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Assessment of Knowledge and Performance of Village Health Volunteers after Expanding Their Responsibilities in Bago Region, Myanmar, 2017

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Abstract

With declining malaria morbidity in recent years, the National Malaria Control Program, in 2017, expanded Village Health Volunteer (VHV) responsibilities with the integration of other diseases, including dengue haemorrhagic fever, lymphatic filariasis, tuberculosis, leprosy and HIV/AIDS; and changed their name to Integrated Community Malaria Volunteer (ICMV). This study aimed to assess VHV's knowledge and performance before and after integration and to identify challenges. VHV's knowledge was assessed with an uncontrolled pre- vs. post-intervention study, and malaria-related performance was assessed with a pre- vs. post-intervention with a non-randomized comparison group. The number of suspected malaria cases blood tested were compared in an intervention township (Kyauktagar) and comparison township (Daik-U). Data were collected by face-to-face interviews and review VHV's reports and patient registers. The VHV attrition rate was 5% (4/86) over 3 months. All knowledge scores increased significantly after training. However, follow-up knowledge scores were still relatively low. The only difference in reporting status between pre- and post-integration was in timeliness, which was significantly better post-integration. Blood testing was increased in the intervention township. ICMVs had no challenges in malaria activities but some difficulties on reporting forms for other diseases. In conclusion, VHV performance improved in malaria-related aspects after the training. This will support malaria elimination efforts but their performance for non-malaria diseases should be re-evaluated.

Keywords: malaria, volunteers, Integrated Community Malaria Volunteers

Introduction

Malaria is caused by Plasmodium parasites, which are spread to people through the bites of infected female *Anopheles* mosquitoes, called "malaria vectors". There are five parasite species that cause malaria in humans, and two of these species–*P. falciparum* and *P. vivax*–pose the greatest threat. In 2018, there were an estimated 228 million cases of malaria worldwide.[1] In 2015, 291 of the 330 townships in Myanmar were malaria endemic.[2] From 2005 to 2016, malaria cases decreased from 622,373 to 110,146 (82% reduction) and deaths also decreased from 1,707 to 21 (99% reduction).[3]

Myanmar's National Malaria Control Program (NMCP) plans to eliminate malaria by 2030. One objective of the National Strategic Plan is to interrupt transmission of falciparum malaria in at least five states and regions (Bago, Magway, Yangon, Mon, Mandalay) by 2020.

In Myanmar, volunteers, called Community-Owned Resource Persons (CORPs), started working for the NMCP in 2006 in three townships with a goal to give residents increased access to facilities that offer quality diagnosis and effective treatment for malaria in remote areas.[4,5] The volunteer program expanded to other states and regions, with the CORPs calling themselves village health volunteers (VHV). According to an NMCP report in 2016, there were 58,359 positive malaria cases among 134,758 tested. By 2017, there were 9,074 VHVs in 218 townships in Myanmar. These VHVs examined 54,900 individuals

with rapid diagnosis tests (RDT) of which 21,505 were found positive and given treatment. Therefore, the VHV case finding rate was approximately 40% of total positive cases.[3] Key activities of VHV include health education, outbreak report, insecticide-impregnation of bed nets, data recording, case reporting and assisting in distribution of long-lasting insecticide-treated nets (LLIN), and early diagnosis and treatment of uncomplicated malaria cases.

The National Malaria Control Program provides annual refresher training courses to VHV to increase their malaria knowledge with a small amount of training on dengue and lymphatic filariasis. Some of the VHVs who had not seen the malaria positive cases since they began working as VHVs had difficulty recalling the names of antimalarial drugs. To continue the community outreach provided by the VHVs in low transmission areas, in June 2017, the NMCP increased their duties by integrating other diseases into their activities and changing their title to "Integrated Community Malaria Volunteer" (ICMV) to reflect this change. The new diseases included dengue haemorrhagic fever (DHF), lymphatic filariasis, tuberculosis, leprosy, and HIV/AIDS. The ICMV training was started in Bago Region as a pilot project. Bago Region is located in central Myanmar and has five million residents with 80% living in rural areas. In 2016, there were 2,021 VHVs working in Bago Region.[6,7] In 2017, there were 1,011 positive malaria cases, of which 67% were detected by VHVs and the malaria positivity rate was 0.49%.[8]

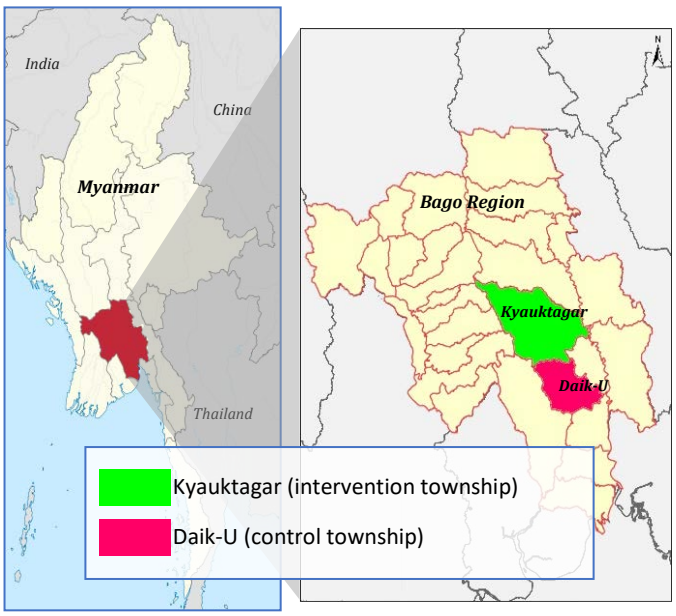

Figure 1. Study areas, Kyauktagar Township and Daik-U Township, Bago Region, Myanmar

To prepare the VHVs for their new duties as ICMVs, the NMCP developed a five-day training course to focus on the mode of transmission, signs and symptoms, and prevention and control methods of each disease. The objective of this study was to evaluate the VHV's knowledge and performance on malaria before and after expanding their responsibilities as ICMVs and then comparing their knowledge on other diseases, including dengue haemorrhagic fever (DHF), lymphatic filariasis, tuberculosis, leprosy, and HIV/AIDS. To help improve support for ICMV, the challenges they perceived were also explored.

Methods

Study Design

We conducted an uncontrolled pre- and post-intervention study to evaluate the participants' knowledge and a pre- vs. post-intervention study with a non-randomized control group to evaluate the participants' performance. Challenges in working as an ICMV was identified from questionnaire and informal interview with all participants. The study was conducted from September to December 2017.

Study Site and Population

We purposively selected two townships in Bago region: Kyauktagar Township (intervention) and Daik-U township (control) (Figure 1). These two townships are located side by side. Malaria cases were still present in these two townships and the situation was not much different. The volunteers' activities were approximately equal. Kyauktagar Township had slightly more volunteers and was chosen to be the intervention township. The study population were all VHV who had been trained by the NMCP and who had at least two years of volunteer service.

Variables and Measurements

Knowledge was evaluated using a semi-structured questionnaire. The questionnaire consisted of 23 questions on malaria with 42.5 being the maximum possible score, eight questions on DHF with 10 the maximum possible score, nine questions on lymphatic filariasis with nine the maximum possible score, eight questions on tuberculosis with 11 the maximum possible score, three questions on leprosy with three the maximum score and three questions for HIV/AIDS with six the maximum score. The maximum total score was therefore 81.5. The questionnaire was administered by face-to-face interview. Open-ended questions asking about challenges in working as an ICMV were asked at the end of survey.

Performance was evaluated using monthly malaria carbonless register reports from October to November 2016, June to August 2017 and October to November

2017 reporting on completeness, accuracy, timeliness, stock status, stockouts and number of rapid diagnostic tests (RDTs) administered.

Completeness was measured using a score of "1" if all cells were filled in and "0" if any cell was blank.

Accuracy (internal consistency) was measured using a score of "1" if there were no data discrepancies during the measurement period (e.g., stock quantities at the end of one month=quantities at the beginning of the next month) and "0" otherwise.

Timeliness was measured using a score of "1" if newly diagnosed cases were reported to a township malaria focal point within 7 days of month, and scored "0" if any report was late.

Stock quantities were measured using a score of "1" if there were no data discrepancies between quantities at the end of one month and the beginning of the next month and "0" if there were any discrepancies.

Stockouts were measured using a score of "1" if there were no stockouts of RDTs and antimalarial drugs for more than one week per month and "0" if there were stockouts for more than one week per month. Expired RDTs and antimalarial drugs were considered as a stockout. For all months during the measurement period we assigned a score of "0" if there was a stockout for more than one week per month.

Malaria blood testing with RDTs was measured by recording the number of individuals tested with an RDT per month and the number of patients with a positive RDT per month.

Data Collection and Analyses

Data collection for knowledge evaluation was done using face-to-face interviews with a semi-structured questionnaire. We collected information before the ICMV 5-day training course in September 2017, and 3 months after the course in December 2017. Performance was evaluated by reviewing carbonless registers and checklists. We collected information from monthly reports of three time periods, October to November 2016, June to August 2017 and October to November 2017. The same data were collected from both intervention and comparison townships of the same time periods.

Change in knowledge scores was analysed using a paired t-test and 95% confidence intervals were calculated. Change in dichotomous performance proportion was analysed using McNemar's test. Change in number of patients tested for malaria was expressed as an incidence rate of performing blood tests per person-months, and an incidence rate ratio comparing intervention to comparison townships during pre- and post-intervention was presented. All analyses were done using Epi-Info and Stata version 14.

Results

There were 86 VHVs enrolled in the study. Table 1 presents the distribution of the characteristics of the study sample. The youngest was aged 18 years and the oldest was 67 years of age and the mean age of participants was 31.6 years. Around 35% were male and the level of education varied from 8% university graduates, 61% high school level, 27% middle school level and 5% primary level. Previous experience included auxiliary midwife (25%) or community health workers (8%). Around 68% had a low income and 46% had no more than two years of volunteer service while the remaining had more than two years. Among the 86 VHVs, 82 returned at the 3-month follow-up visit. The attrition rate was therefore 5% (4 of 86) over 3 months. The four VHVs who left were aged <35 years and had a high school level of education.

Table 1. Socio-demographic characteristics of the malaria village health volunteers

Characteristic	N	%
Age group (years)		
15-24	27	31.0
25-34	35	40.5
35-44	10	11.9
45-80	14	16.7
Education status		
Primary school	4	4.7
Middle school	23	26.7
High school	52	60.5
University graduate	7	8.1
Income level		
Very low	24	29.3
Low	32	39.0
Moderate	24	29.3
High	2	2.4
Duration of service (years)		
2	40	45.7
3	12	14.1
4	18	21.2
5	16	18.8

Changes in Knowledge

Table 2 shows the mean knowledge scores for the six disease groups and the change at the 3-month follow-up period. The overall mean knowledge score among

all participants before the training course was 50 out of a possible 81.5 and the three diseases in which participants had the highest knowledge were lymphatic filariasis (mean=54, DHF mean=49 and malaria mean=48. After the training, the overall mean knowledge score increased by 12 points and the three diseases with the highest increase in knowledge were tuberculosis (mean increase=34), leprosy (mean increase=20) and HIV/AIDS (mean increase=18). Knowledge scores of all six diseases significantly increased at 3 months.

Table 2. Comparison of knowledge scores (%) from pre and post ICMV package in the intervention township (Kyauktagar)

Subject	Pre-ICMV mean (n=86)	Post-ICMV mean (n=82)	Difference in mean and 95% CI (n=82)
Malaria	48	63	15 (13–17)
Dengue hemorrhagic fever	49	68	12 (9–16)
Lymphatic filariasis	54	63	9 (4–14)
Tuberculosis	22	56	34 (30–38)
Leprosy	22	42	20 (15–26)
HIV/AIDS	42	60	18 (14–22)
Total scores for all diseases	50	62	12 (10–13)

Changes in Performance

Comparing the performance (completeness, consistency, timeliness and stock management) between the pre and post intervention, the completeness of malaria reporting increased from 91% to 96%, and the internal consistency increased from 83% to 89%. There was no difference in completeness of reporting and the internal consistency. However, timeliness was significantly better in post intervention township. The antimalarial drugs stockout percent was markedly decreased for RDT, artemether-lumefantrine, chloroquine and primaquine, in post ICMV package. Except the RDT, the decreasing in stockout of anti-malaria drugs were statistically significant (Table 3).

The number of blood examination was increased pre and post ICMV intervention package in intervention township than comparison township regarding all conditions were the same except the intervention. The average number of patients tested, or incidence of testing, in the intervention township was increased from 4.3 tests per person-month to 7.7 tests per person-month after the intervention. Comparing to the comparison township, rate of testing in the intervention was 1.56 time (95% confidence interval: 1.39-1.76) during pre-intervention period. And the rate-ratio of blood testing was increased to 3.84 (95% CI: 3.29-4.51) at post-intervention period (Table 4). Although blood testing was increased, only one malaria positive case found in Kyauktagar Township in November 2017 and Daik-U township in July 2017 during the study period.

Table 3. Reporting status of the VHVs and malaria commodities in the intervention township (Kyauktagar)

	Baseline survey	Follow-up survey	Difference(%) and 95% CI
Malaria reporting status			
Completeness	91	96	5 (-4,13)
Internal consistency	83	89	7 (-3,17)
Timeliness in 7 days	85	98	13 (5,22)
	Pre-ICMV	**Post-ICMV**	**Difference (%) and 95% CI**
Malaria commodities: No stockout in past 3 months			
Rapid diagnostic test	91	98	6 (-1,14)
Artemether-lumefantrine	69	99	28 (17,39)
Chloroquine	62	94	31 (8,43)
Primaquine	57	94	37 (23,50)

Table 4. Number of patients tested per VHV per month pre- and post-ICMV package in intervention and control townships

Township	Period of performance measure		
	Total number of tests	Number of volunteers	Average number of tests per month per VHV
October-November 2016			
Intervention	808	86	4.7
Control	298	46	2.3
June-August 2017			
Intervention	1115	86	4.3
Control	382	46	2.8
October-November 2017			
Intervention	1284	84	7.7
Control	183	46	2.0

Challenges reported by VHVs and ICMVs

ICMVs reported having no difficulty in performing blood testing duties, diagnosis, treatment, recording, or reporting for malaria. However, they faced problems on reporting of non-malaria diseases because of a lack of reporting forms. Villagers were not interested in health education so ICMVs had difficulty in assembling the villagers. Therefore, ICMVs provided health education during blood testing, religious ceremonies, or other situations where people were already assembled in a group. Although there was no

available data on the performance for other diseases, most VHVs wanted to continue as an ICMV. VHVs gave health education about malaria only but ICMVs could give health education for more diseases. They would like to get information education communication (IEC) materials for health education and distribute these to the community. They would also like to assist with tuberculosis case finding programs and be involved in directly-observed therapy (DOT).

Discussion

This study illustrates a real-world challenge of achieving malaria elimination in rural populations and evaluates a programmatic response to that challenge, that is, expanding the responsibilities of village health volunteers (VHVs). Although (theoretically) knowledge is necessary to correct performance, a systematic review of 18 intervention studies found no correlation between health worker knowledge and health worker practices (Pearson's r=0.13, p=0.62).[8] Our study demonstrated that not only the knowledge of VHV was improved, but also some performances were improved after their responsibilities were increased. Moreover, we found no evidence of any negative impact from the increased responsibilities or the change in title to Integrated Community Malaria Volunteer (ICMV).

Almost all (95%) ICMVs returned for the second survey 3 months after the initial survey, demonstrating a low attrition rate. One review reported an annual attrition rate of 6.8% which was similar to our study.[9] Despite annual refresher training, VHV's malaria knowledge at baseline was low (48%) and similar to knowledge levels for other diseases. This was likely because they were unable to open their handbooks during face-to-face interviews. For all diseases, knowledge was raised, but follow-up scores were still somewhat low on knowledge and performance outcomes. There was no control group but given the lack of programmatic activities (besides the ICMV package) it seems implausible that outside influences caused an important secular trend in study outcomes.

With evidence from hard copy reports, improvement was found on the performance of malaria reporting (accuracy or internal consistency), which was 83% before the training package and 89% afterwards. These are similar to results of a Cambodian cross-sectional study in which 84% of VHVs maintained accurate registers.[10]

At baseline, only two-thirds of VHVs reported that antimalarials were in stock, while after 3 months, there was an increase of 28–37 percentage points. At baseline, many VHVs reported expired antimalarials (counted as stockouts), so the ICMV package provided new drugs. Antimalarials were rarely used (very few positive cases), and thus nearly all community health workers had drugs in stock during the follow-up survey. The rate of RDT stockout was 9% in pre and 2% in post intervention, rates much lower compared to the 57% stockout reported from a study in Cambodia.[11]

The training was associated with very large improvements in the number of patients tested per month. ICMVs had no problems concerning malaria blood testing and RDT requirements but VHVs faced problems concerning the regular supply of RDTs (9.9%) and anti-malaria drugs.[12]

Limitations

This study had a few limitations. First, the follow-up period was too short (3 months) for measuring the impact of the training package on the performance of village health volunteers for non-malaria diseases. Second, assessment of stockouts might have been affected by recall bias or social desirability bias. Third, there was a lack of information on quality of testing. Finally, VHVs only registered the people who they tested for malaria; there was no information on patients with febrile illness who were not tested.

Conclusion and Recommendation

Knowledge scores for all diseases and the performance of malaria activities generally increased after the training. However, knowledge levels for all diseases were still somewhat low after the training. If VHVs can perform as well as ICMVs, the program will be effective. The performance of malaria-related duties improved, so the training program was very effective in the support for malaria elimination.

We recommend that the National Malaria Control Program consider selecting VHVs who are aged >35 years to reduce the attrition rate. Close supportive supervision and on-the-job training should be provided to further improve their knowledge and performance related to all diseases. Efforts should emphasize the importance of recognizing expiration dates for RDTs and antimalarial drugs so that fresh supplies can be ordered before stocks expire.

Sufficient recording and reporting forms should be distributed to all ICMVs. Other programs, such as those involving tuberculosis, HIV and leprosy, should coordinate and cooperate with the malaria program by supplying reporting forms and IEC materials. Qualitative studies aiming to identify factors

influencing the performance of volunteers should be done.

In conclusion, the training package was effective in improving knowledge and performance of VHVs in malaria-related duties and should be expanded to other townships. Moreover, in an evaluation of a public health program, performance indicators should be included in the package.

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