

Original article

Greater Adherence to Mass Drug Administration Against Lymphatic Filariasis through Traditional Village Forums in Fiji

Anasaini Moala-Silatolu^{1,2}, Keiko Nakamura¹, Kaoruko Seino¹ and Masashi Kizuki³

¹ International Health Section, Division of Public Health, Graduate School of Tokyo Medical and Dental University, Tokyo, Japan

² Environmental Health Unit, Fiji Centre for Communicable Disease Control, Suva, Fiji

³ Health Promotion Section, Division of Public Health, Graduate School of Tokyo Medical and Dental University, Tokyo, Japan

Abstract

Objective: The aim of this study was to elucidate the roles of knowledge related to lymphatic filariasis (LF), contributions of taking roles in community activities to eradicate LF and participation in traditional village forums in adherence to mass drug administration (MDA) in a preventive chemotherapy program targeted at the community residents.

Materials and Methods: A survey on ingestion of diethylcarbamazine (DEC) and albendazole (ALB), knowledge related to LF, taking roles in community activities and participation in traditional village forums was carried out for 400 adult subjects randomly selected from the Central Division of Fiji within three months after the MDA campaign in 2010 in the respective communities. Multilevel logistic regression analysis and multilevel linear regression analysis were performed to examine relationships between knowledge, community activities, traditional village forums and ingestion of anti-filarial drugs. The LF knowledge score was defined as a factor score of five knowledge variables.

Results: Among 324 respondents, 40.4% of them ingested both DEC and ALB. Participation in traditional village forums was independently and significantly related to ingestion of DEC and ALB (OR=1.78, 95% CI=1.04–3.05) and taking roles in community activities for MDA (OR=1.87, 95% CI=1.18–2.94), regardless of the subject's gender, education, knowledge and taking roles in community activities. Taking roles in community activities for MDA was independently related to the LF knowledge score ($\beta=0.24$, 95% CI=0.15–0.33).

Conclusion: Participation in traditional village forums in Fiji was related to taking roles in community activities for MDA and associated with adherence to MDA regimen regardless of the educational attainment of the individual residents.

Key words: adherence, lymphatic filariasis, mass drug administration, traditional village forums

(J Rural Med 2012; 7(2): 65–72)

Introduction

Lymphatic filariasis (LF) is a neglected tropical disease that causes deformity and is estimated to infect 120 million people in 81 countries globally. The estimated population in LF endemic areas is reported to be 1.34 billion¹. In Fiji, an island nation in the South Pacific with a population of 843,000, LF has been an important public health problem as in other LF endemic countries. The elimination of LF is one of the country's millennium development goals earmarked to be achieved by 2015.

Despite the introduction of a globally recommended mass drug administration (MDA) program in Fiji in 2002, the national prevalence of antigenemia of LF was still 9.5% in 2007 as compared with 16.6% in 2001; less than 1.0% is the recommended level of achievement. The effectiveness of MDA-based programs depends on understanding of the relevant perceptions and practices of the people in the relevant communities for positive behavior change to be adherent to the provided regimen of preventive chemotherapy, vector control and morbidity management.

The Global Programme to Eliminate Lymphatic Filariasis (GPELF), established in 2000, was the first and largest global program based on MDA and has the goal of eliminating LF as a public health problem worldwide by 2020². This followed a recommendation by the International Task Force for Disease Eradication indicating that it is potentially eradicable³ based on knowledge of the effectiveness of combined annual chemotherapy^{4,5}.

The GPELF recommends pursuit of mass treatment in

Correspondence to: Keiko Nakamura, Head of International Health Section, Division of Public Health, Graduate School of Tokyo Medical and Dental University, Yushima 1-5-45, Bunkyo-ku, Tokyo 113-8519, Japan E-mail: nakamura.ith@tmd.ac.jp

the settings where the prevalence of antigenemia is more than 1%⁴). Elimination of LF using MDA will require an efficient drug distribution system and high adherence by the population for an extended period of time because estimates of the lifespan of *Wuchereria bancrofti* adult filarial worms⁶).

The recommended mass treatment strategy is a single-dose, two-drug regimen of albendazole (ALB) with either diethylcarbamazine (DEC) or ivermectin to be used by communities at risk with the goal of reaching microfilaria clearance with an adherence rate of at least 70% for 4–6 years⁷). The two-drug combination of DEC and ALB has been recommended for *Wuchereria bancrofti* endemic populations in areas without *Onchocerca volvulus* like those of the Pacific region. The combined drug effect eliminates 99% of the microfilaria for one year compared with the effect of DEC alone, which eliminates 90% of microfilaria for a year⁴).

LF has been one of the most studied diseases in Fiji's history, with its first documented microfilaria prevalence rate being 27.6% in 1925⁸). The prevalence rates of microfilaria and antigenemia in the Fiji Islands before applying the new regimen of MDA were reported to be 6.8% for microfilaria prevalence tested by a microfilaria test and 15.2% for prevalence of antigenemia tested by the immunochromatographic (ICT) filariasis card test.

The country subsequently joined the MDA campaign for the Pacific in 2002 with the recommended drugs of DEC (6 mg/kg) and ALB (400 mg; GlaxoSmithKline, Brentford, UK) coadministered annually in every village and settlement to persons of 2 years of age or older, excluding pregnant women and those too weak to ingest the drugs.

Traditionally, a village in the Fiji context is a registered settlement for indigenous communities. These villages have a community structure and are led by traditional heads who run traditional village forums to carry out the affairs of the community. Through the community activities, members are able to reflect on their own experiences and review their own decisions with others. Information is shared by this openly communal and organized structure. The way of problem solving in the traditional manner, which is culturally acceptable for these indigenous communities, is sought by community members.

We postulate that village structures and roles within a community have a workable attachment to every household that can be explored for mass eradication of LF. Through traditional village forums and following community activities to promote MDA programs, members are able to participate and involve themselves as a way of increasing their awareness about the issue at hand. It also helps them in their drug ingestion choices because they directly access proper information first hand through the forums and then

provide the necessary information for participation to their households as a rational decision and not based merely on persuasion.

The objective of this study was to elucidate the roles of knowledge related to LF, contributions of taking roles in community activities to eradicate LF and participation in traditional village forums in adherence to MDA regimen.

Methods

A survey was conducted in September and October 2010 in the Rewa Subdivision of the Central Division, Fiji, the subdivision with the highest antigenemia according to the ICT test, 26.0% in 2004 and 15.4% in 2007, among the 4 divisions in the country. This study conducted a survey in 8 villages in the Rewa Subdivision out of 32 villages, which had been previously randomly selected by the Fiji Ministry of Health in 2002 as filarial prevention monitoring sites. In these villages, MDA programs had been conducted since 2002.

The subjects of our survey were adult males or females representing individual households. The population of adults in the Rewa Subdivision was 31,999 as of January 2010. By applying a sampling error of 5% and a sampling proportion of 50%, we selected 400 households as subjects for this study.

The survey was carried out in the villages from September to October 2010, within three months after implementation of the MDA campaign in the targeted villages. All participants in the survey consented to be interviewed in their own home or at common village halls. Interviews were conducted by 15 trained interviewers. Interviews were carried out at convenient times and places for the respondents.

A structured questionnaire form was developed in English, it was translated into the Fijian dialect used in the subdivision for interviewers as well as responding village residents, and then back translation was performed. The questionnaire was pretested in the same subdivision area of the study. Interviewers helped respondents to appropriately understand the meanings of questions according to the guidelines for interviewers.

The following information was collected: demographic characteristics, socioeconomic status, ingestion of DEC and ALB, knowledge related to LF, taking roles in community activities and participation in traditional village forums to discuss about MDA. Responses to questions about ingestion of DEC and ALB were reviewed to ensure consistency with the individual personal records of the MDA program filled out by health professionals. The subjects who ingested both DEC and ALB were regarded as adherent to the MDA preventive chemotherapy regimen.

We examined LF knowledge by using a principal component analysis of five variables of knowledge related to LF. The LF knowledge-related variables were symptoms of LF, causative agents of LF, prevention of LF, benefits of drugs and side effects of drugs. The score was defined as the first principal component of the five knowledge variables.

The means of LF knowledge score according to ingestion of DEC and ALB, gender, education, taking roles in community activities and participation in traditional village forums were calculated, and statistical differences were tested by the *t*-test.

The percentage of subjects who ingested DEC and ALB in the past 3 months according to demographic factors, educational attainment, knowledge related to LF, taking roles in community activities and participation in traditional village forums were calculated. Statistical differences in the percentages were tested by the chi-square test.

We performed multilevel logistic regression analysis to examine relationships between knowledge, taking roles in community activities, participation in traditional village forums and ingestion of anti-filarial drugs by accounting for the intraclass correlation of the observations within villages. To examine the association between LF knowledge score and education, taking roles in community activities and participation in traditional village forums, multilevel linear regression was applied. To examine the association between taking roles in community activities and education, LF knowledge score and participation in traditional village forums, multilevel logistic regression was applied.

Statistical analysis was carried out by using PASW Statistics 18 (SPSS Inc., Chicago, IL, USA). We used a significance level of $\alpha=0.05$.

The study protocol was endorsed and approved by the Fiji National Ethics Committee and an institutional review board of Tokyo Medical and Dental University.

Results

Among the 400 villagers approached, 324 responded, providing a response rate of 81%. Among the respondents, 131 (40.4%) had taken both DEC and ALB in the past 3 months.

Table 1 shows the percentages of subjects who ingested DEC and ALB in the past 3 months by gender, educational attainment, LF knowledge, taking roles in community activities and participation in traditional village forums. The percentage of the subjects having ingested both DEC and ALB was significantly higher among the subjects who had a proper understanding of the causative agents of LF ($p=0.03$) and side effects of the drugs ($p<0.01$) and among the subjects who attended traditional village forums ($p<0.01$).

Table 1 Percentages of subjects who ingested diethylcarbamazine (DEC) and albendazole (ALB) in the past 3 months by characteristics

	Ingestion of DEC and ALB			
	N	n	(%)	p
Gender				
Male	199	76	(38.2%)	0.30
Female	125	55	(44.0%)	
Educational attainment				
Primary	79	40	(50.6%)	0.10
Secondary	214	79	(36.9%)	
Tertiary or above	31	12	(38.7%)	
Knowledge on LF				
Symptoms of LF				
True	298	122	(40.9%)	0.53
False	26	9	(34.6%)	
Causative agents of LF				
True	263	114	(43.3%)	0.03
False	61	17	(27.9%)	
Prevention of LF				
True	285	120	(42.1%)	0.10
False	39	11	(28.2%)	
Benefits of drugs				
True	301	126	(41.9%)	0.06
False	23	5	(21.7%)	
Side effects of drugs				
True	250	112	(44.8%)	<0.01
False	74	19	(25.7%)	
Community activities for MDA				
Yes	106	49	(46.2%)	0.14
No	218	82	(37.6%)	
Traditional village forums				
Yes	199	92	(46.2%)	<0.01
No	125	39	(31.2%)	

LF, lymphatic filariasis; MDA, Mass drug administration.

Table 2 shows the factor loading of 5 knowledge variables for the first principal component obtained by principal component analysis. The LF knowledge score is a factor score of this component, and it was calculated by using these factor loadings. This first component factor accounted for 49% of the entire variances. All variables consistently showed positive factor loadings on the LF knowledge score.

The LF knowledge score was higher among villagers who ingested both DEC and ALB (mean=0.18; standard deviation=0.87) than among villagers who had taken only one or neither of the two drugs (mean=-0.12; standard deviation=1.06) ($p<0.01$).

Table 3 shows the independent relationships between the proportion of subjects who ingested DEC and ALB in the past 3 months and gender, education, the LF knowledge score, taking roles in community activities for MDA and

Table 2 Factor loading of individual knowledge variables for the first principal component

Knowledge on lymphatic filariasis (LF)	Factor loading
Symptoms of LF	0.61
Causative agents of LF	0.76
Prevention of LF	0.78
Benefits of either diethylcarbamazine or albendazole	0.68
Side effects of either diethylcarbamazine or albendazole	0.67

Percentage of the entire variance explained by the first principal component = 49.0.

Table 3 Associations between ingestion of diethylcarbamazine (DEC) and albendazole (ALB) in the past 3 months and education, knowledge, taking roles in community activities for mass drug administration (MDA) and participation in traditional village forums (n=324)

	Ingestion of DEC and ALB	
	OR	(95% CI)
Gender		
Male	Reference	
Female	1.29	(0.70, 2.39)
Educational attainment		
Primary	Reference	
Secondary	0.62	(0.38, 1.01)
Tertiary or above	0.73	(0.22, 2.36)
LF knowledge score	1.34	(0.95, 1.91)
Community activities for MDA		
Yes	1.27	(0.64, 2.54)
No	Reference	
Traditional village forums		
Yes	1.78	(1.04, 3.05)
No	Reference	

LF, lymphatic filariasis; OR, odds ratio; CI, confidence interval. Results of multilevel logistic regression analysis. Name of villages where individual subjects lived were used as a control variable.

participation in traditional village forums for MDA shown by multilevel logistic regression analysis. The odds of ingestion of both DEC and ALB were higher among the subjects who participated in traditional village forums ($p=0.04$).

Table 4 shows the LF knowledge score by gender, education, taking roles in community activities for MDA and participation in traditional village forums for MDA in the past year. The LF knowledge score was lower when the educational level was higher, and the score among the subjects who took roles in community activities for MDA in the past year was higher than for others ($p=0.03$).

Table 5 shows the independent relationships between the LF knowledge score and gender, education, taking roles in community activities for MDA and participation in village health forums for MDA in the past year shown by multi-

Table 4 LF knowledge score by education, taking roles in community activities for mass drug administration (MDA) and participation in traditional village forums (n=324)

	N	Mean	Standard deviation	p
Gender				
Male	199	-0.46	(1.03)	0.28
Female	125	0.73	(0.94)	
Educational attainment				
Primary	79	0.23	(0.76)	0.05
Secondary	214	-0.05	(1.02)	
Tertiary or above	31	-0.20	(1.30)	
Community activities for MDA				
Yes	106	0.15	(0.77)	0.03
No	218	-0.74	(1.09)	
Traditional village forums				
Yes	199	0.03	(0.93)	0.45
No	125	-0.55	(1.10)	

Table 5 Associations between LF knowledge score and education, taking roles in community activities for mass drug administration (MDA) and participation in traditional village forums (n=324)

	LF knowledge score		
	β	(95% CI)	p
Gender			
Male	Reference		
Female	0.14	(-0.14, 0.42)	0.49
Educational attainment			
Primary	Reference		
Secondary	-0.29	(-0.50, -0.08)	<0.01
Tertiary or above	-0.43	(-0.95, 0.10)	0.10
Community activities for MDA			
Yes	0.24	(0.15, 0.33)	<0.001
No	Reference		
Traditional village forums			
Yes	0.04	(-0.22, 0.29)	0.78
No	Reference		

LF, lymphatic filariasis; CI, confidence interval. Results of multilevel linear regression analysis. Name of villages where individual subjects lived were used as a control variable.

Table 6 Associations between taking roles in community activities for MDA and education, knowledge and participation in traditional village forums (n=324)

	Taking roles in community activities for MDA		
	OR	(95% CI)	p
Gender			
Male	Reference		
Female	0.68	(0.48, 0.96)	0.03
Educational attainment			
Primary	Reference		
Secondary	1.08	(0.76, 1.53)	0.68
Tertiary or above	1.72	(1.29, 2.28)	<0.01
LF knowledge score	1.33	(1.16, 1.52)	<0.01
Traditional village forums			
Yes	1.87	(1.18, 2.94)	<0.01
No	Reference		

LF, lymphatic filariasis; MDA, mass drug administration; OR, odds ratio; CI, confidence interval. Results of multilevel logistic regression analysis. Name of villages where individual subjects lived were used as a control variable.

level linear regression analysis. The LF knowledge score was significantly lower among the subjects who completed secondary school than in the subjects completed who only primary school ($p<0.01$) and was higher among the subjects who took roles in community activities for MDA than for others ($p<0.01$).

Table 6 shows the independent relationships between taking roles in community activities for MDA and gender, education, LF knowledge score and participation in traditional village forums in the past year shown by multilevel logistic regression analysis. Taking roles in community activities for MDA was significantly less likely among female than males ($p=0.03$), more likely among tertiary or above school graduates than primary school graduates ($p<0.01$), more likely among subjects with a higher LF knowledge score and more likely among those who participated in traditional village forums for MDA ($p<0.01$).

Discussion

Summary of findings

A survey to examine adherence to an annual single-dose combined chemotherapy for eradication of LF in Fiji by the community residents revealed 40.4% adherence in adult males and females to the given regimen. Participation in traditional village forums was independently and significantly related to ingestion of DEC and ALB, regardless of the subjects' gender, education, knowledge, and taking roles in community activities for MDA. Taking roles in

community activities for MDA was independently related to the LF knowledge score. Participation in traditional village forums by community members was related to adherence to the MDA program's prescribed regimen regardless of educational attainment of the individual residents. The roles of traditional village forums and residents' participation in community activities to support implementing MDA programs were elucidated.

Adherence

Regarding the 80 countries known to be endemic for LF, information about adherence to MDA regimens is only available for 11 countries: Brazil, French Polynesia, Ghana, India, Kenya, Malaysia, Nigeria, Papua New Guinea, the Philippines, Thailand and the United Republic of Tanzania⁹.

This study from Fiji showed only 40.4% adherence among adult males and females. It is short of being a satisfactory level for expected eradication of the disease, which requires an adherence rate of at least 70%. The findings add to the challenge of successfully implementing MDA programs, which need to consider the perceptions and understanding of the receiving population to ensure successful eradication of the disease and to sustain elimination of the disease.

Low adherence rates were also reported in Kerala, India, where the adherence rate observed had been (39.6%) in a cross-sectional survey of 599 persons¹⁰. The adherence rates in the year 2002 when the program was first implemented in India, ranged from 38.8% to 78.8%. Another survey in Orissa, India, in 2004, reported 46.0% in the population surveyed had consumed the drugs¹¹.

Gender

Adherence to the MDA regimen in females was slightly greater than in males. This result is understood in relation to women taking greater roles in family health in Fiji's context. In some societies, for instance in Papua New Guinea (PNG), the MDA program heavily depend on the authority of its elders which is dominated by males¹². Contrary to this study in PNG, our results were regarded as a good sign for the potential to promote understanding of LF and its prevention by engaging women in leadership roles.

Educational attainment

Individuals with the lowest educational attainment (i.e., primary school graduates) showed the highest adherence to the MDA regimen. Consistent with findings on educational attainment and adherence to other medical treatments^{13, 14}, the relationship between adherence to the MDA regimen and educational attainment of individuals was not significant in our study. Factors facilitating practices and behavior

related to receipt of treatment were considered to be more potent for adherence to the MDA regimen among the majority of subjects who completed their basic education.

Knowledge and beliefs related to LF

In this study, more people who ingested DEC and ALB tablets had good knowledge of LF. Knowledge of the symptoms of LF was not significantly associated with adherence to ingestion of the drugs. This could be better described by the concept of the “endemic normal” being unaware of their chance of being at risk of infection as earlier explained above¹².

Perception of the disease

Beliefs about disease causality and transmission were thoroughly discussed in a review by Wynd¹⁵ and confirm that little information has been formally collected about how communities incorporate LF, its origins and impact, into local knowledge systems. The role of mosquitoes in transmitting the parasitic agents of filariasis is poorly appreciated in many endemic communities; hence, there is little awareness in these areas of the importance of minimizing mosquito contact for preventing infection¹⁶.

For instance, in a Malaysian study, only nine of 108 respondents associated filariasis with mosquitoes, while walking barefoot on dirty ground and consuming contaminated foods or drinks were thought to be associated with infection¹⁷. In rural Thailand, while school children indicated correctly that mosquitoes transmit filariasis and that the disease could be prevented by personal protection against mosquito bites, adults maintained that the disease was inherited or resulted from poor blood circulation, carrying heavy loads, prolonged standing, bathing in or drinking swamp water, personal contact with infected individuals or sorcery¹⁸. These and similar stories ensued in Papua New Guinea, the United Republic of Tanzania, French Polynesia and the Philippines^{19–22} and highlight the lack of appropriate behavior in prevention and protection against the disease as a result of poor perceptions. In our study, the knowledge level was similarly poor in Fiji and identifying factors that facilitate ingestion of the MDA regimen was prioritized. Adherence by targeted endemic populations is absolutely necessary. This has been pointed earlier by Dunn²³, who indicated that the gap between biological knowledge of the disease and indigenous perception of the disease has to be explored to ensure acceptance of the MDA drugs and the program by the people in order to produce a positive behavior change in support of eradication of the disease.

MDA community activities

Through community activities, members are able to re-

flect on their own experiences and review their own decisions with others. This is the structure of information sharing that best suits a traditional community that is openly communal and organized. Problem solving in the traditional manner is culturally acceptable for these indigenous communities. The people get to organize and share information for wider participation from their common understanding and knowledge about the MDA program, the drugs and the disease.

Gyapong²⁴ found that community-directed MDA programs achieved much higher levels of coverage than those delivered exclusively through the formal health sector and were especially effective in areas where health facilities were limited. Rifkin²⁵ has argued that community involvement is more effective when viewed as an ongoing process. Improved coverage in the Ghanaian context was explained as resulting from a two-step process. First, the community was more likely to “own” the process because it was involved in directing it and, as a result, was more likely to participate and encourage participation by all community members, and it is possible that this sense of ownership may override or soften resistance to outside intervention. Secondly, the iterative approach to seeking permission, returning to train local treatment coordinators and ultimately delivering medication resulted in a higher overall level of understanding of the program’s purpose.

Traditional village forums

The majority of respondents confirmed that they were encouraged by traditional village forums to cooperate with MDA community activities in the village. Nevertheless, most respondents agreed that the venue of the traditional village forum generally gave them a great deal of information about the MDA program. This gives us a peek into how community ownership of treatment programs such as the MDA program should be reviewed.

This is the strength of this study, and it should be widely acknowledged that the traditional village forum provides an effective avenue to spread knowledge about MDA programs in local communities and can be utilized in other settings where such protocols exist and people are comfortable and familiar with it.

Sociocultural understandings of affected community groups are pivotal in achieving sustainability, local participation and ownership. Knowledge and dissemination of information in traditional village forums were better predictors of ingestion of the DEC and ALB in the community. Efforts to interrupt transmission and eliminate LF as a public health problem will certainly depend on effective mass chemotherapy campaigns and other public health strategies, including vector control where appropriate.

Fiji's context

This study is important to the people of Fiji who are at risk of contracting LF and more appropriately to other regions where the disease may still be endemic and that are going through the same political upheaval and MDA situation as Fiji²⁶). LF is a huge burden placing those infected or disabled by it in poverty and dependence because of their incapacitated condition and subjecting them to social stigma that is second only to malaria, which is the most common disease spread by mosquitoes⁹).

During Fiji's darkest hour of political disturbance, this MDA program survived the political upheaval with the support and cooperation of grassroots supporters in their various forums and organized activities, despite the turmoil. It is necessary to highlight the fact that traditional village forums and activities sustained MDA activity at the local level and were not affected by national disturbances.

Conclusion

Participation in village health forums was related to taking roles in community activities for MDA and associated with adherence to MDA regimen regardless of the educational attainment of individual residents. Greater adherence to mass drug administration was achieved through the use of village health forums in Fiji to share information about lymphatic filariasis and by individuals taking roles in community activities regardless of educational attainment.

Acknowledgments

The authors acknowledge the staff of the National PacELF Centre in Mataika House, Suva, Fiji, for their cooperation and provision of MDA information for Fiji and the staff of the Rewa Subdivision of Fiji's Ministry of Health for their support of the project and not forgetting the communities in which the study was conducted. The authors also acknowledge to Takehito Takano, Professor of the Graduate School of Public Health, Tokyo Medical and Dental University, for his oversight of this study.

References

- World Health Organization Global Programme to Eliminate Lymphatic Filariasis Lymphatic Filariasis: Progress Report 2000–2009 and Strategic Plan 2010–2020. World Health Organization, Geneva, 2010; 24–41.
- Ichimori K, Graves PM, Crump A. Lymphatic filariasis elimination in the Pacific: PacELF replicating Japanese success. *Trends Parasitol* 2007; 23: 36–40. [Medline] [CrossRef]
- Dean M. At last, the fight against lymphatic filariasis begins. *Lancet* 2000; 355: 385. [Medline] [CrossRef]
- Ottesen EA, Duke BO, Karam M, *et al.* Strategies and tools for the control/elimination of lymphatic filariasis. *Bull World Health Organ* 1997; 75: 491–503. [Medline]
- Mataika JU, Kimura E, Koroivueta J, *et al.* Efficacy of five annual single doses of diethylcarbamazine for treatment of lymphatic filariasis in Fiji. *Bull World Health Organ* 1998; 76: 575–579. [Medline]
- Vanamail P, Ramaiah KD, Pani SP, *et al.* Estimation of the fecund life span of *Wuchereria bancrofti* in an endemic area. *Trans R Soc Trop Med Hyg* 1996; 90: 119–121. [Medline] [CrossRef]
- Kyelem D, Biswas G, Bockarie MJ, *et al.* Determinants of success in national programs to eliminate lymphatic filariasis: a perspective identifying essential elements and research needs. *Am J Trop Med Hyg* 2008; 79: 480–484. [Medline]
- World Health Organization Lymphatic Filariasis. World Health Organization, Geneva, 1995; 46–89.
- Wynd S, Carron J, Selve B, *et al.* Qualitative analysis of the impact of a lymphatic filariasis elimination programme using mass drug administration on Misima Island, Papua New Guinea. *Filaria Journal* 2007; 6: 1. [Medline] [CrossRef]
- Aswathy S, Beteena K, Leelamoni K. Mass drug administration against filariasis in India: perceptions and practices in a rural community in Kerala. *Ann Trop Med Parasitol* 2009; 103: 617–624. [Medline] [CrossRef]
- Babu BV, Kar SK. Coverage, compliance and some operational issues of mass drug administration during the programme to eliminate lymphatic filariasis in Orissa, India. *Trop Med Int Health* 2004; 9: 702–709. [Medline] [CrossRef]
- Wynd S, Melrose WD, Durrheim DN, *et al.* Understanding the community impact of lymphatic filariasis: a review of the sociocultural literature. *Bull World Health Organ* 2007; 85: 493–498. [Medline] [CrossRef]
- Kalichman SC, Ramachandran B, Catz S. Adherence to combination antiretroviral therapies in HIV patients of low health literacy. *J Gen Intern Med* 1999; 14: 267–273. [Medline] [CrossRef]
- Gazmararian JA, Kripalani S, Miller MJ, *et al.* Factors associated with medication refill adherence in cardiovascular related diseases: a focus on health literacy. *J Gen Intern Med* 2006; 21: 1215–1221. [Medline] [CrossRef]
- Wynd S, Durrheim DN, Carron J, *et al.* Socio-cultural insights and lymphatic filariasis control – lessons from the Pacific. *Filaria Journal* 2007; 6: 3. [Medline] [CrossRef]
- Remme JH, De Raadt P, Godal T. The burden of tropical diseases. *Med J Aust* 1993; 158: 465–469. [Medline]
- Riji HM. Comparison of knowledge on filariasis and epidemiologic factors between infected and uninfected respondents in a Malay community. *Southeast Asian J Trop Med Public Health* 1986; 17: 457–463. [Medline]
- Rauyajin O, Kamthornwachara B, Yablo P. Socio-cultural and behavioural aspects of mosquito-borne lymphatic filariasis in Thailand: a qualitative analysis. *Soc Sci Med* 1995; 41: 1705–1713. [Medline] [CrossRef]
- Muhondwa EPY. Community involvement in filariasis con-

- trol: the Tanzania experiment. WHO, Geneva, 1983; 21-26.
20. Ahorlu CK, Dunyo SK, Simonsen PE. Scarification as a risk factor for rapid progression of filarial elephantiasis. In: Lymphatic Filariasis Research and Control in Africa. Report on a Workshop Held in Tanga, Tanzania. Danish Bilharziasis Laboratory and National Institute for Medical Research, Denmark, 1997; 46-78.
 21. Carne B. Filarial elephantiasis in French Polynesia: a study concerning the beliefs of 127 patients about the origin of their disease. *Trans R Soc Trop Med Hyg* 1979; 73: 424-426. [\[Medline\]](#) [\[CrossRef\]](#)
 22. Carne B, Laigret J. Longevity of *Wuchereria bancrofti* var. *pacifica* and mosquito infection acquired from a patient with low level parasitemia. *Am J Trop Med Hyg* 1979; 28: 53-55. [\[Medline\]](#)
 23. Dunn FL. Behavioural aspects of the control of parasitic diseases. *Bull World Health Organ* 1979; 57: 499-512. [\[Medline\]](#)
 24. Gyapong JO, Gyapong G, Owusu-Ba G. Community-directed treatment: the way forward to eliminating lymphatic filariasis as a public-health problem in Ghana. *Ann Trop Med Parasitol* 2001; 95: 77-86. [\[Medline\]](#) [\[CrossRef\]](#)
 25. Rifkin SB. Paradigms lost: toward a new understanding of community participation in health programmes. *Acta Tropica* 1996; 61: 79-92. [\[Medline\]](#) [\[CrossRef\]](#)
 26. Trnka S. *State of Suffering: Political Violence and Community Survival in Fiji*. Cornell University Press, New York, 2008; 11-23.