

Satisfaction of Malaria Patients with Care by Community Health Workers Trained in Microscopy: A Mixed-Methods Study in Palawan, the Philippines

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Abstract. Palawan is the malaria-endemic province with the highest prevalence of malaria in the Philippines, and microscopists (community health workers) have been allowed to deliver early diagnosis and prompt treatment of malaria throughout the province since 1999. To improve the quality of care, the present mixed-methods study attempted to identify the factors associated with satisfaction of patients in Palawan with their microscopists by analyzing the patients' perspectives. First, a quantitative cross-sectional study was conducted among 48 ex-patients and their nine microscopists. Ex-patients were asked about their satisfaction with care, and microscopists were asked about their job satisfaction and ability. Structural equation modeling was conducted for data analysis. Second, a qualitative cross-sectional study was performed using narrative interviews. Data were analyzed using the NVivo 10 software program. As a result, both studies revealed high patient satisfaction with microscopists. The quantitative study showed that ex-patients' satisfaction with their microscopists was independently enhanced by two factors: high ability in malaria microscopic observation and low household wealth of the patients. Particularly, specific subpopulations (those with lower household wealth, relatively old people, and ethnic minorities) were more satisfied with the microscopists' care. The qualitative study strengthens this finding by showing that their microscopists offered prompt and precise diagnosis and effective treatment for free. In conclusion, microscopists were shown to have an important role in narrowing the disparities in malaria care in Palawan. It is important to maintain/enhance the ability of microscopists in malaria microscopy to satisfy their patients.

INTRODUCTION

Since 1999, 344 microscopists (community health workers [CHWs]) have been trained and placed in each endemic village in Palawan, the Philippines.¹ The microscopists diagnose malaria in febrile patients by microscopy, prescribe first-line antimalarial drugs to the malaria-infected patients, and implement community awareness-raising activities.^{2–5} Following the launch of the strategy, early diagnosis and prompt treatment have been extended throughout the province, resulting in a drastic decrease in malaria morbidity and mortality in Palawan.³ The annual parasite index (API) per 1,000 population in Palawan decreased from 27.6 in 2004 to 13.0 in 2010, but the API in 2017 still remained 0.47.^{6,7}

Indeed, the impact of health strategies is mostly discussed in relation to morbidity or mortality because of their quantifiability, and the context of patients' satisfaction to the consequence is often ignored.⁸ Only a few studies have examined the effects of community-based control strategies by measuring patients' satisfaction with care, which is an important dimension for the elimination of malaria in Palawan.^{9–11} Besides, the study of illness narratives (stories about getting ill, being ill, getting better or worse, and coping or failing to cope with the illness) offers the possibility of developing an understanding that cannot be obtained by any other means, and it eventually helps to generate new patient-centered hypotheses, particularly for those vulnerable population who are most affected by malaria.^{12,13}

Furthermore, to better understand the research problems or issue, mixed-methods research was conducted by integrating quantitative and qualitative research methods.¹⁴ To improve the quality of medical care from the patients' perspective, the present mixed-methods study identified the factors associated with the patients' satisfaction with microscopists' care in Palawan. The findings obtained from this mixed-methods study may be useful for determining a strategy to further reduce the incidence of malaria in Palawan to accomplish its elimination.

MATERIALS AND METHODS

Study design and data collection. The present mixed-methods study was conducted in Palawan. Nine target rural villages were selected for the study from totally 49 villages located in two endemic municipalities, Brooke's Point and Roxas, in Palawan (Figure 1), namely, five of 18 villages in Brooke's Point and four of 31 villages in Roxas. Those highly malaria-endemic villages were chosen with consideration of malaria transmission intensity (at least two cases a year per 1,000 population of the village with reference to the lists of malaria patients which were collected from rural health units) and following discussions with local malaria experts. The API of each municipality was 9.59 for Brooke's Point and 2.98 for Roxas in 2011.⁷

After ethical approvals were obtained from the Palawan Provincial Health Office, permissions to conduct the present study were granted from the governor. Both quantitative and qualitative data were collected and analyzed separately, and then, the results were compared to see if the findings confirm and reinforce each other (Figure 2).¹⁴

Data were collected in these villages from ex-patients who were diagnosed by microscopists from January to February in 2011 and also from their microscopists from November in

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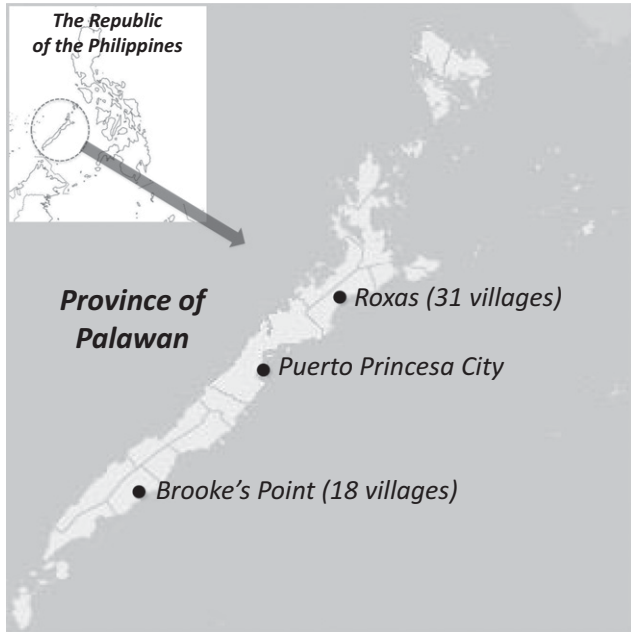


FIGURE 1. Study areas of the study, Brooke's Point and Roxas.

2010 to February 2011. Target population of the quantitative study was those ex-patients and their microscopists, and some ex-patients also joined the qualitative study. All the ex-patients who participated in the present study were diagnosed

as having malaria by microscopists. The average number of the days from most recent fever episode was 7.2 days (SD: 3.6, minimum: 1, and maximum: 12). Among them, 41.1% received treatment within 2 days of the fever episode, 51.0% started the first treatment after 3 days or more, and the rest (7.8%) did not remember the actual days of their starting treatment according to the questionnaire. Therefore, the average number of days from malaria diagnosis of ex-patients to the date of the survey could not be accurately calculated, but their span was from 1 day to 15 days. All of them were successfully treated with the first-line drugs.

First, data on the ex-patients were collected by visiting all households within an hour on foot from the health center, which could cover almost all the households in the village. Thus, farmers and gatherers living in distant mountains, migrant agricultural workers, miners, and members of militant separatist groups were excluded from the present study. In each household, the most recently seen patient was selected as a participant in the present study. The mothers answered the questionnaire if the ex-patients were infants. Then, some of the ex-patients were asked to additionally join the qualitative study. This data collection was conducted with the support of microscopists and health center staff.

Second, data on the microscopists were collected by contacting them on the occasion of a malaria congress in the southern municipality (Brooke's Point) in November 2010, and during the refresher courses held in the northern municipalities (Taytay and San Vicente) in February 2011. Self-administered questionnaires were handed out to all of the attending

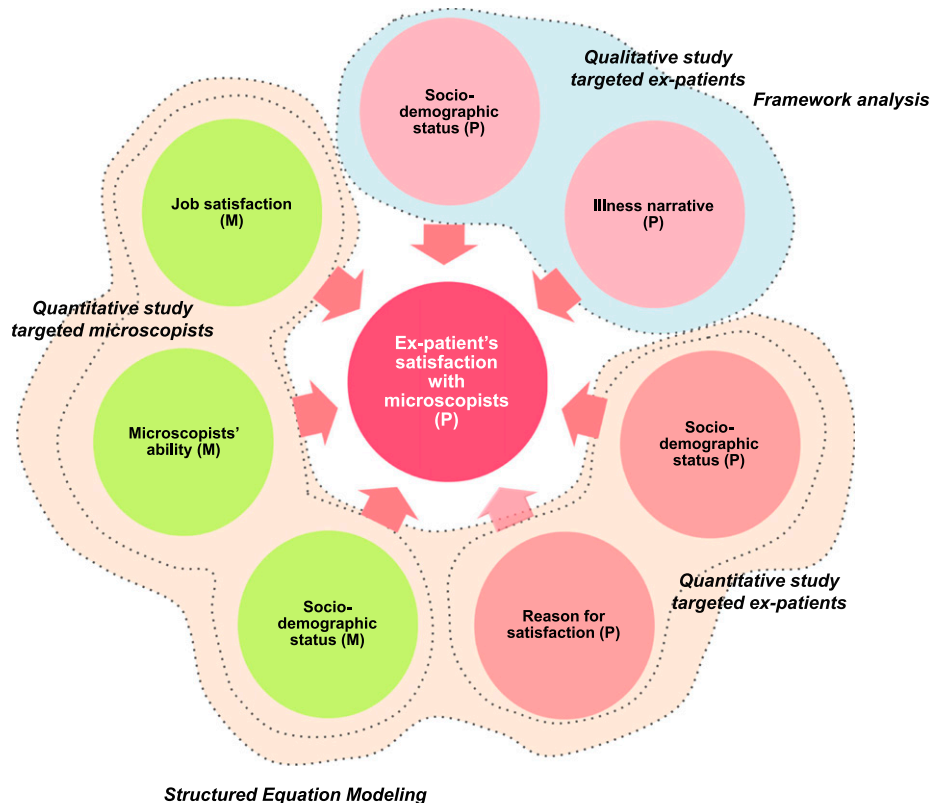


FIGURE 2. Conceptual framework. The present study was a mixed-methods study. The quantitative study was analyzed using structured equation modeling (SEM), and the qualitative study was analyzed using framework analysis. Factors of the microscopists are marked with "(M)," and factors of the ex-patients are marked with "(P)."

microscopists.³ The authors closely supervised all processes of data collection and found out that all participants were able to read and answer the questionnaires by themselves and that there were no inconsistencies in their response.³

The quantitative study. Interviews were carried out with ex-patients ($n = 48$) and their microscopists ($n = 9$) in Palawan without any refusals (Figure 3). All questionnaires were developed in English and translated into Tagalog by local malaria experts who were fully knowledgeable of the situation of microscopists in Palawan. All ex-patients and microscopists spoke Tagalog.

The interviews with ex-patients included sociodemographic characteristics (place of residence, gender, occupation, marital status, religion, ethnicity, educational status, and household wealth), and satisfaction with microscopists (level of satisfaction and its reasons), which was, respectively, linked to the resent past episode of malaria. The level of satisfaction was measured by one question: “Are you satisfied with the work of your microscopist?” The question had five response options ranging from “bad” to “very good” (1–5 points, respectively). The score was treated as a continuous variable.

The interviews with microscopists included sociodemographic characteristics (place of assignment, gender, occupation,

marital status, religion, ethnicity, educational status, and household wealth), microscopists’ ability (service quality, knowledge on malaria, and ability in malaria microscopy), and job satisfaction. For the microscopists’ ability, it was measured with seven questions on “preparation and documentation,” 21 questions on “slide preparation and observation,” seven questions on “safe handling and disposal” of the smears, and 24 questions on “knowledge on the morphology of infected red blood cells” with *Plasmodium falciparum*, *Plasmodium vivax*, and *Plasmodium malariae*.⁴

Two types of statistical analyses were conducted. First, descriptive analysis was conducted to provide an overview of the ex-patients’ characteristics. Second, a structural equation modeling (SEM) analysis was conducted to identify the factors associated with appropriate treatment (Figure 3). Structural equation modeling has been described as a combination of exploratory factor analysis and multiple regression.¹⁵ In fact, SEM is now widely used in the behavioral sciences and is suitable for exploratory analysis using relatively large numbers of factors. Structural equation modeling can also clearly show the results as a simple figure to be understood. Moreover, SEM offers results that consider the interrelationships of the multiple factors. Our study used a relatively large number of

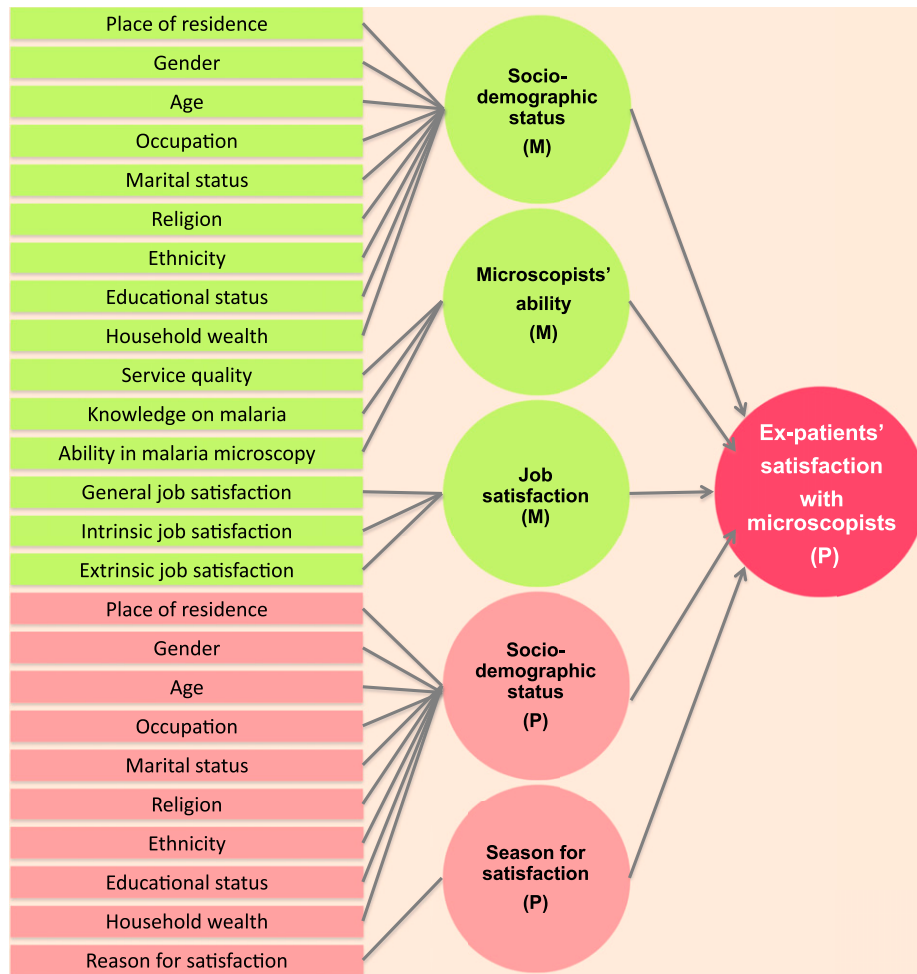


FIGURE 3. Quantitative study. The dependent variable was ex-patient’s satisfaction with microscopists, and the independent variables were collected from ex-patients (sociodemographic status and reason for satisfaction) and their microscopists (sociodemographic status, microscopists’ ability, and job satisfaction). All variables used in the Structural equation modeling were analyzed as continuously observed variables. Factors of the microscopists are marked with “(M),” and factors of the ex-patients are marked with “(P).”

factors as listed in Figure 3, and SEM was chosen for statistical analysis because it can clearly show the results with a simple figure that considers the interrelationships of the multiple factors. Therefore, use of SEM was justified in our study.

All variables were used as continuously observed variables. The correlation of all variables was examined, and a path model was built based on the results of a bivariate analysis (cutoff value $P < 0.10$). The fit of the model was examined in terms of degrees of freedom (df), chi-square (CMIN), comparative fit index (CFI), and root mean square error of approximation (RMSEA). According to the conventional criteria, a good fit was indicated by $CMIN/df < 2$, $CFI > 0.97$, and $RMSEA < 0.05$, and an acceptable fit by $CMIN/df < 3$, $CFI > 0.95$, and $RMSEA < 0.08$.¹⁶ All statistical analyses were conducted using SPSS version 18.0 and Amos 18.0 (SPSS Inc., Chicago, IL).

The qualitative study. The qualitative study was conducted by employing only nine ex-patients who participated in the quantitative study (Figure 4). All the nine ex-patients were willing to join the study. Semi-structured interviews were conducted, in which we asked open-ended questions and also allowed the participants to discuss with the interviewers. The interviews included sociodemographic status, illness narrative, and perception about microscopists. The questionnaire was developed in English and translated into Tagalog by local malaria experts who were fully knowledgeable of the situation of microscopists in Palawan. All ex-patients

spoke Tagalog. Ex-patients were asked eight questions on their (one) sociodemographic status: seven nominal questions on place of residence, gender, occupation, marital status, religion, ethnicity, and educational status, and two continuous questions on age and household wealth. Questions on the following topics were asked to clarify the illness narratives of the ex-patients: the day the illness started, the day treatment started, stories of getting ill, symptoms, stories of suffering, stories of being treated, and recovery. Finally, questions about the perception of microscopists were asked, which explored whether the ex-patients were satisfied with the work of the microscopists, and in what ways, and if they had any more expectations from the microscopists. Subsequently, a framework analysis was conducted with the assistance of NVivo 10 (QSR International Pty Ltd. Doncaster, Australia).^{17,18}

Ethical approval and consent of participation. The present study was approved by the Research Ethics Committee of the University of Tokyo (no. 3001) and upheld by the Palawan Provincial Health Office. All the microscopists and ex-patients gave written informed consent to take part in the study and to use anonymized data for publication before the data collection. They were also told that they could withdraw from the study during the data collection or even afterward. No persons who worked in health facilities were involved with the ex-patients while they were answering the questionnaire.

RESULTS

The quantitative study. The population of Brooke's Point and Roxas were 40,411 and 64,974, respectively. Among them, during our survey period, January to February 2011, 39 villagers from Brooke's Point and 16 from Roxas were diagnosed as having malaria by the microscopists during January to February. In the present study, we could cover totally 48 ex-patients of them (94.1%).

Of the 48 ex-patients, 36 were women (75%), and their average age was 38.2 years (SD: 14.0) (Table 1). Ethnicity was evenly distributed across the Tagalog ethnicity ($n = 10$), amalgamation of Tagalog ($n = 19$), and other ethnicities ($n = 19$). Other ethnicities were Bicolana, Bisaya, Ceuano, Cuyunon, Ilocano, Kagayan, Mindanao, Palawan, and Tagbanwa. The average number of family members in each household

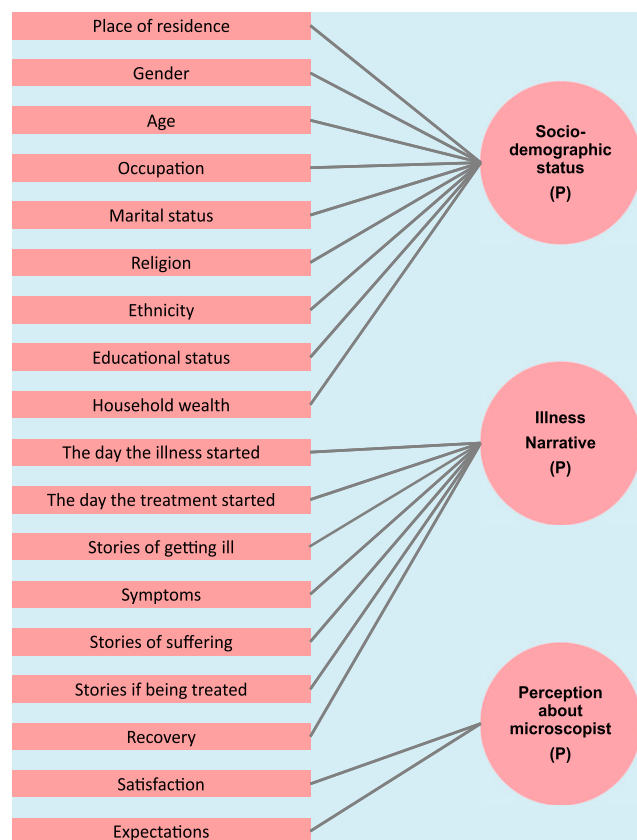


FIGURE 4. Qualitative study. The semi-structured interviews included sociodemographic status, illness narrative, and perception about microscopists. Subsequently, a framework analysis was conducted.

TABLE 1

Sociodemographic status of the ex-patients (quantitative study)	
Status	n (%)
Gender	
Male	12 (25.0)
Female	36 (75.0)
Mean age (SD) (years)	38.2 (14.0)
Ethnicity	
Tagalog	10 (20.8)
Amalgamation of Tagalog	19 (39.6)
Other	19 (39.6)
Educational status	
No grade completed	5 (10.4)
Elementary grade	16 (33.3)
High school	1 (2.1)
College	22 (45.8)
Higher	4 (8.3)
Mean number of family members in household (SD)	5.08 (1.61)
Mean number of children (SD)	2.83 (1.74)

was 5.08, and the average number of children was 2.83. In addition, most of the female ex-patients were homemakers, and a few of them were shopkeepers, shop owners, or personal business owners. Male ex-patients were mostly farmers.

Most ex-patients (94%) were highly satisfied with the work of their microscopists, whereas a minority (6%) rated the microscopist's work at a reasonable level. The reasons for the ex-patients' satisfaction were their experience with their healthcare providers (80.4%), the quality of the equipment (80.4%), and the quality of the treatment provided (71.7%) (Table 2).

Of the nine microscopists, eight were married homemakers, and their average age was 36.2 years (SD: 9.1). They had a high ability in malaria microscopy to discriminate *P. falciparum*, the most harmful species of the parasite, from the other parasite species from the characteristics of infected RBCs.³

Based on a bivariate analysis (Table 3) and conventional criteria indicated by informative fit indicators (df, CMIN, CFI, and RMSEA),¹⁶ a hypothetical SEM was built to examine the factors associated with satisfaction with microscopists (cutoff value $P < 0.10$). The SEM fits the data adequately (CMIN/df = 1.43, CFI = 1.000, RMSEA = 0.000; Figure 5). The ex-patients' satisfaction with their microscopists was independently and significantly enhanced by the following two factors: the microscopist's high ability in malaria microscopy and the low household wealth of the ex-patients. In addition, ex-patients' low household wealth was related with low education, and the level of education decreased with age and among those belonging to minor ethnic groups. In the final model, the microscopists' ability in malaria microscopy increased significantly with the length of their work experience.

The qualitative study. Nine ex-patients (one female and four male children, two female and two male adults) participated in the present study (Table 4). All of them had a history of illness, and they had been diagnosed as having malaria by microscopists in 2011. All the infants and two male adults presented with fever, but the other two female adults were afebrile. The other symptoms of theirs were cold, nausea, headache, stomachache, shivering, sweating, muscle pain, and/or diarrhea.

Ex-patients were satisfied with their microscopists' care because they offered prompt and precise diagnoses and effective treatment for free in a province where limited healthcare resources were available. Ex-patients sought microscopists as soon as they suspected that they or their children might have been infected with malaria. Ex-patients were also satisfied with the microscopists because of their diligence, politeness, and non-preference for the patients.

The microscopist checked my child's blood smear. Malaria positive. The microscopist gave us medication immediately. My child's fever disappeared after taking the medicines. He continued drinking them for 1 week. His blood smear was also constantly checked for 1 month. His malaria did not recur. (45 years old, woman)

TABLE 2

Reasons for satisfaction with the work of the microscopists (quantitative study)

Variable	n (%)
Experience of the healthcare provider	37 (80.4)
Quality of the equipment	37 (80.4)
Quality of the treatment provided	33 (71.7)

First come, first served. He (microscopists) is good in serving the patients. You can easily approach the microscopist. (Mother of 6 years old boy who had malaria)

Several years have passed since the launch of the malaria control strategy in Palawan, and ex-patients have come to trust the microscopists because they have been treating many villagers, including themselves. One ex-patient said that he had never heard any ill comments about the microscopists in the village. The quality of the microscopists' ability was also strongly appreciated. Before the launch of this program, one ex-patient had to be hospitalized for malaria, but now he had received a prompt diagnosis from a microscopist and was cured immediately.

Ex-patients also evaluated the microscopists positively because of their awareness-raising activities about malaria and its prevention, equipment, distance from their homes, and strict prescription. The microscopists prescribed medications only to patients whose blood smears were positive for malaria, and prescriptions were rigorously enforced.

Microscopist is okay because the microscopist teaches us the right dosage. He scolds us if we fail to follow. (43 years old, woman)

The problem which ex-patients mentioned was that they wanted the microscopists to be on duty every day. One ex-patient sought treatment from a traditional healer as well, but he trusted the microscopist more than the healer.

He (microscopist) comes to work every Monday, Wednesday, and Friday only. For me, it is better if he comes every day. (52 years old, man)

There was a time when I usually visited the center first, but if they could not handle it, I went to the herbal doctor. But I trust the center more. Every time we go to the center for check-up, he gives medicines and the patients really get well. He (the microscopists) has already been in the village as a microscopist for a long time. He is strict but I think it is good because you will learn something from him. There was a time when he even conducted a lecture at the center on how to prevent malaria. (32 years old, woman)

Ex-patients were craving to retain microscopists in their villages. Most did not have any additional expectation from the microscopists, and they just asked them to maintain the current malaria control services for their family and village.

I hope he (the microscopists) will continue to render good services to our barangay. That's all I ask. (32 years old, woman)

Yes, we need microscopists. No one will check our blood smears if the microscopist is not here. (45 years old, woman)

DISCUSSION

Both studies revealed the high patient satisfaction with the microscopists and the importance of microscopists' high

TABLE 3
Correlation matrix (quantitative study)

Variables	1	2	3	4	5	6	7
1 Satisfaction with microscopist*	1	-	-	-	-	-	-
2 Household wealth†	-0.466‡	1	-	-	-	-	-
3 Education§	-0.212	0.330	1	-	-	-	-
4 Age	-0.88	0.133	-0.367	1	-	-	-
5 Ethnicity¶	-0.069	0.003	-0.293	0.196	1	-	-
6 Ability in malaria microscopy#	0.452‡	-0.191	-0.026	-0.158	0.043	1	-
7 Duration of work as microscopist (months)	0.312	-0.229	0.032	-0.244	0.091	0.670‡	1
Mean	4.81	1.98	2.53	38.2	2.19	0.80	90.1
SD	0.53	1.82	0.79	14.0	0.76	0.043	23.2
Skewness	-2.83	0.855	-0.244	0.762	-0.335	-0.673	-1.01

* Satisfaction with microscopists ranges from bad to very good (1–5 points, respectively).
 † This score ranges from one to eight points each for the following: electricity, radio, television, refrigerator, bicycle, bike-car, and tin or cement walls.
 ‡ 0.001 < P < 0.01.
 § Education is calculated as follows: no grade completed is “1,” elementary grade is “2,” high school is “3,” college is “4,” and higher is “5.”
 || 0.01 < P < 0.05.
 ¶ Ethnicity is calculated as follows: Tagalog is “1,” amalgamation of Tagalog is “2,” and other is “3.”
 # This was measured with questions on “preparation and documentation,” “slide preparation and observation,” “safe handling and disposal,” and “knowledge of the morphology of infected red blood cells.”

ability in malaria microscopy. The quantitative study showed that ex-patients’ satisfaction with their microscopists was independently enhanced by the high ability in malaria microscopy. This ability was increasing significantly with the increase in duration of work as microscopists. The results of the qualitative study strengthened those of the quantitative study by evaluating the ex-patients’ microscopists who could offer prompt and precise diagnoses and effective treatment in the island with limited healthcare resources. In fact, all of the ex-patients were keen on retaining microscopists in their

villages until the day when malaria is to be eliminated from Palawan Island.

Besides, our results in the quantitative study showed that specific subpopulations (those with lower household wealth, relatively old people, and ethnic minorities) were more satisfied with the microscopists’ care. Malaria control among these minorities is the key to reducing the incidence of malaria in Palawan, and it may also be true with most malaria-endemic regions in other Greater Mekong Subregion (GMS).^{19,20} About one-third of the population in GMS lives in remote areas where

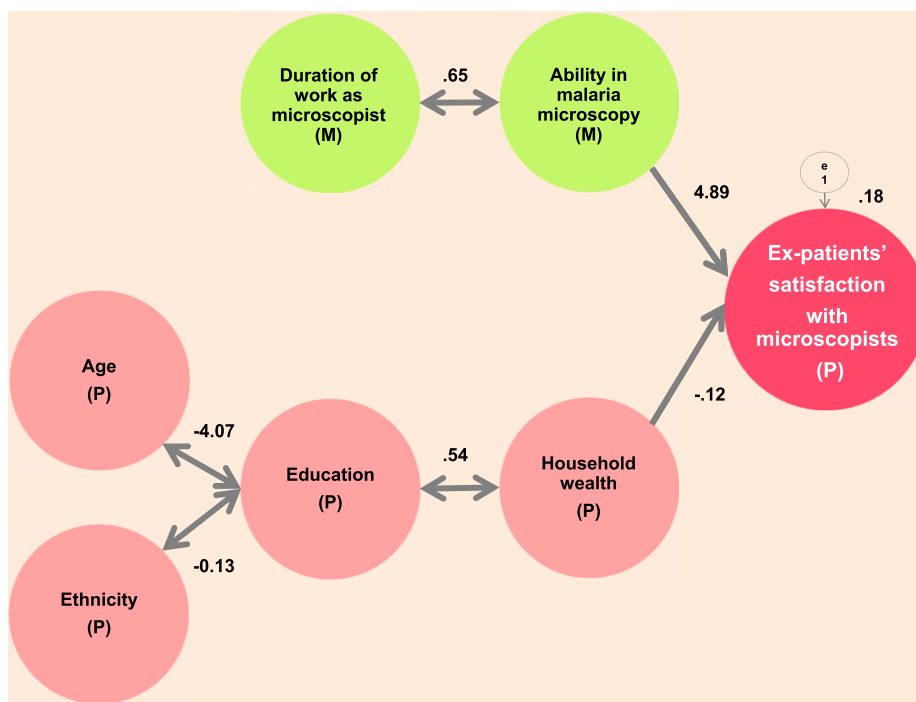


FIGURE 5. Determinants of satisfaction with microscopists among their ex-patients. N = 48, CMIN = 15, df = 10.5, CFI = 1.000, RMSEA = 0.000. All relations and correlations were significant (P < 0.05). Factors of the microscopists are marked with “(M),” and factors of the ex-patients are marked with “(P).” Household wealth scale scores range from 1–8 points as follows, with one point each for the following: electricity, radio, television, refrigerator, bicycle, motorcycle, bike-car, and tin or cement wall. Ethnicity is calculated as follows: Tagalog is “1,” amalgamation of Tagalog is “2,” and other is “3.” CFI = comparative fit index; CMIN = chi-square; df = degrees of freedom; RMSEA = root mean square error of approximation.

TABLE 4
Sociodemographic characteristics and symptoms of the ex-patients (qualitative study)

Group	Age-group (years)	Gender	Ethnicity	Malaria	Fever	Cold	Nausea	Headache	Stomachache	Shivering	Sweating	Muscle pain	Diarrhea
Children	6–10	Female	Bisaya	+	+	–	–	+	+	–	–	–	–
	6–10	Male	Ilongo	+	+	+	+	+	+	+	+	–	–
	6–10	Male	Bisaya/Tagalog	+	+	+	+	–	–	–	+	–	–
	11–15	Male	Tagalog	+	+	+	+	+	–	+	–	–	–
	11–15	Male	Tagalog	+	+	+	+	+	+	+	–	–	–
Adults	41–45	Female	Tagalog	+	–	–	–	–	+	+	+	+	–
	51–55	Female	Bisaya	+	–	–	+	–	+	+	+	+	+
	51–55	Male	Tagalog	+	+	+	–	+	+	+	+	+	–
	56–60	Male	Bisaya/Tagalog	+	+	+	–	+	+	+	+	–	+

health services are difficult to access and costs for malaria treatment are high.²⁰ The major contribution of the microscopists to malaria control in Palawan is that they could have an important role in narrowing the disparities in health care.

The only problem mentioned by the ex-patients was the microscopists' working hours, which was raised from the results of the qualitative research. In fact, one ex-patient mentioned that she had to seek the services of traditional healers if the microscopists were absent. As the therapies implemented for malaria by the microscopists were trusted more, additional strategies to strengthen daily diagnosis and treatment are required.

It is noteworthy that some adult ex-patients in the present qualitative study consulted microscopists although they did not have a fever. This is very important because adults in the areas of moderate or intense transmission conditions can develop partial immunity over years of exposure, which reduces the risk of severe symptoms.²¹ This immunity enables them to remain asymptomatic even if they are carrying some parasites. Molecular diagnosis such as sensitive PCR may be useful to detect those low-density parasite carriers, but nevertheless, the strengthened health system which builds on community health malaria control with quality microscopists right in the center is to be maintained until the day of elimination.²²

Finally, the limitation of the present study should be noted. All the participants were ex-malaria-patients who were diagnosed by microscopists as being positive for malaria; thus, we could not satisfactorily ask varied satisfaction with CHWs from those individuals who were diagnosed as being negative.

As for the sample size for the qualitative study, it was less than the targeted number of 105 which was statistically calculated to be large enough, on account of the extended geographical situation with poor infrastructure and security problems. Representativeness of them from the total ex-patients who were enrolled in this study was not secured, but the final SEM model could adequately fit the data, and the narrative interviews successfully extracted active statements.

Besides, the data sets in this study were collected from 2010 to 2011, when the API was 13.0. Since then, from 2011, the prevalence of malaria in Palawan has been decreasing owing to the dedicated efforts of the local government along with aid from the Global Fund, and consequently, the API dropped to a low of 0.47 in 2017. However, it has been noted that the malaria problem remains among specific subpopulations who are residing in remote and difficult-to-reach areas. With this important concern in the last few years, there is a need to have another look at issues on satisfaction with microscopists' care. Strategies to address such issues can then be developed and implemented to achieve malaria elimination.

CONCLUSION

The qualitative study revealed the importance to maintain and enhance microscopists' ability in malaria microscopy to ensure high patient satisfaction. In the WHO guidelines,²³ quality assurance system, supervision, work environment management, team quality improvement meetings, as well as appropriate training such as refresher courses are suggested. In addition, maintenance of their employment will also be important to ensure ex-patients' sustainable satisfaction with care. Particularly because specific subpopulations were found, in the quantitative study, to have higher satisfaction with the microscopists' care, the microscopists could play the more important roles in reaching them and narrowing the disparities in health care in Palawan. This satisfaction could nurture the solidarity which is the key factor for the community-based malaria control, one of the horizontal ways of attaining the elimination of malaria in the endemic areas or regions. The role of microscopists is found to be all the more important now in the Philippines until the day of her malaria elimination.

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