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Tanzania Filariasis Project

Survey methodology and clinical manifestations of Bancroftian filariasis

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Participating bodies: The East African Institute for Malaria and Other Vector-Borne Diseases, Amani, and the British Medical Research Council Helminthiasis Research Unit at Tanga. Other bodies associated and collaborating with the project since its commencement were: the World Health Organization, the Tanzania Ministry of Health, Department of Community Medicine (Medical Faculty, University of Dar es Salaam), London School of Hygiene and Tropical Medicine, and the Medical Research Centre at the Netherlands Royal Tropical Institute, Nairobi.

Summary

In a Bancroftian filariasis survey on the coast of Tanzania microfilaria rates rose with age reaching 53% in the 60–69 year group followed by a slight fall above this age. The most important clinical manifestations were hydrocoele, funiculitis and elephantiasis, with hydrocoele presenting the most serious public health problem. Hydrocoele rates increased with age reaching 90% above the age of 70. The highest proportion of large hydrocoeles were also in the older age groups. A satisfactory methodology was established for the planning of future surveys leading to control.

Key words: Tanzania; Bancroftian filariasis; microfilaria; survey; hydrocoele.

Introduction

Bancroftian filariasis surveys have verified high endemicity along the coasts of Tanzania (Jordan, 1956) and Kenya (Nelson et al., 1962) and in such

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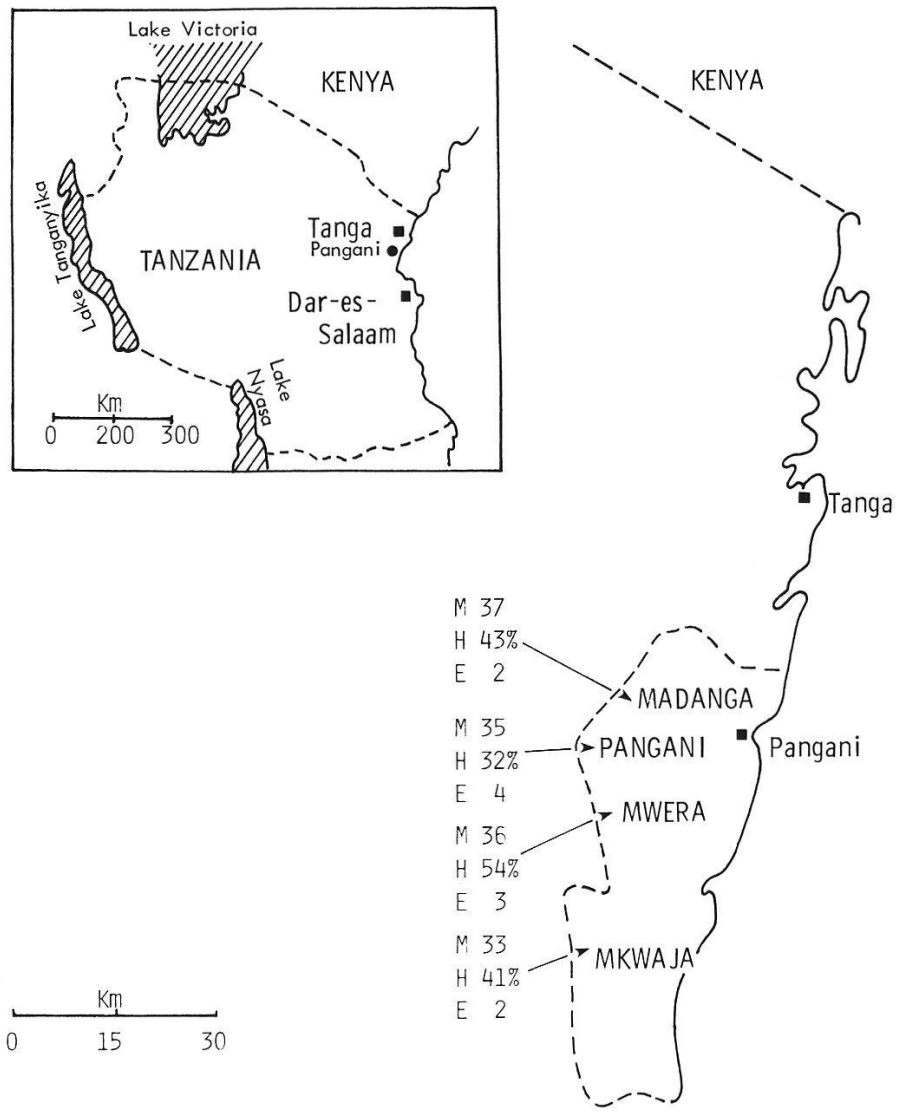

Fig. 1. The four divisions – Madanga, Pangani, Mwera and Mkwaja – surveyed in Pangani District and the microfilaria (M), hydrocoele (H), and elephantiasis (E) rates in these divisions.

surveys, microfilaria (mf) prevalence rates have varied between 10 to 40%. The importance of hydrocoeles as a probable clinical manifestation of filariasis has been noted by Hawking (1940), Jordan (1955), Nelson et al. (1962), Menu and Kilama (1974), and Wijers and McMahon (1976).

In 1973 a Bancroftian filariasis project commenced in the Tanga region of Tanzania, which was aimed at a better understanding of the dynamics and control of transmission.

The objectives of the present work were to gain information in Pangani District of Tanga Region (Fig. 1) on:

1. the prevalence of mf in the general population;
2. the importance and frequency of the various clinical manifestations of filariasis; particular significance was given to investigating hydrocoeles as a public health problem;

3. the testing of survey methodology and logistics.

The experience obtained in co-ordinating these clinico-parasitological surveys under field conditions was used to assess the degree of efficiency possible with the locally available administrative and technical services, and for the planning of future survey work.

Methods and materials

Sampling and area surveyed

Subjects from 12 randomly selected villages in 4 Divisions (Madanga, Pangani, Mwera and Mkwaja) in Pangani District (Fig. 1) were examined. Initially a 3 stage random cluster sampling method was used in which small samples of 50 subjects were examined. The stages were by selection of villages, then sections of villages and finally by Balozi[5]. This proved impractical and samples were increased to about 100 persons. In order to standardise with Wijers and Kinyanjui (1977) in Kenya those examined were males 10 years and over who (a) had been born in or came as a small baby to the village and who had never left the area except for occasional visits, or (b) claimed they had lived in the area for at least 10 years.

Because children were often absent from villages when examinations were conducted, in addition to a total of 787 males (6% of the total population in the Pangani District) examined in cluster samples, 504 pupils (males and females) aged 6–15 years from primary schools were also examined.

Parasitological

In East Africa mf of *Wuchereria bancrofti* exhibit nocturnal periodicity. Because of problems associated with collecting blood at night and in order to standardise with a filariasis project being conducted in Kenya the provocative day test was used as described by Manson-Bahr and Wijers (1974) and in detail by McMahon et al. (1979). Briefly the method consisted of collecting 0.1 ml of finger prick blood in capillary tubes containing 3% acetic acid 50 min after oral administration of diethylcarbamazine base (DEC 100 mg to persons 15 years and above and 75 mg to those 10–14 years). Mf were counted in a counting chamber under the low power of a binocular microscope.

Fuglsang and Anderson (1974) found the number of mf of *Onchocerca volvulus* increased in the urine following diethylcarbamazine therapy. We investigated whether this occurred with *W. bancrofti* following the provocative test. Urine specimens were collected approximately 1 h after the DEC had been given and 10 ml samples were centrifuged and examined for mf.

Clinical

Particular significance was placed on the *histories* of fever, lymphadenitis, lymphangitis, lymphadenopathy, chyluria and funiculitis as well as present clinical signs by means of a standardised questionnaire.

Hydrocoeles and groin glands were graded as follows:

Hydrocoeles – longitudinal axis: Grade I thickened cord or/and hydrocoele 6–8 cm, Grade II 8.1–11 cm, Grade III 11.1–15 cm, and Grade IV 15+ cm.

[5] In the political structure in villages in Tanzania, a senior person from a group of homes (called a Balozi or Ten House Chairman) is responsible for co-ordinating health and other activities of a small particular group. The Balozi was of great assistance in obtaining co-operation of the people selected for examination.

Groin glands[6] –I Not visible or diameter <3 cm
II Visible or diameter > 3 cm
III Skin fold present

The presence of elephantiasis (scrotal and limb) was recorded.

Procedure

In each village examinations were carried out in a suitable local home or administrative office. On the day prior to examination persons in the selected cluster sample were given cards which were presented at the examination. Blood samples were collected between 7.30–14.00 h.

The clinical examination was conducted by 2 medical officers (J.E.M. and D.E.A.). The importance of observer variation in clinical findings in onchocerciasis was emphasised by Hamilton et al. (1974). In the present work variation in clinical findings between the 2 clinicians was reduced by conducting duplicate clinical examination on the same subjects on randomly selected groups at intervals throughout the survey. Subjects were re-examined in the event of any discrepancy and close mutual agreement was reached by this method. At the end of the survey the rates and gradings recorded by each clinician for all lesions were compared.

The first microscopic examinations for mf were carried out at a field station in Pangani. Cross check examinations were later conducted on these specimens in the laboratories at Tanga and Amani.

Period of survey

The survey was conducted between June and August (1973). The seasonal variation over this period was not thought to be a problem since, in the case of Bancroftian filariasis, the long incubation period of *W. bancrofti* plus the longevity of mf diminish the importance of the time interval between the commencement and termination of the survey.

Results

The mf, hydrocoele and elephantiasis rates for the 4 divisions are shown in Fig. 1. As there were no marked differences in rates from different villages, in the further analysis the cluster samples have been combined.

Microfilaria prevalence

The mf prevalence rates by age for both the combined village cluster samples and schoolchildren are shown in Fig. 2. A rise of prevalence with age is evident in both groups followed by a slight fall in the oldest subjects of the cluster samples.

Fever

There was no relation between microfilaraemia and fever either in eight persons having fever at the time of examination or in 108 persons with histories of recent fever.

[6] As enlarged femoral and inguinal glands often coalesce they have been graded together as groin glands.

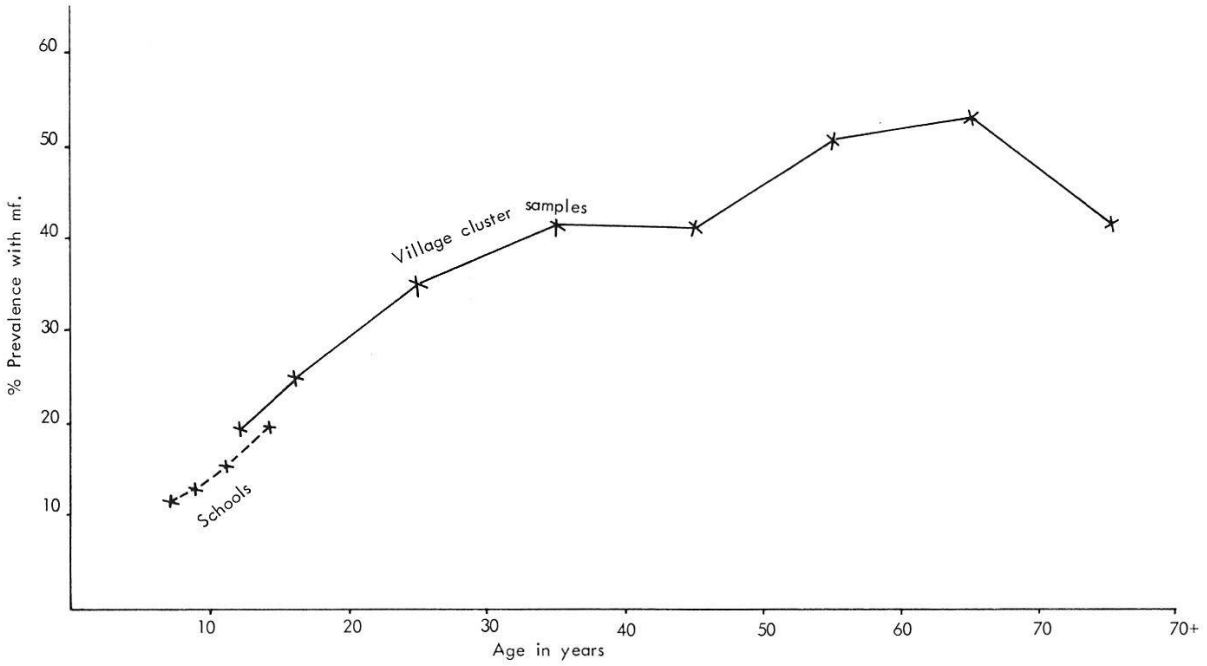

Fig. 2. Prevalence of microfilaraemia in village cluster samples and schools.

Table 1. Funiculitis grading for each age group

Age	No. examined	No. positive for funiculitis	%
10–14	74	7	9.5
15–19	75	24	36.9
20–29	160	49	30.6
30–39	146	45	30.8
40–49	102	39	38.2
50–59	89	34	38.2
60–69	106	41	38.7
70+	40	13	32.5
Totals	792	252	31.8

Lymphatic system and hydrocoele

Only 8 subjects (1%) had groin glands of Grade 3. Seven of these had a microfilaraemia.

Small glands grades 1 and 2 were found in 83% of subjects. Due to scabies, other skin infections, sores and wounds (many of the population do not wear shoes) lymphadenitis and lymphangitis were common. There were only 2 cases (0.2%) of retrograde lymphangitis. No cases of chyluria were seen.

A large proportion of postpubertal males gave a typical history of spermatic cord pain or had thickened and tender cords. The prevalence of funiculitis is shown in Table 1.

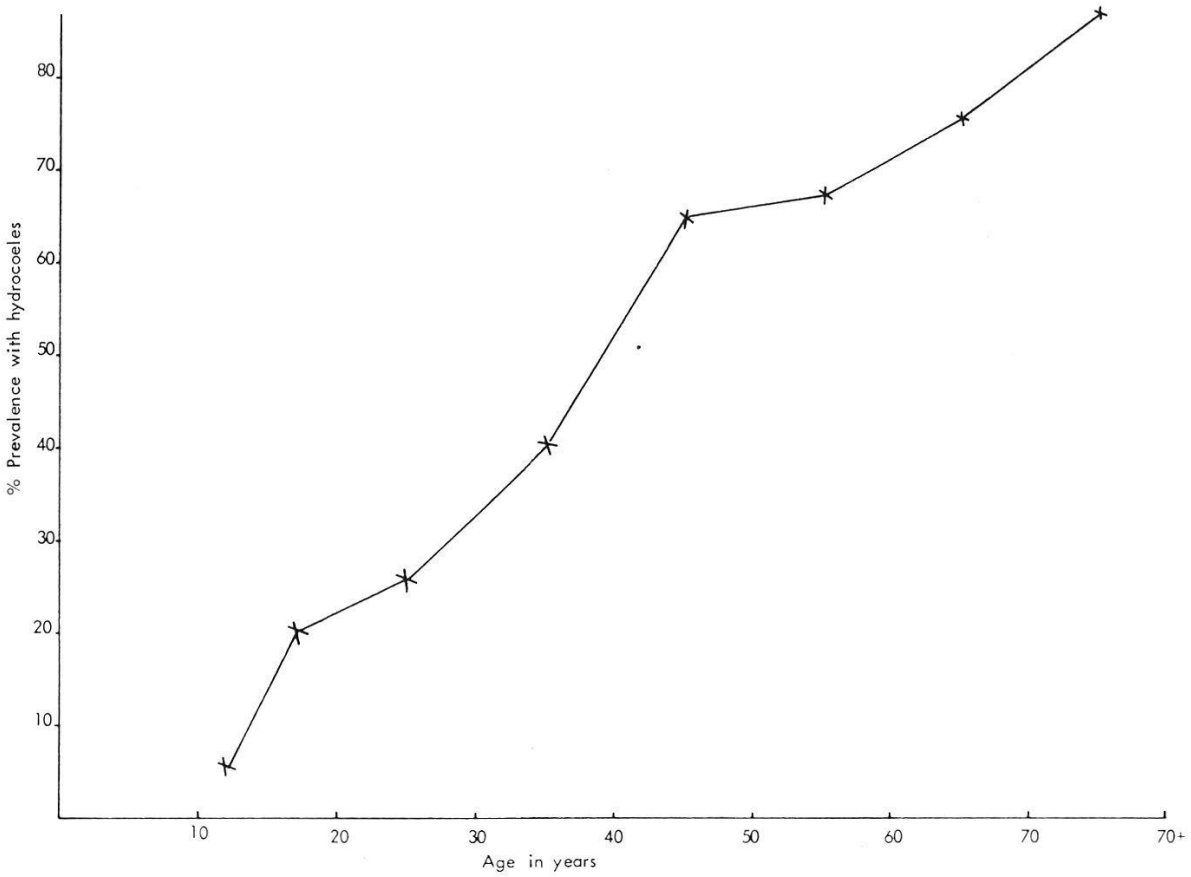

Fig. 3. Prevalence of hydrocoeles in village cluster samples.

The results shown in Fig. 3 indicate that the total hydrocoele prevalence rates increase with advancing age and Table 2 demonstrates that the proportion of larger hydrocoeles is greater in the older age groups.

Mf prevalence in persons with normal testes and those with different grades of hydrocoele are shown in Table 3. There is no significant difference between these groups.

A similar pattern is shown in 33 subjects who had been operated upon for hydrocoeles, of whom 11 (33.3%) had microfilaraemias at the time of examination.

Elephantiasis

Prevalence rates of leg and scrotal elephantiasis were low, 2.8 and 1.3%, respectively. The more severe lesions are commoner in older age groups. No elephantiasis was seen below the age of 19 years. No cases of arm elephantiasis were seen.

Microfilaruria

Only one case of microfilaruria was seen and this was in a child with hae-

Table 2. Hydrocoele grading for each age group

Age	No. examined	Normal		Grade I		Grade II		Grade III		Grade IV	
		No.	%	No.	%	No.	%	No.	%	No.	%
10–14	76	72	94.7	3	3.9	1	1.3	–	–	–	–
15–19	66	52	78.8	10	15.1	4	6.0	–	–	–	–
20–29	160	122	76.3	23	14.4	15	9.4	–	–	–	–
30–39	147	88	59.9	31	21.1	20	13.6	8	5.4	–	–
40–49	102	35	34.3	30	29.4	32	31.4	3	3.0	2	2.0
50–59	89	29	32.6	22	24.7	31	34.8	5	5.6	2	2.2
60–69	106	25	23.6	28	26.4	37	35.0	13	12.3	3	2.8
70+	41	5	12.1	10	24.4	17	41.5	6	14.6	3	7.3
Totals	787	428	54.4	157	20.0	157	20.0	35	4.4	10	1.3

Table 3. Comparison of mf rates in subjects without (0) and with hydrocoeles Grades I–IV

	0	I	II	III	IV	Total I–IV
Total	428	157	157	35	10	359
No. with mf	164	66	63	13	3	145
Mf rate	38.3%	42.0%	40.1%	37.1%	30.0%	40.2%

maturia from concomitant urinary schistosomiasis. The provocative dose of diethylcarbamazine did not induce microfilaruria.

In all clinical manifestations there was a satisfactory correlation between findings of the 2 clinicians.

Discussion

In the present work elephantiasis, funiculitis and hydrocoele were assumed to be the main clinical manifestations of Bancroftian filariasis. In comparison with the high hydrocoele rates, elephantiasis cannot be considered of major public health importance. In 1976 at Tanga hospital 15% of all major operations were for hydrocoele. Hydrocoele rates increased with age reaching nearly 90% in males over 70 years. Large hydrocoeles (Grades 3 and 4) occurred in 42 (9%) of subjects over 30 years, and resulted in 'dragging' and tiredness with a decreased ability to perform manual work. They are therefore an economic liability in a peasant community. Muhondwa (1978) noted that as well as having economic consequences hydrocoeles are considered to be a shameful condi-

tion and are socially unacceptable. Funiculitis may result in severe scrotal pain and the course of a typical attack was described by Wijers and McMahon (1976).

Fever and lymphadenopathy appeared to be of little value in this Bancroftian filariasis survey as the former is commonly due to malaria and skin infections commonly cause lymphadenopathy and lymphadenitis. Hanging groin and chyluria appear to be unimportant clinical complications of filariasis.

Important problems of methodology brought out in this survey were related to sampling, the provocative test, accurate identification of microfilariae of *W. bancrofti* and observer variation, both in clinical assessment and in the recording of mf counts.

Prior to examining cluster samples of persons living in groups of houses it is important to have accurate census figures, since bias may result due to persons with gross signs of filariasis, but not included in the cluster sample, wishing to be examined and attaching themselves to a household in the sample. Examination of the total population of villages in later surveys (McMahon, unpublished data) revealed that the age related rates for village cluster samples gave a good estimate of the mf and clinical prevalence patterns within the village.

The use of the daytime DEC provocative test was acceptable to subjects. A small number complained of pruritus of the skin. Because of the possibility of provoking Mazzotti reactions the test is contraindicated in onchocerciasis endemic areas. The test proved to be as sensitive in detecting microfilaraemia as was the examination of night blood (McMahon et al., 1979). Its use in routine surveys is therefore justified. Although mf densities by day and night were highly correlated ($r = 0.83$) they tended to be lower after provocative day time DEC than in the corresponding night blood.

The mf of *W. bancrofti* are easily identifiable in the unstained counting chamber preparations. Apart from *W. bancrofti* the only human filarial infection encountered was occasionally *Dipetalonema perstans.* In a few instances where small mf of *W. bancrofti* were difficult to differentiate from mf of *D. perstans* species identification was confirmed by making a stained film of finger-prick blood from the subject concerned.

The regular but random cross checking of slides by technicians resulted in the maintenance of high standards of reading and the clinical cross checks with mutual discussions successfully established a high observer correlation between the 2 clinicians. Because of the good correlation established in clinical grading of hydrocoeles and glands it was considered that the grading system was satisfactory for future surveys.

In conclusion, the main significance of Bancroftian filariasis in this area was shown to be the clinical manifestations of hydrocoele, funiculitis and to a lesser extent elephantiasis. A satisfactory methodology was established for research into the epidemiology of Bancroftian filariasis in this coastal area and for the planning of future surveys leading to control.

Correlations between microfilaraemia and the important clinical manifestations of Bancroftian filariasis are discussed in a further paper in this journal.

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