug sellers/dispensers to assess malaria, diarrhea, colds and cough (ARI) knowledge.

Post-intervention and control drug shops

The intervention strategy given to all groups consisted of a questionnaire that was done by each drug seller/dispenser for 10-30 minutes under supervision by the Principal Investigator (PI). The questionnaire consisted of ten questions that was answered by the drug seller/dispenser who was found at the counter for each facility. Completed forms were collected and corrected immediately by the PI.

Sample design

Based on the baseline results, the facilities were then randomized into intervention and control facilities/groups. Hence, the study team gave posters, individual information and a one to one training sessions which lasted for one hour to 20 intervention facilities (each drug shop/seller on one to one basis). Whereas, only posters were given to the 20 control facilities to see if they could read or make use of these posters. These posters consisted of information or messages on how to properly dispense drugs, make correct labeling and give correct instructions on how to administer drugs to customers. Survey questions (baseline/first survey) and second survey data (post-intervention survey). Ten survey questions on knowledge and drug prescribing/dispensing practices in treating fever, diarrhoea, cough and colds (ARI) were prepared and pre-tested.

During the training in the intervention facilities, drug sellers/dispensers were told about the common misperceptions the public had about sulfadoxine/pyrimethamine (e.g., that it was "too strong" for children below 5 years of age), and the main difficulties faced by drug sellers (e.g., when consumers demand for anti-malarial drugs of their choice and other drugs such as certain antibiotics of their own interest). The team used posters written in the *Swahili* language (National language for Tanzanians) to communicate the new national malaria diagnosis and treatment guidelines and to motivate the public to purchase the approved anti-malarial (sulfadoxine/pyrimethamine) drug which is the first-line

recommended drug for uncomplicated malaria in Tanzania. Flip charts were also used and drug sellers selling anti-malarial drugs were instructed to hang them in their shops so that they could easily use or refer to it when serving clients. The chart also included the clinical symptoms of malaria, a dosage chart of the approved brands of sulfadoxine/pyrimethamine and anti-pyretics and treatment advice.

Data collection at baseline and post-intervention survey

Visits to the drug shops to obtain data on knowledge and practice of drug prescribing/dispensing was done by the Principal Investigator (PI) and the author who was assisted by the trained simulated nurses. Both control and intervention facilities were surveyed prior intervention and 6 months after intervention. Baseline data on drug dispensing practice of each drug shop were extracted in March, 2004 and intervention was given to the intervention group in April, 2004. The second (post-intervention) survey was done in November, 2004. Trained nurses were trained to pose as clients in order to collect baseline and second survey data.

Data analysis

Data entry and statistical analysis was conducted using SPSS 8.0 which enabled us to get average and percentages which was used to illustrate these results and making further comparison between intervention and control groups. Chi-square test, Fishers Exact Test (where cell counts were less than five) and ANOVA were performed to compare intervention versus control drug shops/stores. Knowledge and practice on drug dispensing and use was compared between intervention and control groups. Also comparison was made between baseline (first survey) and second (intervention) survey/post-intervention survey data. A p-value of 0.05 was considered statistically significant. Furthermore, test of hypothesis on the two population proportions were used to compare the experimental and control groups.

Ethical Considerations

Ethical approval was given by the National Institute for Medical Research Human Ethics Committee. All information obtained was treated confidentially and no drug sellers or shops names or staff names have been mentioned or referred to. That means care was taken to follow ethical guidelines, such as preserving confidentiality of individual drug sellers and shops respectively.

Results

Profile of private drugs stores/shops

The socio-demographic characteristics of respondents in the intervention and control groups are presented in Table 1. More than half (60%) of the attendants at the 40 drug shops interviewed by the principal investigator were females (Table I). Nearly 25% had seven years or less of education. About 85% of these private facilities were drug stores and the rest were ordinary shops. These private facilities reported serving 18 malaria clients on average per day, of whom, half were drugs for children under five. About 70% of these outlets obtained anti-malarial drugs from the wholesalers in Dar-es-Salaam and 20% from the Medical Stores Department of the Ministry of Health and the remaining 10% from other sources including drug mobile vendors. Intervention and control private facilities were similar in terms of sex and education level of attendants as well as settings.

Table 1: Socio-demographic data of drug sellers (Intervention & Control group) of drug sellers

Socio demographic Profile	Intervention group N= 20	Control group N= 20
Age (average)	37.1	36.2
Sex (female)	12 (60%)	14 (70%)
Sex (male)	8 (40%)	6 (30%)
Educational attainment		
Primary education	12 (60%)	14 (70%)
Secondary education	5 (25%)	4 (20%)
Professional training	3 (15%)	2 (10%)

Different drugs sold

Refusal to sell drugs in the study facilities differed according to or depending on the child's age and the type of facility: 43% of intervention drug stores/shops versus 80% of the control stores/shops sold anti-malarial drugs for a 2 year old child without a prescription, whereas, 57% of intervention shops versus 20% of control shops could not sell for a 2-year-old child.

Furthermore, whether nurse clients were told the correct doses, this again differed significantly by type of drugs and condition for the presented scenario. However, clients who were sold SP were much more likely to be told the correct dose (85%) than those who were sold say amodiaquine (AQ) and other anti-malarials. The fact that sulfadoxine/pyrimethamine is a single dose treatment may have made it easier for counter attendants to remember the dose and especially the adult dosage. Most counter attendants in the control facilities wrongly recommended a single dose of amodiaquine instead of the required three-day treatment regimen.

Acceptability and coverage of posters

About 70% of the intervention drug shops displayed posters and the client poster in their shops at the time of supervision. The majority of these posters were displayed in visible locations, such as on walls or main entrance doors. More than 65% of counter attendants in drug stores/shops reported using those posters in day-to-day work when dispensing drugs. However, 48% of the intervention

facilities acknowledged the usefulness of posters since they referred to them when asked about dosages of anti-malarial drugs and in particular sulfadoxine/pyrimethamine and amodiaquine for under-five children.

General impact of the intervention

During the evaluation, the PI administered a short ten quiz-question on anti-malarials, antibiotics, anti-diarrhoea, antipyretics and other drugs or measures which can be applied for reducing high fever such as in a sick child. Intervention facilities scored much better than control facilities on eight out of ten questions. Furthermore, intervention facilities had a better knowledge about sulfadoxine/pyrimethamine (SP) misconception, such as that the drug (SP) is not too strong for children and that SP can be sold in shops. Among 18 intervention drug stores/shops that stocked SP, 90% of intervention facilities knew the correct dose of SP for a 2 year old child as compared to 45% of controls ($p< 0.001$).

A total knowledge score was marked by assigning one point to a correct answer and zero points for an incorrect/wrong answer or "don't know". Education level analysis revealed that, at each level, intervention facilities scored higher. When compared by facility type, the intervention appears to have had a significant impact on drug stores/shops knowledge in general (Tables 2, 3 & 4).

Table 2: Drug sellers who gave correct answers (Intervention group)

Questions asked	Responses	Nos of respondents who gave answers	
		Baseline: N= 20	Interventio n survey N= 20
Give ORS for Diarrhoea	True	11 (55%)	18 (90%)
Give cotrimoxazole for all types of diarrhoea.	False	6 (20%)	4 (20%)
Give antidiarrhoeals for diarrhoea	False	14 (70%)	9 (45%)
Give ampicillin syrup for simple cough	False	7 (35%)	8 (40%)
Sponge bath for fever	True	18 (90%)	20 (100%)
Give paracetamol for children with high fever	True	12 (60%)	19 (95%)
Give aspirin for children with high fever	False	10 (50%)	7 (35%)
Give SP to children with fever	True	8 (40%)	14 (70%)
Continued giving antipyretics even if fever has been relieved	False	15 (75%)	16 (80%)
Give any antibiotics for colds	False	15 (75%)	11 (55%)

Table 3: Drug sellers who gave correct answers (Control group)

Questions asked	Responses	Nos of respondents who gave answers	
		Baseline: N= 20	Intervention survey N= 20
Give ORS for Diarrhoea	True	13 (65%)	14 (70%)
Give cotrimoxazole for all types of diarrhoea.	False	10 (50%)	11 (55%)
Give antidiarrhoeals for diarrhea	False	8 (40%)	9 (45%)
Give ampicillin syrup for simple cough	False	11 (55%)	11 (55%)
Sponge bath for fever	True	18 (90%)	19 (95%)
Give paracetamol for children with high fever	True	12 (60%)	15 (75%)
Give aspirin for children with high fever	False	12 (60%)	14 (70%)
Give SP to children with fever	False	7 (35%)	8 (40%)
Continued giving antipyretics even if fever has been relieved	False	14 (70%)	16 (80%)
Give any antibiotics for colds	False	9 (45%)	12 (60%)

Table 4: Respondents (drug sellers) who gave correct answers in the second survey (Comparison between post-intervention and control groups)

Questions asked	Responses	Nos of respondents who gave answers	
		ost intervention ntervention group) = 20	Post intervention (control group) N=20
Give ORS for Diarrhoea	True	18 (90%)	14 (70%)
Give cotrimoxazole for all types of diarrhoea.	False	4 (20%)	11 (55%)
Give antidiarrhoeals for diarrhoea	False	9 (45%)	9 (45%)
Give ampicillin syrup for simple cough	False	8 (40%)	11 (55%)
Sponge bath for fever	True	20 (100%)	19 (95%)
Give paracetamol for children with high fever	True	19 (95%)	15 (75%)
Give aspirin for children with high fever	False	7 (35%)	14 (70%)
Give SP to children with fever	False	14 (70%)	8 (40%)
Continued giving antipyretics even if fever has been relieved	False	16 (80%)	16 (80%)
Give any antibiotics for colds	False	11 (55%)	12 (60%)

Table 5: Medicines dispensed by drug sellers to simulated clients for treatment of fever, diarrhoea and cough for intervention facilities (baseline and second survey)

Disease symptom	Drug dispensed	Frequency at Baseline	Frequency on Second Survey
Fever	Paracetamol	40	60
.	SP	60	100
	Asprin	40	0
	Dawaquine	20	0
Diarrhoea	ORS	60	100
	Co-trimoxazole	40	40
	Metronidazole	20	0
	No medication given	40	0
Cough	Ampicillin syrup	60	20
	Chloramphenical syrup	40	0
	Co-trimoxazole	40	40
	Mist expect sedate	0	80
	No medication given	20	20

Respondents who gave right answers to the questions during the baseline and post intervention are given on Tables 2-4. Change in knowledge of respondents (drug sellers) was very limited in the control group. Thus, there was significant differences between intervention and control groups on the number of respondents ($p < 0.01$), who were able to correctly answer the questions in the second survey. Furthermore, the test for hypothesis of the two study groups showed no significant differences in questions 3, 5, 9 and 10 (see questions in result tables) between the intervention and the control facilities. However, the difference were significant for the rest of the questions 1, 2, 4, 6-8 ($p < 0.01$) of the intervention and control facilities in the post-intervention data.

Dispensing practices

The appropriate malaria dispensing practice is selling an approved first-line anti-malarials. In Tanzania the Ministry of Health's policy is to prescribe and dispense sulfadoxine/pyrimethamine (SP) which is the first-line drug for uncomplicated malaria in all age groups and should be taken with an anti-pyretic mostly paracetamol. As shown in Table 5, the intervention seems to have had a significant differential impact when compared to control facilities. Of those simulated clients who went to drug shops, 85% visiting intervention facilities were sold sulfadoxine/pyrimethamine (SP), compared to only 55% at control facilities ($p<0.01$). However, consumer demand appeared to have an influential impact on the dispensing of anti-malarial drugs. Thus, nurse clients (who did not demand a particular anti-malarial drug or any other drug of their choice) 13% were sold a drug when compared to 36% of the other group of simulated clients (who did demand for a particular medicine). Control facilities were three fold as likely as intervention facilities to sell the demanded anti-malarials or any other medicines to our nurse clients (Table 6).

Table 6: Medicines dispensed by drug sellers to simulated clients for treatment of fever, diarrhoea and cough for control facilities (baseline and second survey)

Disease symptom	Drug dispensed	Frequency at Baseline	Frequency on Second Survey
Fever	Paracetamol	80	80
.	SP	40	60
	Asprin	20	20
	Sponge bath	20	0
Diarrhoea	ORS	60	80
	Co-trimoxazole	40	20
	Lomotil	40	60
	No medication known	20	0
Cough	Ampicillin syrup	40	40
	Co-trimoxazole	60	80
	Chloramphenical	40	40
	Mist expect sedate	0	20

In general all nurse clients were sold a drug, 100% purchased an approved SP and an anti-pyretic paracetamol (60%) in the intervention facilities when compared to only 60% in the control facilities. Almost as many as three folds of our nurse clients were told the correct doses by intervention facilities (84%) than clients who visited control facilities (30%). All simulated clients (40%) who purchased drugs at intervention facilities, both received an approved drug and were given correct instructions about dosage, as compared to only 13% at control private facilities ($p<0.01$).

In providing effective malaria treatment, drug sellers should seek to ascertain an accurate presumptive diagnosis by questioning the client. When comparing intervention and control facilities, 95% versus 60% asked or inquired about the child's age from their clients, 65% versus 20% asked about symptoms, and 59% versus 15% asked about the duration of the child's illness ($p<0.01$). Furthermore, on the overall performance, intervention facilities (72%) gave more correct advice than control facilities (33%) on what to do if a child's signs and symptoms worsens (i.e. advised customers/clients to observe for danger signs).

Discussion

In Tanzania, it is estimated that 70,000-80,000 children die each year from malaria (16). In August 2001 the Government of Tanzania changed its first-line anti-malarial treatment from chloroquine to sulfadoxine-pyrimethamine (16). Amodiaquine was reserved as the second-line drug and quinine as third line for severe and complicated malaria. Since the official introduction of sulfadoxine/pyrimethamine for use country wide, the drug is sold over the counter.

However, because of a lack of enforcement, there are many anti-malarial formulations of different brands in the country. Home treatment of malaria, using drugs purchased from private drug stores/shops or vendors is common in sub-Saharan countries (17-18). For example, studies from Tanzania revealed more than 54% of the children with fever received home treatment (19-20), and most of the antipyretics and anti-malarials mostly being chloroquine were obtained from private drug shops (19-20). In Kenya, it has also been reported that 47% of children received home treatment with anti-malarial drugs, purchased mainly from pharmacies (54%) or ordinary small shops (29%)(9). Furthermore, a knowledge survey also reported that 87% of the shopkeepers had never received training on drug use, but 60% gave their customers some instruction on dosages (9). A similar study from Tanzania reported that both prescribers in public facilities and drug sellers/dispensers in the private drug shops had inadequate knowledge on dosage of anti-malarial drugs and few of them gave proper instructions after dispensing the drugs to clients (10).

In areas with a high transmission of malaria, adverse outcomes from malaria can only be reduced if malaria symptoms are recognized early (within the first 12-48 hours after onset)(4, 21), and sick children are treated promptly and appropriately with effective anti-malarial drugs in the right doses (22). Health education campaigns on malaria

signs and symptoms and the importance of prompt and effective treatment are fundamental. However, these proposed campaigns may be of limited value if clients are sold ineffective or poor quality drugs in the wrong doses. Thus, it is important to strengthen the capacity of private drug sellers/dispensers so that they give to clients correct information/instructions and recommended anti-malarials and other drugs. In addition, correct dispensing of drugs should be accompanied with proper information which is important as far as appropriate malaria case management is concern. The big challenges are how to achieve good performance, compliance and improved practices and positive behavioural changes from the private sector at low costs so that the proposed programme can be scaled up nationally to include other districts in the country.

However, there are several strategies which have been suggested in improving practices or performance of drug sellers/dispensers in developing countries such as provision of incentives and motivation (23). So far there are few interventions which have been applied and evaluated on changing drug sellers behavioural practices (24). It has been reported in South East Asia that a "face to face educational" intervention carried out for counter attendants resulted in significant short-term improvements for anti-diarrhoeal drugs and instructions given to customers on diarrhoea treatment (25).

It should be noted that the evaluation of an intervention in this study had some limitations which are mostly related to sampling design, small sample size of drug shops as well as giving posters to control facilities which was containing health information. There possibilities also of interactions between drug sellers themselves because they were in the same area or vicinity (spill over effects between intervention and control facilities), which may limit generalization of these findings and making solid conclusions. It is also important to test this type of intervention procedure further in a better controlled situation and not giving posters to control facilities so as to avoid or prevent spill over effects (avoid or minimizing cross contaminations between the two study groups) as these facilities were contiguous to each other. Interactions between control and intervention facilities plus provision of posters in both study groups may be a possible explanation of some improvements observed in knowledge and dispensing practices in the control facilities as well (Tables 3 & 4). Also selection bias may be possible and this may have resulted from the decision that we excluded drug shops/stores that were not located along the main road because of logistical considerations. Thus, there is a case of doing more studies of this kind without giving posters to control facilities in order to validate the findings using a lager sample size in bigger cities/towns which are far apart in order to minimize spill over effects. The posters were given to control facilities without telling them anything in order to see if they could read and use them. This has shown that some control facilities used these poster as shown in improvement of their knowledge and dispensing performance.

Using trained nurses as clients yielded important information, but this approach is cumbersome and had some drawbacks. Nurses posing as clients cannot evaluate properly institutions (private facilities) where they are sometimes detected as outsiders (e.g. at the drug shops or schools or dispensaries) or where they may be required to bring their children with them to such study facilities. If the these nurse clients would have carried their sick children, private facilities probably would have dispensed more anti-malarials and other drugs. It is also quite possible that real clients, who are familiar to the drug sellers/dispensers, would not be refused treatment (to buy drugs) more often than our nurse clients in the study area. Furthermore, this approach requires well trained clients/personnel to present scenarios in these facilities in the correct manner without being detected.

However, the researchers were aware and convinced that intervention and control facilities were not different because they were all in the same geographical area of Kibaha and Mlandizi main highway. So there were no differences that could affect directly the outcomes of interest. To increase internal validity, the team examined whether the respondent's position (employee, family member or owner), educational level or gender could bias results. None of these seemed to be confounders.

Conclusion

One to one educational training sessions seems to have had a relative moderate impact on private drug sellers/dispensers knowledge of and compliance with malaria treatment guidelines in both urban and peri-urban facilities of Kibaha district. Given the difficulty of changing the private sector practices as their motives for profit making, these results are encouraging. Significant differences were observed between intervention and control drug facilities on the types and brands of drugs sold, dosages sold, questions asked of clients, and advice given. The program had also a positive impact on knowledge of malaria treatment guidelines, especially among counter attendants in drug stores/shops with less education.

However, to achieve better success with drug sellers, there is a need for national drug policies and other programs should clearly address the importance of rational prescribing, dispensing, use of anti-malarials and other drugs. Furthermore, advertising, prohibiting sales of unapproved, inefficacious drugs and enforcing correct dosage labeling. Moreover, the National Malaria Control Program (NMCP) and the Tanzania Food and Drug Authority (TFDA) within the Ministry of Health needs to be more active by putting in place strong regulations, monitoring and regular supervision in these drug shops. Furthermore, there is a need for educating both consumers and drug sellers about the importance of early recognition and prompt treatment for malaria, the reason certain anti-malarial drugs such as SP (is recommended by the Ministry of Health as first-line drug) and others, and which drugs are approved and those not approved for human use nationally

in the management of malaria and other childhood disease conditions.

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