
PUBLIC HEALTH RESEARCH

Community Empowerment for Malaria Control and Prevention in Kampung Tong Nibong, Sarawak: an Intervention Study

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ABSTRACT

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Introduction	Tong Nibong is a Bidayuh village located at Sarawak Kalimantan border. Since the year 2004 to 2009, a total of 537 cases of malaria were recorded in Serian District of which 14 cases were reported from Kampung Tong Nibong. Community empowerment programme for malaria infection prevention showed tremendous improvement in implementation. This intervention study aims to gauge the effectiveness of community empowerment approach in malaria elimination programme in Kampung Tong Nibong Serian.
Methods	An intervention study was conducted with pre and post data collection. Data was collected using validated questionnaire by face to face interview. Universal sampling method was used to select respondents from head of household and post data was collected after intervention activities were carried out within a year of study period.
Results	The study showed significant difference on level of knowledge of respondents on vector of malaria between pre and post data with a $P < 0.05$. There was significant difference between pre and post data on practices on control and prevention of malaria with a $P < 0.05$. The same goes to level of positive attitude of respondents towards malaria control.
Conclusions	In conclusion, the study can be considered successful because there is significant difference in knowledge, attitude and practice among the respondents between pre and post data. This indicates that community empowerment (voluntary participation) measures can be implemented in high risk or endemic areas where malaria is a persistent problem to the community and health institutions faces many limiting factors.
Keywords	Community Empowerment - bed net impregnation - residual spraying - personal protection equipment.

INTRODUCTION

Malaria is caused by plasmodium parasites, which is transmitted by infected anopheles mosquito bites. In the human body, the parasites multiply in the liver, and then infect red blood cells. Symptoms of malaria include fever, headache, vomiting, and usually appear between 10 and 15 days after the mosquito bites. If not treated, malaria can become life-threatening by disrupting the blood supply to vital organs. In many parts of the world, parasites have developed resistance to a number of malarial drugs 1. Key interventions to control malaria includes: usage of insecticidal bed nets and insecticidal residual spraying on houses walls to control the mosquito vector 2.

There were 212 million new cases of malaria worldwide in 2015 (range 148–304 million). The WHO African Region accounted for most global cases of malaria (90%), followed by

the South-East Asia Region (7%) and the Eastern Mediterranean Region (2%) (WHO 2016). In Sarawak, there were 2802 cases with 5 death reported in 2010, 1761 cases with 2 death in 2011 and 1571 cases with 3 death in 2012 (Sarawak Health Annual Report 2012). Whereas in Serian, Malaria has been in an endemic with a total of 537 malaria cases registered since the year 2004 3. To control malaria disease from spreading, Sarawak Health Department implemented malaria elimination programme since 1960s whereby malaria control areas are divided into malaria sectors and each sector consists of several villages 4. Kampung Tong Nibong is located in sector 842. The division of areas into sectors is to facilitate implementation of malaria elimination programme in the district. Records show all malaria sectors from 841, 842, 843, and sector 844 registered an average of 38 malaria cases a year (refer to table 1).

Table 1 Malaria cases by Sectors in Serian District

Sector/Year	2004	2005	2006	2007	2008	2009
Sector No 841	24	7	4	4	7	14
Sector No 842 (Kg Tong Nibong)	48 (1)	21 (0)	15 (6)	9 (2)	19 (3)	20 (2)
Sector No 843	36	9	3	1	2	1
Sector No 844	67	63	67	38	20	38
Total	175	100	89	52	48	73

(Source: Serian Health Office, 2009)

By end of December 2009, sector 842 recorded a total of 132 cases of which Kampung Tong Nibong registered 14 malaria cases during the same period. The yearly incidences of malaria in Kampung Tong Nibong, are as follows; year 2004 (1 case), 2005 (no case), 2006 (6 cases), 2007 (2 cases), 2008 (3 cases) and 2009 (2 cases). Therefore, this intervention study generally aims to gauge the effectiveness of community empowerment approach in malaria elimination programme in Kampung Tong Nibong Serian and specifically to determine the level of knowledge, attitude and practice of the community on Malaria, to determine the effectiveness and usage of impregnated bed net as control measure to prevent infection, to determine the effectiveness of insecticidal residual spray on dwelling houses and farm huts by villagers as measure to control malaria and to determine the effectiveness of personal protective equipment in preventing infection.

METHODOLOGY

An intervention study design was used to measure the focus issues of knowledge, attitude and practice in relation to the implementation of empowerment

activities in malaria elimination programme. A rigorously tested interview questionnaire was used to collect data from respondents by research assistants with special guidance from research members. The study began with the collection of pre data in June 2010. After the pre-data collections and analysis, interventions activities were carried out and a post data collection was done in June 2011.

The study population was villagers of Kampung Tong Nibong, Serian District, Sarawak. Universal Sampling method was used to select respondents for this study. The respondents were head of households unless he or she is not available during interview period or refused to participate. The head of households here refers to any adult person with authority to give views or information on behalf of the family. The intervention activities involved the entire members of the community. A total of 63 respondents were interviewed during pre-data collection, and reduced to 59 during post data collection. Four respondents dropped from the study group because they were unavailable during post data collection. Respondents for pre and post data were same person and actually covered all the houses in the village.

The questionnaires were divided into four sections namely demography, knowledge, attitude and practice. These questionnaires were adapted from study by Ricky Gayoh (2004). The questionnaire was in Bahasa Malaysia and translated by the interviewer to local language for those who do not understand Bahasa Malaysia. Demographic variables include age, sex, race, employment, family incomes and education level. Knowledge focused on vector of malaria, mode of transmission, severity of disease, prevention and control activities. In practices, questions were asked on preventive methods to avoid getting infection, whereas attitude component revolves around five constructs of Health Belief Model of *perceived to susceptibility, perceived to severity, perceived to barriers, perceived to benefit and cues to action*. Five constructs were measured using Likert scale with range from strongly disagree to strongly agree. A pilot study was conducted toward 10 respondents from nearby village to test the reliability of this instrument where Cronbach Alpha value for the attitude questionnaires was 0.852. Therefore this question is suitable to be used for this study.

Data was analyzed using SPSS Version 19 and intervention activities carried out on the availability of the results of the study. Descriptive analysis was conducted to identify demographic characteristics and paired t-test was used to compare KAP of respondents before and after an intervention.

INTERVENTION

This study focused on community empowerment activities in malaria elimination programme. Empowerment here refer to the implementation of malaria control and prevention activities by community themselves, after being given adequate level of knowledge and skills on the intervention activities. Empowerment activities included *bed net impregnation, insecticidal residual spraying of dwelling houses and farm huts and usage of personal protective equipment (long pants, long sleeves shirts, shoes and hats)*. These interventions were conducted throughout the study period after getting preliminary results in July 2010 until May 2011. These activities were fully monitored and supervised by health staff and research team at the beginning and by the Village Health Promoter towards the end of the study.

Strategies used for implementing the community empowerment intervention activities are communication strategy such as health talks,

dialogue, small group discussion and questions and answer sessions and individual advice during door to door visits, display of messages on banners and buntings, distribution of pamphlets, putting up posters at strategic locations, poster exhibitions, focus group discussion (FGD) and health quiz⁵. This was followed by skills training including demonstrations and practical sessions to selected respondents who are entrusted to perform specific tasks.

The skill demonstrations and training are focused on *bed net impregnation, insecticidal residual spraying and the usage of personal protective equipment (PPE)*².

RESULTS

Demography of respondents

All respondents were Bidayuh community where majority were farmers with low education level. Only eight 8 (14.5%) attained secondary school education. Majority 33 (55.9%) age 45 and above, 53 (89.8%) self-employed and 55 (93.3%) earn income less than RM1000 per month.

Knowledge of respondents

The data on must know knowledge on malaria control and prevention measures has six main constructs or components i.e. malaria epidemiology, vector of malaria, signs and symptom of malaria, bed nets impregnation, residual spray of dwelling houses and farm huts and malaria blood slides. Analysis on Pre and Post data was done using *paired T test*, to determine the mean difference between pre and post data. The results showed significant difference in the level of knowledge between pre and post data on malaria epidemiology, vector of malaria, signs and symptoms of malaria, impregnation of bed nets and residual spraying except blood slide with a $p = 0.103$ (Table 2). In every construct, carried different number of score which right answer equivalent with one point. Construct about impregnated bed net carry the highest point followed with vector of malaria and the least was about residual spray. Generally, the intervention activities have increased the level of awareness of the respondents which subsequently increase the level of knowledge on malaria control and prevention activities. This findings support the study by Gayoh (2004) which level knowledge of the respondents increased after interventions activities.

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Table 2 Knowledge of respondents

Variable	Mean(SD)		Mean difference (95% CI)	t statistic (df)	p value
	Pre	Post			
Malaria Epidemiology	2.05 (0.97)	2.47 (0.57)	0.42 (-0.74, -0.10)	-2.667 (58)	$p < 0.05$
Vector of Malaria	4.64 (2.26)	7.07 (2.21)	2.43 (-3.23, -6.06)	-3.131 (58)	$p < 0.05$
Sign and Symptoms	3.05 (1.57)	3.85 (1.11)	0.8 (-1.31, -0.29)	-6.054 (58)	$p < 0.05$
Impregnated Bed Net	9.17 (2.31)	11.19 (1.07)	2.02 (-2.70, -1.33)	-5.907 (58)	$p < 0.05$
Residual spray	1.64 (0.580)	1.92 (0.281)	0.28 (-0.45, -0.10)	-3.132 (58)	$p < 0.05$
Blood slide	3.56 (0.745)	3.76 (0.50)	0.2 (-0.45, 0.04)	-1.657 (58)	$P = 0.103$

*Paired t-test

Attitude of respondents

Attitude of respondents was categorized into five (5) constructs of Health Belief Model (HBM) namely *perceived susceptibility*, *perceived severity*, *perceived benefits*, *perceived barriers* and *cue to action*. This construct measured by Likert Scale ranging from strongly, agree, agree, not sure, disagree and strongly disagree. To each construct assigned variables base on the needs of questionnaires. The purpose was to identify respondents overall attitude towards malaria disease. There were 5 questions been asked in *perceived susceptibility*, 3 questions in *perceived severity*, 4 questions in *perceived benefits*, 1 questions in *perceived barriers* and 2 questions in *construct cue to action*. For these constructs, they were classified to a favorable or an unfavorable attitude. The lowest percentage pre data in

perceived susceptibility construct was question about either can be infected with malaria if sleeping in an improper bed nets which only 41(69.5%) gave favorable answer and increased to 54(91.5%) in post-test. Overall, results shows constructs of *perceived to susceptibility*, *perceived to severity*, *perceived to benefits* and *perceived to barriers* have significant difference between pre and post data with $P < 0.05$ for all constructs, except construct *cue to action* showed no significant difference which all respondents have a favorable attitude in pre and post data. Overall, interventions activity has managed to increase the level of knowledge and awareness among respondents which also has triggered positive attitude toward malaria control and prevention measures activities. (Table 3).

Table 3 Attitude towards Malaria Control

Variable	Mean(SD)		Mean difference (95% CI)	t statistic (df)	P value
	Pre	Post			
Perceived to susceptibility	11.86	14.05	2.19 (-4.034,-2.305)	-9.561	$p < 0.05$
Perceived to Severity	19.49	22.66	3.17 (-2.644,-1729)	-7.339	$p < 0.05$
Perceived to benefits	18.68	15.88	2.8 (-3.297, -2.297)	-11.195	$p < 0.05$
Perceived to barriers	4.53	4.14	0.39	-4.307	$p < 0.05$
Cue to Action	9.00	8.90	0.1 (0.158,0.215)	-6.44	$P = 0.522$

*Paired t-test

Practices on control and prevention of malaria

To have effective malaria elimination programme, pro-active and collective actions of all respondents and community is needed. If partial of community practices and others are not, infection will still occur among those who do not practice. There are

three variables being studied here namely usage of impregnated bed nets at home, usage of impregnated bed nets while sleeping overnights in farm huts or in the jungle and usage of personal protective equipment during farming activities or foraging in the jungle. Result shows community are

practicing the measures as advocated as all three variables indicated significance difference between pre and post data where $p < 0.05$. (Table 4). Generally, respondents took into high consideration about their safety from infected by malaria and this

interventions were very successful mainly about usage of impregnated bed nets at home due to involved all the family members. For this practices section, the question was asked directly either they did the practices or not.

Table 4 Practices towards Malaria control and prevention programme

Variable	Mean(SD)		Mean difference (95% CI)	t statistic (df)	P value
	Pre	Post			
Usage of Impregnated bed nets at home	0.68 (0.48)	1.00 (0.00)	0.32 (-.445, -.199)	-5.249	$p < 0.05$
Usage of Impregnated bed nets in farm huts and jungle	0.64 (.48)	1.00 (0.00)	0.36 (-.482, -.230)	-5.662	$p < 0.05$
Usage of Personal Protective Equipment (PPE)	0.66 (0.48)	0.95 (0.22)	0.29 (-.434, -.143)	-3.962	$p < 0.05$

*Paired t-test

Community empowerment

Empowerment towards malaria control and prevention measures

The empowerment of community here refers community voluntary participation in implementing the malaria control and prevention measures but after necessary knowledge and skills were given. The specified measures are; impregnation of bed nets (how to treat bed nets with insecticide), insecticidal residual spraying of dwelling houses and usage of personal protective equipment's (PPE) such as long sleeves shirt, long pant, stocking and shoes while carrying out farming activities and foraging in jungles as measure to protect against mosquito bites.

The main component of empowerment was *voluntary participation* in the treatment of bed nets and its coverage on usage by community and residual spraying of dwelling houses and farm huts by members of the community. All bed nets either own by families or issued by health office must be treated and every houses and farm huts must be sprayed with residual insecticides. The community was also encouraged to use PPE to protect themselves from mosquito bites.

The intervention activities were carried out by selected members of the community after they were given adequate skills through demonstration and training.

Implementation of bed nets Impregnation

A group of five trained community members carried out the process of treating bed nets with insecticides from door to door. The team was equipped with household list of bed net ownership, a set of equipment and insecticides and every bed nets in each household was treated during the visit. The families with inadequate number of bed net were issued with new bed nets based on family requirement (number in the family). Besides treating bed nets they also gave advice to the

community to sleep under the treated bed nets at night, at home while overnight in the farm huts and jungles to protect from mosquito bites. The treatment process was supervised by local health staff and the treatment was done once every six months. The equipment and insecticides were provided by local health office

Mosquito bed net impregnation by the community themselves was the most important practice highlighted in this intervention program. In pre data, only 9(15.3%) respondents declared that they capable of doing self-bed net impregnation provided by the health department. After intervention, the number increased to 58(98.3%). Paired t-test show significant different before and after intervention which p value is < 0.05 .

Implementation on residual spraying of dwelling houses and farm huts

Residual spraying of home and farm huts by respondents also showed good results, which initially only 5(8.5%) of the respondents declared that they can do it during the pre-survey. But the number increased to 56(94.9%) respondents after the intervention. Paired t-test show that p value is < 0.05 .

Personal Protective Equipment

The usage of personal protective equipment (PPE) such as long sleeves shirt, long pants, socks and shoes while doing farming activities and foraging in jungles to protect against mosquito bites was emphasized. This is the most convenient measure that every residents of the village are able to implement with ease. Use PPE showed significant difference between pre and post data with $p < 0.05$.

DISCUSSION

Knowledge

Generally, active involvement of the respondents and the community in all the control and

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prevention activities has increased their level of knowledge on mode of transmission for malaria disease i.e. through mosquito bites⁶. However, majority of the respondents did not know that malaria is caused by parasites and assumed malaria is caused by virus or bacteria. The significant finding was, majority of the respondents knew malaria can cause death and pose serious health problem. Consequently respondents' knowledge on mosquito resting places and on sign and symptoms also increased with $P < 0.05$.

The knowledge prior to the intervention was found to be grossly deficient and this could be explained by their level of education. Previous studies in different societies, among aboriginal and rural communities showed an associated between education and knowledge level¹⁰. The study showed that better education level has reflected a better knowledge about malaria at the community level. It seems that education plays an important role in defining people's perception especially in controlling malaria.

Generally, communication strategy and training has been used during the activities as one of the intervention component. Subsequently, level of awareness has shown increases in the prevention measures for malaria⁷. Likewise, a better understanding of for malaria elimination significantly increased after the intervention. This community-based interventions demonstrates that the approach was able to enhance the community knowledge to comprehend the effect of their participation is the best ways of controlling malaria¹¹. Thus the community's involvement through empowerment activities is an effective strategy to eliminate malaria especially in endemic areas⁸. As it is now, the malaria elimination activities are entirely the responsibility of health staff.

Attitude

The respondents showed a positive attitude towards malaria disease and its control and prevention measures, where eventually 100% of the respondents showed favorable attitude in post data.

Practice

The result shows positive changes among respondents and community as a whole in malaria prevention practices. Data showed an increased in number of respondents who sleeps under treated bed nets when at home or staying overnights in the farms. The number of respondents and families using PPE and taking prophylaxis treatment as preventive measures before entering the jungle also increased. The respondent's acceptance of residual spraying as effective measures for killing adult mosquito also increased.

The community has become conscious of their responsibility to look after themselves from

malaria infection after being empowered with knowledge and training to prevent malaria. Yet, the continuous for the community support must be done to have greatest influence on their practices to ensure the sustainability of community participation¹². A similar finding reported that there was a significant reductions in malaria prevalence with the guidance of personnel health staff through intervention¹³.

Empowerment towards malaria control and prevention measures

The empowerment here refers to community voluntary participation in implementing malaria control and prevention measures after necessary knowledge and skills given. The specified measures are; impregnation of bed nets (how to treat bed nets with insecticide), insecticidal residual spraying of dwelling houses and usage of personal protective equipment's (PPE) such as long sleeves shirt, long pant, stocking and shoes while carrying out farming activities and foraging in jungles as measure to protect against mosquito bites.

The main component of empowerment was *voluntary participation* in the treatment of bed nets and residual spraying of dwelling houses and farm huts by members of the community. All bed nets either own by families or issued by health office must be treated and every houses and farm huts must be sprayed with residual insecticides. The community was also encouraged to use PPE to protect themselves from mosquito bites.

CONCLUSION

As a conclusion, the level knowledge, attitude and practice of respondents showed increment before and after intervention. This evident proved that intervention is necessary and also welcome by the community. Basically, community also needs such program to be implemented at their places and eventually they are protected from infection. Community also welcome empowerment program introduced i.e. impregnated bed net, residual spray and personal protective equipment. They gave full cooperation and support during training and willing to do it with minimum monitoring by the health staff. Study result also showed significant different in term of empowerment after interventions.

However, the team also faced some limitation during post data collection. Some of the pre-survey respondents were dropped due to their absence during post survey either due to work commitments, moved out from the village or died.

Another challenge was to get full involvement of the entire community with ease because the village has two set of official leaders (different political affiliation) with their own followers. This has slightly affected the smooth implementation of intervention activities. However, the research team managed to resolve amicably

most of the disagreement among them through discussion with the community members.

Overall, this intervention programme is capable to improve knowledge of the respondents and the village community. Based on the result on this particular community, Community empowerment intervention programme could be used as a strategy to mobilize community to improve health status^{1, 9}. The benefits have been proven in Kampung Tong Nibong where the community awareness level on malaria has increased compare to before the project. The community was able to implement control and prevention activities and assimilate it as their daily routine practices to combat malaria with minimal supervision from local Health Department. Therefore, it is highly recommended that this strategy should be applied in other localities with similar situation as regards to malaria problem.

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REFERENCES

1. Sibley CH. Tracking artemisinin resistance in *Plasmodium falciparum*. *The Lancet Infectious Diseases*. 2015; 13(12):999-1000.
2. Okumu FO, Moore SJ. Combining indoor residual spraying and insecticide-treated nets for malaria control in Africa: a review of possible outcomes and an outline of suggestions for the future. *Malaria Journal*. 2011;28(10):208.
3. MOH. Annual report Ministry of Health Malaysia (2005). Kuala Lumpur: Kementerian Kesihatan Malaysia. 2005.
4. WHO. Eliminating Malaria: Case-study 8 | Progress towards elimination in Malaysia. Geneva: World Health Organization. 2015.
5. Tanzania Ministry of Health and Social Welfare . Communication Strategy for Malaria Control Interventions, Tanzania 2008 – 2013. (cited 2017 January 6); Available from: <http://www.thehealthcompass.org/project-examples/communication-strategy-malaria-control-interventions-tanzania-2008-2013>.
6. Humphrey D, Mazigo, Emmanuel Obasy, Wilhelmus Mauka, Paulina Manyiri, Maria Zinga, Eliningaya J. Kweka, Ladslaus L. Mnyone, Jorg Heukelbach. Knowledge, attitudes, and practices about malaria and its control in rural northwest Tanzania. *Malaria Research and Treatment*. 2010.
7. Junko Yasuoka, Masamine Jimba, Richard Levins. Application of loop analysis for evaluation of malaria control interventions. *Malaria Journal*. 2014;13(1):140.
8. Mlozi MRS, Shayo EH, Senkoro KP, Mayala BK, Rumisha SF, Mutayoba B, Senkondo E, Maerere A, Mboera LEG. Participatory involvement of farming communities and public sectors in determining malaria control strategies in Mvomero District, Tanzania. Canada: University of Toronto. 2007.
9. E. Richard Brown. Community action for health promotion: A strategy to empower individuals and communities. *International Journal of Health Services*. 1991;21(3):441-456.
10. Al-Adhroey AH, Nor ZM, Al-Mekhlafi HM, Mahmud R. Opportunities and obstacles to the elimination of malaria from Peninsular Malaysia: knowledge, attitudes and practices on malaria among aboriginal and rural communities. *Malaria Journal*. 2010;9(1):137.
11. Salam RA, Das JK, Lassi ZS, Bhutta ZA. Impact of community-based interventions for the prevention and control of malaria on intervention coverage and health outcomes for the prevention and control of malaria. *Infectious Diseases of Poverty*. 2014;3(1):25.
12. Atkinson JAM, Fitzgerald L, Toaliu H, Taleo G, Tynan A, Whittaker M, Riley I, Valley A. Community participation for malaria elimination in Tafea Province, Vanuatu: Part I. Maintaining motivation for prevention practices in the context of disappearing disease. *Malaria Journal*. 2010; 9(1):93.
13. Atkinson JA, Valley A, Fitzgerald L, Whittaker M, Tanner M. The architecture and effect of participation: a systematic review of community participation for communicable disease control and elimination. Implications for malaria elimination. *Malaria Journal*. 2011;10(1):225.