Certifying lymphatic filariasis elimination in the Pacific – the need for new tools

Abstract: Experience from successful global elimination programmes highlights the pivotal role of functional surveillance programmes for confirming cessation of local disease transmission. Lymphatic filariasis is targeted for global elimination by 2020 with an earlier target of 2010 for the Pacific Island countries. No surveillance protocol for confirming filariasis elimination in small island countries has yet been agreed evaluated.

Currently recommended surveillance strategies for confirming lymphatic filariasis elimination are not ideal for small Pacific countries. Relying on occasional surveys to detect an increasingly rare health condition has inherent epidemiological weaknesses. Characteristics of effective surveillance for confirming filariasis elimination would include adequate sensitivity for detecting residual transmission, ongoing population scrutiny, and integration within a resource-sensitive system that includes other important conditions requiring public health surveillance. We propose that acute adenolymphangitis (ALA) may prove a suitable surveillance condition.

ALA surveillance nested within a syndromic communicable disease surveillance programme implemented universally by health facilities may provide a solution to the current conundrum facing Pacific lymphatic filariasis elimination programmes and should be carefully evaluated. (Pacific Health Dialog 2003, Vol.10 (2); Pg 149-154)

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Introduction

Smallpox eradication is considered by many to be the greatest public health achievement of the 20th century. A key prerequisite for this remarkable achievement was a functional surveillance system for targeting eradication efforts to areas of ongoing disease activity and transmission.[1] It is thus not surprising that surveillance for acute flaccid paralysis (AFP) was adopted as one of the four principal strategies for poliomyelitis eradication.

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Lymphatic filariasis remains an important cause of physical, social and economic disability, affecting approximately 120 million people in 80 countries, with 20% of the global population living at risk of infection with filarial parasites. In 1993, the International Task Force for Disease Eradication identified lymphatic filariasis as one of only six infectious diseases considered eradicable with currently available tools.[2] Evidence from China, Trinidad and Tobago, Surinam and Costa Rica suggested that disease elimination could be accomplished by chemotherapy alone. Thus the World Health Assembly adopted a resolution in 1997 to eliminate filariasis as a public health problem by 2020. The approach recommended was to first map the distribution of disease and then to administer a combination of two drugs effective against blood-circulating microfilaria to the entire "at risk" population through annual mass treatment programmes for a period long enough to interrupt disease transmission.[3,4]

Historically, the island countries of the Pacific have been severely affected by lymphatic filariasis, and in the past it was not uncommon for 40% of populations on specific islands to be infected with *Wuchereria bancrofti*. In March 1999, the Ministers of Health of the 22 Pacific Island countries, comprising 1,000 islands and 7.6 million people, recognizing the negative impact that filariasis has on development, unanimously adopted a resolution to rid their region of the disease by 2005 and achieve a formal declaration of elimination by 2010, ten years earlier than the global target. The Pacific Initiative for the Elimination of Lymphatic Filariasis (PacELF), established in June 1999, has provided remarkable leadership in this initiative, serving a management and coordinating function, acquiring and distributing drugs

and other supplies, maintaining a central epidemiological database for the region, and facilitating communication and training for the 22 Pacific countries.[5,6]

Progress has been profound, with all but two countries having completed a comprehensive baseline assessment using immunochromatographic rapid test cards. Mass drug administration (MDA) programmes were initiated in nine Pacific island countries by the end of 2001, with 11 million DEC and 1.7 million albendazole tablets distributed.[7] A number of these countries achieved high levels of MDA coverage and currently have very low levels of antigenaemia detected by convenience blood surveys. These countries are now demanding reliable surveillance strategies for confirming and maintaining elimination. However, no surveillance protocol for confirming filariasis elimination in small island countries has yet been developed or recommended, let alone evaluated.

We discuss the potential utility and advantages of routine acute adenolymphangitis surveillance for guiding programme activities and confirming lymphatic filariasis elimination in Pacific Island countries.

Current surveillance approaches in the lymphatic filariasis elimination programme

The World Health Organization (WHO) encourages endemic countries to establish surveillance to identify foci of transmission preferably within an integrated disease surveillance system.[8] However, approaches presently recommended, including hydrocoele and elephantiasis reporting by all health institutions; population surveys for hydrocoele and elephantiasis integrated into other community surveys, including leprosy, family planning, school health or active guinea worm surveys; screening of military recruits; and random testing for filarial antigenaemia using immunochromatographic card tests among blood donors, are more appropriate in countries at an early stage of elimination when chronic clinical disease or a high prevalence of microfilaraemia still exist.

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Additional surveillance activities have focused on delimiting the extent of endemic areas requiring intervention. These include risk profiles based on climatic modelling, surveys amongst key informants and health staff to determine lymphoedema and hydrocoele occurrence, and review of hydrocoelectomy cases in hospital records.[9-11]

Regular randomised cross-sectional population blood surveys are neither feasible nor cost-effective for monitoring a disease that has attained a very low prevalence. For example, to detect one positive individual at a likelihood of 0.95 in a population with a true prevalence of lymphatic filariasis of 0.01%, 2,994 people would have to be sampled.[12] The focal nature of filariasis distribution makes cluster sampling techniques inappropriate.[13] In addition immunochromatographic tests, although allowing rapid assessment of filariasis prevalence, display persistent filarial antigenaemia for an unknown period following MDA campaigns, thus minimizing their usefulness for monitoring the success of campaigns.[14] Sentinel sites are recommended during the early phases of MDA campaigns to confirm a downward trend in antigenaemia or microfilaria prevalence.

Currently the WHO recommends that when population infection levels approach elimination levels, Lot Quality Assurance Sampling (LQAS) surveys of 3,000 children in the 6-10 year age group are conducted for assessing interruption of LF transmission.[15,16] A survey of 3,000 children will allow one positive individual to be detected at a likelihood of 0.95 when the true prevalence is roughly 0.01%. LQAS surveys are rapid and cost-effective because they can be terminated immediately after detecting a single positive blood sample. It should be mentioned that it is not known whether a prevalence of 1 per 10,000 for infection with *Wuchereria bancrofti* will universally result in cessation of transmission.

A problem faced by many of the small Pacific island nations in applying the WHO LQAS strategy is insufficient total numbers of suitable subjects or insufficient numbers in a particular geographic area. Population numbers and density in Pacific island nations tend to be low even in countries with a large land area; for example, Papua New Guinea, the largest Pacific Island nation with filariasis, has a land area of 452,860 sq km (almost twice as large as the United Kingdom) and a population of 5.2 million (10 times smaller than the UK).[17] In Papua New Guinea, to access 3,000 children aged between 6-10 years poses major access problems as the population is largely rural located in small isolated hamlets, many linked only by footpaths, not roads. Some of the smaller Pacific nations such as Tuvalu do not have 3,000 children aged between 6-10 years. If all of the approximately 1,300 Tuvaluan children aged between 6-10 years were tested using the LQAS strategy, the minimum prevalence that could be confidently be detected would be roughly 25 cases per

10,000. Hence, the LQAS strategy has severe logistic difficulties in most Pacific island nations.

A key characteristic of a functional surveillance system is its ability to monitor progress on an ongoing basis to immediately detect clusters of disease and programme deficiencies that allow immediate remedial action.[18,19] The periodic nature of LQAS and other recommended survey approaches may result in neglect of relatively inaccessible populations and late detection of ongoing transmission.

Acute Flaccid Paralysis (AFP) and polio eradication

Effective AFP surveillance is a prerequisite for certifying polio eradication.[20] AFP surveillance is classified as adequate when at least 80% of reporting units report weekly on the presence or absence of AFP cases (zero reporting), cases of non-polio AFP are detected at a specified minimum rate in children under the age of 15 years, and at least 80% of AFP cases elicit an appropriate response, including special investigations to exclude polio.[21,22] Although geographical differences in the underlying aetiology of non-polio AFP results in heterogeneous AFP incidence, the fundamental value of having an active, responsive and ongoing surveillance system throughout the health system is generally accepted.

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Acute adenolymphangitis (ALA)

Episodic adenolymphangitis (ALA) is an important clinical manifestation of lymphatic filariasis.[23] Recurrent ALA contributes to disease progression and has important socio-economic implications, as the temporary incapacitation caused leads to considerable loss of productivity.[24] Bacterial and fungal super-infections appear to play an important role in triggering many ALA episodes, and this may explain some of the observed geographical variability in ALA incidence.[25] ALA rates in the few incidence studies reported have varied, with 0.31 ALA episodes reported per person-year in Papua New Guinea, 0.10 ALA episodes per person-year in India, and 0.03 episodes per person-year in Tanzania.[26-28] ALA attacks have been associated with the wet season in some endemic countries.[29]

The detailed clinical presentation of ALA was initially described in United States troops serving in filariasis endemic areas during the Second World War.[30,31] ALA attacks were described as acute episodes of local swelling and pain following initial numbness of the affected area, particularly the upper and lower extremities and occasionally the neck. Transient redness, usually in the form of broad streaks that spread in a retrograde direction, was common. Affected lymphatic vessels were often palpable and tender, but adenitis, fever, chills and malaise were more unusual. When the latter symptoms did occur they were mild and of short duration. ALA episodes generally resolved within 3-5 days, but occasionally persisted for a number of weeks.

Although attempts have been made to distinguish between acute filarial lymphangitis (AFL) most likely associated with the death of adult worms, and acute dermatolymphangioadenitis (ADLA) probably resulting from secondary bacterial infections, this distinction is not of great importance from a surveillance perspective, as either presentation should trigger a similar response.[32]

A case-definition already exists for ALA episodes. ALA is considered confirmed if the affected individual presents with localized pain, lymphadenitis and/or lymphangitis and/or cellulitis with local warmth, with or without systemic manifestations of fever, nausea and vomiting of at least 3 days duration.[33] Where the objective of surveillance is to detect every case of lymphatic filariasis-associated ALA, then episodes of shorter duration should ideally also be included.

A clinic-based surveillance system for ALA

Effective communicable disease surveillance programmes for AFP and other infectious disease syndromes requiring a public health response are operational in a number of countries. The core attributes of the effective syndromic surveillance systems operative in areas of South Africa and India are: inclusion of all health facilities; a limited list of priority surveillance conditions; trained and motivated specific surveillance agents; syndromic case-definitions; an action-orientated focus, including mechanisms for confirming diagnosis; zero-reporting to demonstrate that surveillance is ongoing; and mechanisms for providing regular feedback to the generators of the surveillance data.[34-36]

Inclusion of ALA as a target condition of a routine syndromic surveillance system in Pacific countries committed to lymphatic filariasis elimination may prove immensely valuable. Implementing a routine surveillance system in all health facilities, that includes the zero-reporting safeguard, will ensure that clusters of disease are not missed, with detection of ongoing transmission

and focusing of intensified elimination efforts. On detection of an ALA case, demographic and clinical details should be recorded and an attempt made to confirm lymphatic filariasis using a standard protocol. Demographic details should include age, sex, place of residence, place of presentation, and date of presentation. Clinical details should include nature of ALA episode, affected area, duration, any enlargement of limbs, breast, or external genitalia, history of treatment for filariasis, including participation in MDA campaigns, results of previous relevant diagnostic tests, and other clinical signs. Confirmatory laboratory tests should include microfilaria level determination in a blood sample collected at the peak of microfilarial density for the site and testing to detect antigen using immunochromatographic card test or quantification of antigen using the Og4C3 ELISA. Any suspicion of lymphatic filariasis should result in individual patient treatment and community follow-up.

From a public health programme perspective, the establishment of clinic-based ALA surveillance could serve as a catalyst for improving routine surveillance of communicable diseases of public health importance. Filariasis-infected individuals would benefit from the heightened awareness of the importance of ALA episodes amongst health staff. Earlier detection and implementation of standardised management algorithms using symptomatic anti-pyretic and anti-inflammatory therapy, simple hygienic measures and antibiotic or antifungal therapy should see more rapid recovery from acute episodes.[37]

The currently recommended surveillance strategies for confirming lymphatic filariasis elimination are not ideal for small Pacific countries.

Conclusion

Experience from successful global elimination programmes serves to highlight the pivotal role of functional surveillance programmes for confirming cessation of local disease transmission. The currently recommended surveillance strategies for confirming lymphatic filariasis elimination are not ideal for small Pacific countries. A useful surveillance system should demonstrate adequate sensitivity for detecting residual transmission while providing ongoing population scrutiny, and be integrated within a resource-sensitive system that includes other important conditions requiring public health surveillance. It is possible that ALA surveillance, nested within a syndromic communicable disease surveillance programme and implemented universally by health facilities, may provide a solution to the current conundrum facing Pacific lymphatic filariasis elimination programmes and should be carefully evaluated.

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It is possible that ALA surveillance, nested within a syndromic communicable disease surveillance programme and implemented universally by health facilities, may provide a solution to the current conundrum

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Illness is the right side of life, a more onerous citizenship. Everyone who is born holds dual citizenship, in the kingdom of the well and in the kingdom of the sick. Although we prefer to use only the good passport, sooner or later each of us is obliged, at least for a spell, to identify ourselves as citizens of the other place
Susan Sontag (1933) in Illness as Metaphor.