

US Navy-NIMPE Collaborations & Operations Research

Support of Malaria Elimination in Vietnam



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Introduction

The Vietnam National Malaria Control Plan (NMCP) has set a goal for malaria elimination by 2030. The US Navy began collaborations with the Vietnamese National Institute of Malariology, Parasitology, and Entomology (NIMPE) in 2014 with projects to enhance malaria surveillance. Phu Yen Province in central Vietnam (Figure 1), near areas of highly drug-resistant malaria, was selected as the lead study site.

The primary objective of this study was to measure the association between risk factors and malaria status. The findings from this preliminary study can be used to inform the NMCP.

Methods

In 2015 a survey was completed of 100 households with and 100 households without confirmed malaria in three communes of western Phu Yen. Cases were identified using malaria case report forms that were confirmed by review of commune health clinic records while controls were recruited from the nearest household without a confirmed case of malaria.

Survey instruments were developed to collect data on participant demographics, known risk factors, use of bed nets, and preferences for potential interventions.

ANOVA and t-test were utilized to detect differences between cases and controls. Pearson's Chi Square test was utilized to characterize differences in risk between cases and controls. Logistic regression models were utilized to assess associations between risk factors of forest goers and malaria status.



Figure 1: Map of Vietnam with Phu Yen Province highlighted.

Table 1: Demographic description of study population.

		Case (n = 81)	Control (n = 94)	p-value
Age		34.2 ± 11.7	37.8 ± 11.6	0.04
Gender	Male	71 (87.7%)	83 (88.3%)	0.90
Household income	Low	11 (13.6%)	17 (18.1%)	0.42
	High	70 (86.4%)	77 (81.9%)	
Primary forest-based work	Aloe wood collection	16 (19.8%)	25 (26.6%)	0.21
	Tree plantation	43 (53.1%)	21 (22.3%)	
	Trapper	6 (7.4%)	19 (20.2%)	
	Other (charcoal production, farmer, tree cutter)	16 (19.8%)	26 (27.7%)	
Education (self identified)	Unable to read/write	18 (22.2%)	28 (29.8%)	0.54
	Primary School	25 (30.9%)	21 (22.3%)	
	Secondary	16 (19.8%)	19 (20.2%)	
	High School	22 (27.2%)	26 (27.7%)	
Ethnicity (self identified)	Kinh	28 (34.6%)	33 (35.1%)	0.70
	Cham	43 (53.1%)	53 (56.4%)	
	Bana	10 (12.3%)	8 (8.5%)	

Results

Cases and controls were well-matched for all factors (p-value >0.05) except age (Table 1). Activity at night (getting water, bathing and working) had a significant association with malaria status (Table 2). Adjusted odds ratios were significant for four risk factors by logistic regression analysis (Table 3).

Households reporting no use of a treated net had a higher risk of malaria (OR 3.17; 95% CI 1.70 – 5.88; p-value: <0.01). A majority of forest-goers (85%) reported dislike of nets provided by public health programs (e.g. freely distributed long lasting insecticide-treated nets). Forest goers were asked what type of net they preferred: 92.4% reported a preference for treated nets/hammock for sleeping in the forest with 83.2% of these respondents indicating a preference for hammocks with a zip-in treated net.

A difference was noted between forest goers and farmers with respect to willingness to use chemoprophylaxis and repellents. Forest goers reported a greater preference for chemoprophylaxis (91.3% vs. 42.9%) and repellents (89.1% vs. 17.5%).

Table 2: Analysis of risk factors for malaria cases in Phu Yen Province.

	Case	Control	OR (95% CI)	p-value
Average days spent in the forest	130.8 ± 80.8	118.5 ± 80.4		0.28
Travel to the forest during malaria transmission season	60 (74.1%)	72 (76.6%)	0.84 (0.84 - 17.4)	0.70
Do not use net or hammock net while sleeping in the forest	13 (16.0%)	11 (11.7%)	1.44 (0.61 - 3.43)	0.41
Get water after dark	57 (70.4%)	51 (54.3%)	2.00 (1.07 - 3.75)	0.03
Bathe in stream after dark	72 (88.9%)	71 (75.5%)	2.59 (1.12 - 5.99)	0.02
Work after dark	26 (32.1%)	14 (14.9%)	2.70 (1.30 - 5.63)	<0.01
Sleep in hut with open walls	15 (18.5%)	4 (4.3%)	5.10 (1.62 - 16.1)	<0.01

Table 3: Logistic regression analysis of risk factors for malaria cases in Phu Yen Province.

Variable	Case	Control	AOR (95% CI*)	p-value
Get water after dark	57 (70.4%)	51 (54.3%)	2.32 (1.15 - 4.67)	0.02
Bathe in stream after dark	72 (88.9%)	71 (75.5%)	3.16 (1.25 - 7.99)	0.02
Work after dark	26 (32.1%)	14 (14.9%)	3.72 (1.54 - 9.00)	<0.01
Sleep in hut with open walls	15 (18.5%)	4 (4.3%)	5.77 (1.71 - 19.4)	<0.01

* Reference – Control Group

Conclusions

Intervention programs must be tailored to the specific at-risk populations. In Phu Yen, forest goers engaging in night time activities were at greater risk of having malaria. Targeted education and vector control strategies can be developed to address the risk factors identified in this study. An understanding of user preferences appears to be an important factor in the successful implementation of targeted interventions highlighted by the differences noted between farmers and forest goers.

Based on these preliminary findings an updated survey is planned for 4800 households and all transmission hotspots in 2016 to confirm the 2015 findings. These activities will provide an evidence base from which to tailor interventions for malaria elimination.

Acknowledgements

The authors wish to thank the people of Dong Xuan District in Phu Yen Province, Vietnam for their willingness to participate in this study. Additionally, this project would not have been possible without the support of the NIMPE and Phu Yen Provincial Preventive Medicine teams.

Disclaimer

The opinions and assertions contained herein are those of the author(s) and are not to be construed as official or reflecting the views of the Department of the Navy, Department of Defense, the U.S. Government or the Vietnam National Institute of Malariology, Parasitology, and Entomology. This work was funded by the US Defense Health Program.