Diurnal sub-periodic Bancroftian filariasis in Dogura, Papua New Guinea

PETER SAPAK, BSc, MMEDSCI (QLD)*
ANDREW VALLEY, MBBS, MRCP (LON.) DTMH(LON.)**
PAMELA GIURINA, CERT. RURAL LABORATORY ASSISTANT (RLA)**
CONRAD MAIBANI, CERT. MEDICAL LABORATORY ASSISTANT (MLA)**

Abstract

Ninety two daytime blood smears were collected from eight villages in the immediate vicinity of St Barnabas Health Centre, Dogura, Milne Bay Province. Microfilaria of *Wuchereria bancrofti* were observed in 11/92 (11.9%) smears. The possibility of a focus of diurnal sub-periodicity of bancroftian filariasis in this rural location warrants further investigation. Our findings may have important implications for future filariasis control programmes in this area.

Introduction

The periodicity of lymphatic filariasis is expressed by high peak microfilaria density in the peripheral blood within specific hours of the day. In the South Pacific region the only type of human filarial infection is Bancroftian filariasis caused by *Wuchereria bancrofti*. Although the species of lymphatic filariasis in the region is the same, the periodicity is not identical throughout. The periodicity of bancroftian filariasis in the region is expressed in the form of either nocturnal, diurnal or sub-periodic diurnal[1]. In summarising the epidemiology of bancroftian filariasis (BF) in the Pacific, Iyengar[2] noted the periodicity of lymphatic filariasis was expressed as nocturnal periodic and non-periodic in the region. The nocturnal periodicity was present in New Guinea, Solomons Islands, Vanuatu, and Micronesia. Non-periodic form of BF was notable in Fiji, New Caledonia, Samoa, Tonga and Cook Islands. Studies conducted in French Polynesia[3] reported the periodicity as diurnally sub-periodic, and a similar pattern was noted in Samoa[4].

In the South Pacific region the only type of human filarial infection is Bancroftian filariasis caused by *Wuchereria bancrofti*.

In Papua New Guinea (PNG) where the only type of human filarial infection is by Bancroftian filariasis, the periodicity has long been documented and accepted as nocturnally periodic[1,5]. However, positive daytime smears for microfilaria have been reported in PNG before. In 1915 Breinl (in Iyengar[4]) showed 17.0% of daytime blood samples were positive for microfilaria (mf) in samples collected in Port Moresby. In Madang and Rabaul around the same time Fülleborn (in Iyengar[4]) reported mf rates in daytime blood samples ranged between 11% and 70%. There were no reports on daytime blood results for Milne Bay Province. A 1980 study conducted in the North Fly area of Western Province showed 6.7% of daytime blood smears were positive for microfilaria[5]. A more recent study in Madang Province in 1993 showed matutinal microfilarial periodicity in two volunteers, with peak microfilarial densities recorded at approximately 0600 hr[6].

In PNG, the *Anopheles punctulatus* group of mosquitos are the primary vector of lymphatic filariasis[7,8], with Culex and Mansonia species probably involved in some areas[8]. Consequently many authors advocate a combination of mass drug administration, use of insecticide impregnated bed nets, and vector control methods (such as the introduction of larvivarous fish, *Gambusia affinis*, which eat mosquito larvae) in filariasis eradication programmes[7,8].

BF is endemic in many rural areas of PNG, from lowland coastal regions to highland communities. Microfilaraemia rates of 20-30% have been reported in most endemic regions where screening has been by examination of night blood smears[9,10].

*Department of Community Medicine, Faculty of Medicine, University of Papua New Guinea, PO Box 5623, BOROKO, Papua New Guinea. **St. Barnabas Health Centre, PO Box 21, Dogura[,] Milne Bay Province, Papua New Guinea. Correspondence to: Mr Peter SAPAK, Department of Community Medicine, Faculty of Medicine, University of Papua New Guinea, PO Box 5623, BOROKO, Papua New Guinea.

Table 1. Daytime blood smear results by village

Village	Slides examined	% +ve	mf density range/10µL
Aboma	18	5.5	1
Pova	6	50.0	1-53
Dabudabu/Kwabunaki	23	8.7	1
Wabiga	17	17.6	1-2
Ineria/Agi/Diriuna	28	7.1	2-3
Total	**92**	**11.9**	**1-53**

Much higher microfilaraemia rates have been found using the Nucleopore technique in night surveys. A 68% microfilaraemia rate was reported in male Hagahai adults, Madang Province in 1993[6] whilst a 92% prevalence was documented at Fogomaiyu village, Southern Highlands Province in 1994[7]. The prevalence of bancroftian filariasis in Milne Bay Province is estimated between 24 and 50%[11,12].

This study was undertaken in an attempt to clarify whether diurnal sub-periodicity was present in the area around Dogura. During 1995, all twelve cases of lymphatic filariasis treated at St Barnabas Health Centre came from lowland and in land river plain areas in close proximity to the Health Centre (1-3 hours walking distance). In all cases, the diagnosis of filariasis was made on daytime blood smears with nocturnal smears unnecessary. In other patients where filariasis was suspected, both nocturnal and daytime smears were taken before the diagnosis was discarded.

Method

Eight villages (total population over 5 years: 574) within 1-3 hours walking distance were selected for the study. All persons aged more than 5 years were invited to participate. Daytime blood smears were obtained between 1100 and 1300 hrs from the participants using a systematic sampling technique. Fingers were pricked by autolets (AMES, USA), and 10µL of blood placed on a pre-cleaned glass slide. Thick films were made by one of us (PS) throughout the study to reduce variation in blood volume and smear type. Blood smears were left to dry overnight, then de-haemoglobinized in water, and stained for 40 minutes with Giemsa 4% at the laboratory in Dogura. The resident rural laboratory assistant then examined each slide and noted the serial number of slides where microfilaria were observed. The slides were then passed to staff at the Department of Community Medicine, UPNG in Port Moresby where they were independently examined. The two laboratories were unaware of each other's findings until the study was concluded.

Results

A total of 64 blood smears were examined by three observers independently in the two laboratories for *W. bancrofti* microfilaria. A further 28 slides were examined by one of us (PS) in the laboratory at Port Moresby. 7.8% of the slides (5/64) examined by three observers were positive for microfilariae (mf). The overall prevalence of mf in daytime smears was 11.9% (11/92) (see Table 1). The mf density ranged between 1 and 53 per 10µL blood.

Discussion

Subperiodic diurnal microfilarial periodicity in the Eastern Pacific has long been established[2,13]. Where positive daytime smears have been documented before in PNG[4,5], some authors have suggested a high background prevalence of filariasis as the cause, but maintained that the strain is nocturnally periodic[14]. Others have suggested that altered host sleep and activity patterns may have resulted in apparent diurnal periodicity[6]. Recently, diurnal periodicity for *W. bancrofti* in Uttar Pradesh, India has been reported[15].

Results of our study from Milne Bay and those from Madang[5] and Western Provinces[4] suggest two possible periodicities of bancroftian filariasis (BF) in PNG; nocturnal periodicity and diurnally sub-periodic. Limited information is available to ascertain the distribution of the sub-periodicity in other foci of PNG.

Observation of microfilaria (mf) in daytime smears in our study supported by results of past studies[1,2,4,5,6] suggest that diurnal sub-periodicity of BF is present in PNG. Varied sleeping pattern and activity suggested by the authors[6] of a Madang study could be a less important explanation of matutinal microfilaraemia.

More advanced methods like ELISA antigen capture technique, which cannot be used to determine the periodicity of BF, will supersede the blood smear technique. Further

assessments are warranted to establish the true pattern of periodicity, the principal vectorial capacity, and appropriate control strategies. A study to assess the impact of mass administration of diethylcarbamazine is under way in this area already.

Acknowledgements

We thank Ms Margaret Gangai of Community Medicine Department, University of PNG for her assistance in laboratory preparation. The study was supported by TDR/WHO training grants and Medical Faculty Research Committee of the University of Papua New Guinea.

References

1. Sasa M. *Human Filariasis: a Global Survey of Epidemiology and Control.* University of Tokyo Press. Tokyo.
2. Iyengar MO. *Epidemiology of filariasis in the South Pacific. Technical Paper No. 148.* South Pacific Commission, New Caledonia, 1965.
3. Cartel JL, Nguyen NL, Spiegel A, Moulia-Palat JP *et al. Wuchereria bancrofti* infection in human and mosquito populations of a Polynesian village ten years after interruption of mass chemoprophylaxis with diethylcarbamazine. *Trans Roy Soc Trop Med Hyg* 1992; 86:414-416
4. Iyengar MO. *Distribution of filariasis in the South Pacific region. Technical Paper No. 66.* South Pacific Commission, New Caledonia, 1954.
5. Taukuro B D, Antoni S, Ashford R W, *et al.* The World Health Organisation North Fly clinico-epidemiological pilot study. *PNG Med J,* 1980; 23:80-86.
6. Desowitz R S, Jenkins C, Anian G. Bancroftian filariasis in an isolated hunter-gatherer shifting horticulturist group in Papua New Guinea. *Bull WHO,* 1993; 71:55-58.
7. Prybylski D, Alto W A, Mengeap S, Odaibaiyue S. Introduction of an integrated community-based bancroftian filariasis control program into the Mt Bosavi region of the Southern Highlands of Papua New Guinea. *PNG Med J,* 1994; 37:82-89.
8. Bockarie M, Kazura J, Alexander N, Dagoro H, *et al.* Transmission dynamics of *Wuchereria bancrofti* in East Sepik Province, Papua New Guinea. *Am J Trop Med Hyg,* 1996; 54:577-581.
9. Forsyth K. New approaches to the control of filariasis using diethylcarbamazine. *PNG Med J,* 1987;30:189-191.
10. Cattani J, Taufa T, Anderson W, Lourie J. Malaria and filariasis in the OK Tedi region of the Star Mountains, Papua New Guinea. *PNG Med J,* 1983; 26:122-126.
11. Sapak PJ, Williams G. Epidemiology Study of Bednet Influence on Bancroftian Filariasis in Milne Bay Province, Papua New Guinea. *Pacific Health Dialog,* 1996; 4:35-38.
12. Hopla CE. Studies on filariasis in Papua, New Guinea. *Mosquito News,* 1946; 6:189-192.
13. Peters W, Gilles H M. *A Colour Atlas of Tropical Medicine and Parasitology.* Wolfe Medical Publications Ltd, 1989.
14. Schuurkamp GJ, Kereu R K, Bulungol P K, Kawereng A, *et al.* Diethylcarbamazine in the control of splenome galy associated with Bancroftian filariasis in the OK Tedi area of Papua New Guinea. *Trans Roy Soc Trop Med Hyg,* 1992; 86:531-536.
15. Prasad R N *et al.* Concomitant occurrence of malaria and filariasis in man in India. *Mosquito-borne Dis Bull,* 1991; 7:51-53. □

The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition.

WHO Constitution