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Determining the impact of community awareness-raising activities on the prevention of malaria transmission in Palawan, the Philippines

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ABSTRACT

Palawan has the highest malaria endemicity in the Philippines, and malaria remains a major health burden in the region. In 1999, 344 microscopists were trained in Palawan. This allowed for early diagnosis and prompt treatment throughout the island. To take a significant step toward the elimination of malaria on the island, microscopists implemented community awareness-raising activities aimed at preventing transmission of malaria. The objective of the present study was to determine the impact of these activities on the self-implemented preventive measures against malaria by the ex-patients of the microscopists. Structured interviews were carried out from January to February in 2012, in 20 remote malaria-endemic villages throughout Palawan. In total, 141 ex-patients who had previously been diagnosed malaria-positive by the microscopists, volunteered to participate in the present study. Structural equation modeling was conducted to determine factors associated with self-implemented preventive measures against malaria, which included: (1) place of residence; (2) socio-demographic characteristics; (3) knowledge on malaria; (4) participation in community awareness-raising activities for malaria prevention; and (5) satisfaction with microscopists. Structural equation modeling identified six significant factors independently associated with self-implemented preventive measures against malaria; ethnicity, knowledge on malaria transmission, knowledge on vector species, knowledge on vector's most active time, participation in awareness-raising activities for malaria prevention by microscopists, and satisfaction with microscopists. Tagalog ethnicity (the predominant ethnic group) was positively related to better self-implemented preventive measures. In conclusion, aside from providing early diagnosis and treatment, microscopists played a significant role in self-implemented preventive measures against malaria. The strengthening of awareness-raising activities by microscopists was suggested to be an effective strategy for reducing malaria re-infection in Palawan. These activities should be strengthened to improve preventive measures implemented by ex-patients traveling to mountain areas and to enhance the knowledge on malaria transmission particularly among indigenous residents.

1. Introduction

Malaria remains endemic in remote rural areas in the Philippines [1–6]. In 2011, approximately 75,700,000 people (80% of the national population) were living in malaria-endemic areas in the Philippines; of these, 6,800,000 (7.2% of the national population) were living in high transmission areas [1]. The Philippines is divided geographically into (from highest division to lowest): provinces, municipalities and component cities, and villages. Nationwide, 65 of the 78 provinces, 760 of the 1600 municipalities and component cities, and 9345 of the 42,979 villages are considered to be malaria-endemic [2–6]. *Anopheles flaviostris*, which breeds in clear, slow-flowing streams, is the insect vector for the major *Plasmodium* species, *Plasmodium falciparum* (*P.f.*), which accounts for 75% of infections in the country. Anti-malarial drug resistance is widespread but low-grade.

Palawan is the fifth largest island in the Philippines, whose capital, Puerto Princesa, is located in the latitude 9° 30′ North and longitude 118° 30′ East. The island is largely covered by tropical rainforests, and led the country in the number of infections, morbidity and mortality in 2011 [1]. The population is comprised of various ethnicities, including Tagalog (the predominant ethnic group in the Philippines), Cuyunon, Hiligaynon, Palawan, Cebuano, Ilocano, Bisaya, Kagayanan, and Tagbanwa [7,8]. Malaria is prevalent in 18

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of Palawan's 23 municipalities (78.3%) and 344 of its 367 villages (93.7) [2–6]. Although the Annual Parasite Index (API) decreased from 27.6 per thousand in 2004 to 13.0 in 2010, there were more than 5000 malaria infections in 2011 and the disease has consistently been one of the top 5 causes of morbidity [2–6].

Infections mainly occur in the tropical rainforests or adjacent areas during the rainy season (June to October) [2–6]. Peaks of transmission are usually 2 months after the start of the rainy season and toward the end of the rainy season. Malaria has commonly affected upland subsistence farmers, indigenous cultural groups, forest product gatherers, frontier settlers, migrant agricultural workers, charcoal makers, and miners.

To reduce the incidence of malaria in Palawan, a community-based malaria control program by *Kilusan Ligtas Malaria* (KLM) (Tagalog: Movement Against Malaria) was established in 1990. KLM trained 344 community health workers (CHWs) in Palawan to be malaria microscopists (one microscopist per malaria-endemic village) [2]. Most microscopists were homemakers in the villages in which they were appointed. They were trained to take blood from febrile patients, make giemsa-stained blood smears, diagnose by microscope, and prescribe anti-malarials. Microscopists received only token remuneration.

The use of CHWs is a potentially inexpensive, effective, and sustainable approach for bringing malaria treatment closer to homes [9,10]. For more than 35 years and in many different settings, CHWs are reported to play an important role in malaria diagnosis and treatment at the community level [11–14]. This approach has particular application in rural areas such as Palawan, where there is a recognized paucity of formal public and private healthcare providers [15–17].

To control malaria in Palawan, the microscopists have two main roles: 1) to increase the proportion of febrile patients receiving early diagnosis and prompt treatment (the primary goal); and 2) to reduce malaria incidence by the additional role of implementing community awareness-raising activities with febrile patients, their family members, and people at health centers.

Since the initiation of the microscopist-training program, early diagnosis and prompt treatment have been extended throughout Palawan, and morbidity and mortality have decreased year-by-year [2–6]. In 1995, before the project started, 76.1% of malaria diagnoses were made solely on the basis of signs and symptoms. This percentage decreased steadily until 2006, when all of the malaria cases in Palawan were confirmed through microscopy and treated with appropriate anti-malarial therapy.

For malaria control, the WHO recommends the use of insecticide-treated nets (ITNs) and indoor residual spraying (IRS) [1]. KLM has distributed 30,804 insecticide-ITNs and re-treated 17,916 existing nets with insecticide. The provincial health office regularly conducts IRS. The stabilization of malaria incidence since 2006 suggests that it is time for community members to take additional preventive measures on an individual basis and for microscopists to assist these measures by raising malaria awareness in their communities.

Several studies have been conducted to determine associated factors and risk factors of several preventive measures against malaria and knowledge on malaria. Despite the massive scaling-up of ITN and IRS, malaria prevalence remains high in several areas, and a number of risk factors have been identified, namely: a history of high transmission, low community and individual wealth, house design, ethnicity, and being a child [18–20].

The improvement of knowledge on malaria is also important for facilitating preventive measures against malaria. Interventions, including community awareness-raising activities carried out by CHWs have succeeded in improving knowledge on malaria in communities [21]. Moreover, gender, poverty, human mobility, conflict, and displacement, also determined vulnerability with regard to malaria knowledge and coping strategies [22,23]. Few studies have been conducted among the inhabitants of Palawan to identify factors that strengthen preventive measures against malaria.

A previous study investigated the predictors of community-raising activities for malaria prevention by microscopists and found a significant association between high microscopists' capacity and the implementation of a greater number of community awareness-raising activities [24]. Microscopists' capacity was determined by two subcomponents: service quality (detection, diagnosis and treatment, prescription of anti-malarial drugs, and follow-up) and ability in malaria microscopy (prevention and documentation, slide preparation and observation, safe handling and disposal, and knowledge on the morphology of infected red blood cells). The authors found that minor corrections based on the strengths and weaknesses of individual microscopists would be a highly useful intervention for improving service quality and ability in microscopic examination of malaria. The implementation of such corrections is an intervention that might succeed, not only in improving microscopists' capacity, but also in increasing the number of community awareness-raising activities.

Thus, the objective of the present study was to identify the factors associated with the self-implemented preventive measures against malaria of ex-patients in Palawan. The authors' considered the effect of their place of residence, socio-economic status, health seeking behavior, malaria knowledge (symptoms, transmission, vector species, and vector's most active time), participation in community awareness-raising activities, and satisfaction with microscopists. The findings would be useful in forming strategies to reduce malaria incidence in Palawan.

2. Methods

2.1. Study design and site

The present study was a cross-sectional study conducted from January to February in 2012, in 20 rural villages situated in four highly malaria-endemic provinces in Palawan, Philippines: 6 villages in Roxas (northern region), 7 villages in Puerto Princesa City (central region), and 2 and 5 villages in Bataraza and Brooke's Point, respectively (southern region). The study sites, which evenly cover the island of Palawan were chosen, with consideration for malaria transmission, following discussions with local malaria experts. All of the study villages chosen from the 137 villages of the four provinces were in highly endemic areas (at least two cases a year per 1000 population). All of the ex-patients in each village were targeted. In 2011, the APIs of each targeted municipalities were: 2.98 in Roxas, 5.87 in Puerto Princesa City, 20.4 in Bataraza, and 9.59 in Brooke's Point. The remaining high-transmission municipalities (Quezon, Rizal, Sofronio Espanola, and Balabac) were not chosen due to location (mountain or islands) and/or safety concerns (several active militant separatist groups were based around these mountain areas). Since members of these separatist groups were frequently the patients of the microscopists, the local facilitator strongly suggested that the authors should not approach these municipalities.

2.2. Participants and data collection

The 141 participants, who comprised 15.1% of the ex-patients in the 4 municipalities, all had a history of malaria. After obtaining permission for the study from the governor of Palawan the Provincial Health Office and each respective Municipal Health Office, lists of malaria patients 2011 were collected from each of the rural health units and barangay health units. The lists were used to select highly malaria-endemic villages. Data collection in the villages was carried out with the support of the microscopists and health center staff. Participants living near a health center were asked to assemble at the health center; home visits were conducted for participants whose homes were more distant. Farmers and gatherers living in distant mountains, migrant agricultural workers, miners, and members of militant separatist groups were excluded from the study.