

## Yaws in the periurban settlements of Port Moresby, Papua New Guinea

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### SUMMARY

Yaws is a re-emerging disease in Papua New Guinea. A resurgence of yaws is documented in the periurban settlements around Port Moresby. A total of 494 cases were identified from April 2000 to September 2001. The age distribution ranged from 2 years to adult (median 9 years). Presenting symptoms were adequately recorded in 286 cases (58%). Of these, 42% presented with raised painless sores, 47% with bone/joint symptoms only and 11% with both sores and bone/joint symptoms. Children in communities with a suspected high prevalence were surveyed and examined for presence of primary yaws sores. 33 out of 227 children examined (15%) had evidence of primary yaws sores. Initial control measures have been case-finding and treatment of contacts, but in areas of known high prevalence mass treatment is planned.

### Introduction

Yaws was endemic in areas of Papua New Guinea (PNG) before 1950. Between 1953 and 1956 an average of 16,186 cases were reported annually (1). A nationwide total mass treatment campaign from 1953 to 1958 markedly reduced the incidence of yaws. Yaws became a notifiable disease in 1969 with annual reported cases remaining less than 1000 per year until 1978. The majority of these cases were during outbreaks on the New Guinea Islands (2). In 1978 the PNG Department of Health removed yaws from the national reportable disease listing and interest in yaws waned. However, following reported recrudescence on Karkar Island (Madang Province), West Sepik (2), East Sepik, Trobriand Islands (3), East New Britain, West New Britain, New Ireland and West Province of the Solomon Islands (4), yaws was re-listed as a reportable disease in 1984 (1). In 1984, 821 cases were reported (5), in 1989, 3421 cases (6). Most outbreaks have been on the New Guinea Islands or in remote rural communities. To date, no reports have been published detailing yaws outbreaks in urban or periurban areas of PNG.

Yaws is an infectious disease of the tropics caused by *Treponema pallidum* var *pertenue*.

This spirochaete is morphologically, antigenically and genetically indistinguishable from *T. pallidum* var *pallidum*, the causative agent of syphilis. However, there are differences in pathology, local immune response and clinical features (7,8).

Yaws is transmitted via skin to skin contact. The role of flies and fomites in transmission is unclear. Congenital transmission of yaws does not occur (8).

Yaws is primarily a rural disease mainly affecting children in communities with poor hygiene. It has three clinical stages. There is a 3-4 week incubation period. The primary lesion is a papule that develops into a round or oval 2-5 cm painless, pruritic papilloma leaving no scar. This lesion has also been termed framboesia tropica. It usually resolves after 3-6 months. Weeks to years later, multiple secondary papillomatous lesions may occur all over the body. Other cutaneous lesions include dermatitis, hyperkeratosis of the palms and soles, and regional lymphadenopathy. Periostitis, osteitis, dactylitis and juxta-articular inflammation may occur causing bone and joint pains – particularly at night. Chronic effusions may occur in synovium-lined cavities.

After a latent period yaws may reappear in a

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tertiary form with necrotic destruction of skin, cartilage and bones resulting in gross deformity (8).

In early lesions *T. pertenuis* may be seen on dark-field microscopy examination of the exudate from suspected lesions. Diagnosis in the field is often made on clinical grounds alone (8).

The VDRL (Venereal Disease Research Laboratories) flocculation test is a sensitive nontreponemal test. The antibody titres peak at about 10 months after initial infection. Treatment interrupts the peak levels. Antibody levels gradually decrease to normal over 9 months to 3 years (9). Reactive VDRL tests are confirmed by a treponemal-specific test such as the *T. pallidum/pertenuis* haemagglutination (TPHA) test. A negative test in a person suspected of having secondary yaws excludes the diagnosis. Sensitivity is lower in tertiary syphilis and yaws. The positive predictive value of a positive VDRL and positive TPHA is very high for yaws/syphilis (8).

*T. pertenuis* is still generally susceptible to penicillin. Benzathine penicillin is preferred as a single dose, producing a treponemocidal level for more than 3 weeks. It is stable in the tropics and available in multidose phials.

In the Western Pacific Region a decreased response to benzathine penicillin has been reported (6). Tetracycline, erythromycin and chloramphenicol would be appropriate second-line treatment (8).

## Methods

### Study population

The 9 Mile Urban Clinic serves a population of approximately 20,000 people (1998 figures) from 8 and 9 Mile settlements. The annual population growth rate is estimated to be 7.2%. However, patients also come regularly from Erima, Sogeri District and communities along the Hiritano Highway (Laloki, Sabusa, Brown River and others).

Residents' access to utilities is limited even in the established 8 and 9 Mile settlements. 32% of the dwellings do not have water

coming to their block (group of houses) and only 21% of dwellings have electricity. On average there are 6.8 people per dwelling. People from every province of PNG live in the area (10). Yaws was first observed by clinic staff in 1995. From 1995 to 1998 there was a gradual increase in cases. During 1999 case numbers increased markedly and a yaws register was started in April 2000.

### Study design

The first part of the study involved clinic-based case detection at 9 Mile Clinic. Patients presenting to the clinic with signs or symptoms of yaws had a blood sample taken for VDRL/TPHA testing. Confirmed cases, defined as a clinical case of yaws with a positive VDRL and TPHA, were then noted in the clinic register. The age, sex, clinical presentation and location of confirmed cases were recorded. The VDRL titres were also recorded. Previous studies have used a titre of 16 as positive. However, given the high positive predictive value of any VDRL titre and a positive TPHA, it was decided to use a positive TPHA in conjunction with a positive VDRL, regardless of titre. Clinical presentations were divided into the following: typical yaws sores, bone/joint symptoms suggestive of yaws alone, yaws sores and bone/joint symptoms together and 'yaws unspecified'. The patients with 'yaws unspecified' were those in whom clinical presentation was not recorded accurately. These were often symptomatic contacts of known yaws cases who were brought in for a check-up.

The second part of the study was a community prevalence survey of cutaneous yaws. This was carried out in July 2001, in sites around 9 Mile Urban Clinic with a predicted high prevalence of yaws.

There were four survey sites; Sabusa, Keto, Lareba and Laloki. The surveys were planned in advance to coincide with 'local government' day ensuring the presence of the majority of the population. The surveys were carried out at the local meeting area of each community. Consent was obtained from the local leaders and the survey explained in both Melanesian Pidgin and the local language. Children who

were old enough to walk up to the age of 16 years were examined for raised painless papules suggestive of yaws and a history taken specifically asking about the presence of bone/joint symptoms suggestive of yaws. The survey was carried out by the nursing and medical staff of 9 Mile Clinic. All participating staff had had considerable experience over the previous year in recognizing typical yaws sores.

Yaws cases identified were advised to come to the clinic for benzathine penicillin injections. Family members were also advised to come and receive treatment.

### Results

From April 2000 until the end of September 2001, 494 confirmed yaws cases were identified and registered at the 9 Mile Urban Clinic. The number of cases per month is depicted in Figure 1. The male to female ratio of the 486 confirmed cases of known sex was 1.9:1.

The ages of confirmed yaws cases ranged from 2 years old to adult (median 9 years). Of the 494 cases, 31 cases did not have the age recorded. The age distribution of the remaining 463 confirmed cases is shown in Figure 2. Many adults in this population do not know their age. These were recorded as having ages greater than 20 years old. More than 90% of all cases were between 2 and 18 years old.

The clinical presentation of confirmed yaws cases is shown in Table 1. Of the 286 cases (58%) in which there was a clear clinical presentation documented, 42% had typical raised yaws sores, 47% had bone/joint symptoms only and the remaining 11% had both sores and bone/joint symptoms.

The VDRL titres of yaws cases are shown in Table 2. In 85% of the cases the VDRL titre was 16 or above. All cases had a positive VDRL titre and a positive TPHA.

The results from the field surveys carried out are shown in Table 3. 227 children were

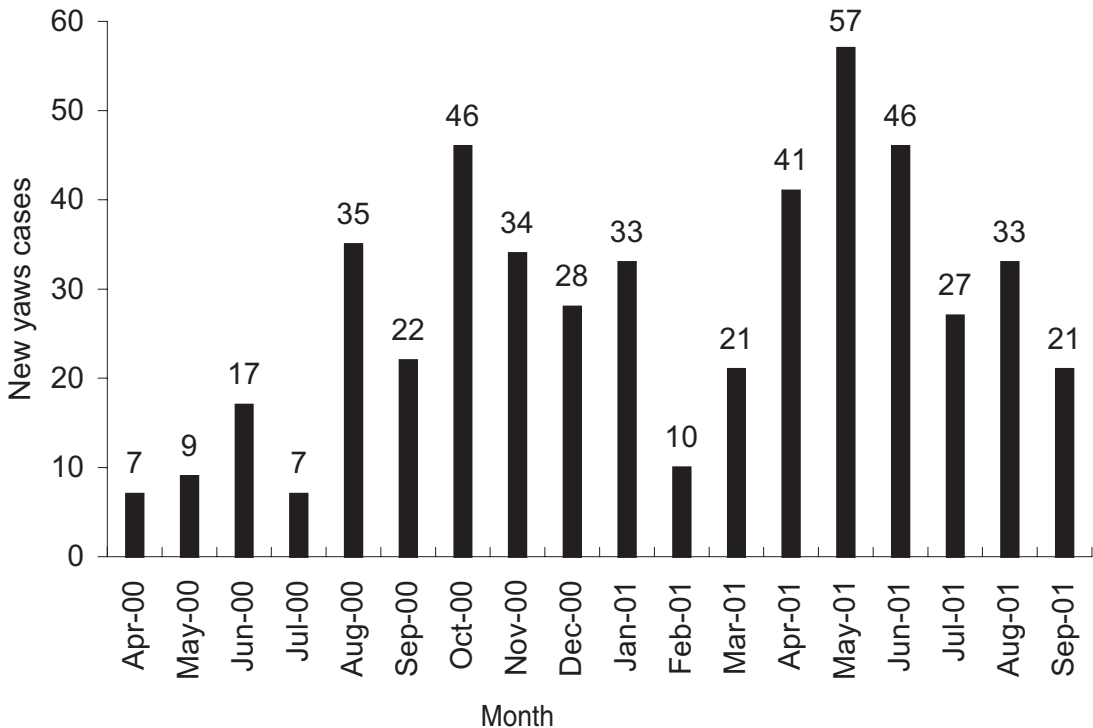


Figure 1. Number of new yaws cases by month from April 2000 to September 2001 in the periurban settlements of Port Moresby, Papua New Guinea.

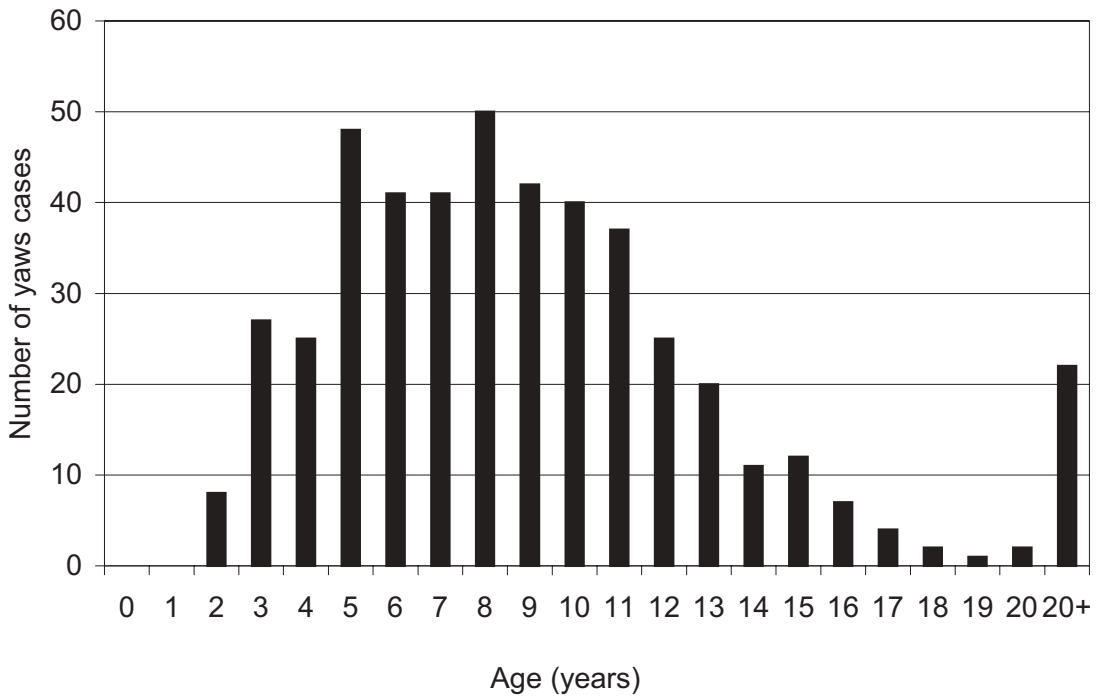


Figure 2. Age distribution of yaws cases in the periurban settlements of Port Moresby, Papua New Guinea.

examined in the four areas described. Of these, 33 (15%) had active yaws sores. 20 (9%) gave a history of bone/joint symptoms suggestive of yaws. The highest prevalence of active yaws sores was in Sabusa. 26 (23%) of the 112 children examined had evidence of a raised painless sore and 13 (12%) said they had bone/joint symptoms in response to direct questioning. In Lareba, a different location but with similar demographics and socioeconomic status to Sabusa, there were no yaws sores found in the 19 children that were examined. In Keto and Laloki the prevalence of yaws

sores amongst the children examined was 7% and 8% respectively.

**Discussion**

The results presented here demonstrate a resurgence of yaws in the periurban settlements of Port Moresby, Papua New Guinea. A case series of 494 cases is documented. This is the first published case series of yaws in a periurban area of Papua New Guinea. Yaws resurgence has been previously documented on the New Guinea Islands and in rural areas.

**TABLE 1**

CLINICAL PRESENTATION OF YAWS CASES IN THE PERIURBAN SETTLEMENTS OF PORT MORESBY, PAPUA NEW GUINEA

| Clinical presentation     | Number of yaws cases | Percentage |
|---------------------------|----------------------|------------|
| Typical raised yaws sores | 121                  | 24.5       |
| Bony symptoms only        | 134                  | 27.1       |
| Sores and bony symptoms   | 31                   | 6.3        |
| Yaws unspecified          | 208                  | 42.1       |
| <b>Total</b>              | <b>494</b>           | <b>100</b> |

**TABLE 2**

VDRL TITRES OF YAWS CASES IN THE PERIURBAN SETTLEMENTS OF PORT MORESBY, PAPUA NEW GUINEA

| VDRL titre   | Number of yaws cases | Percentage |
|--------------|----------------------|------------|
| <16          | 75                   | 15.2       |
| 16-64        | 328                  | 66.4       |
| >64          | 91                   | 18.4       |
| <b>Total</b> | 494                  | 100        |

The periurban settlements of Port Moresby in 2001 provide an ideal environment for yaws transmission. There is a young, highly mobile and rapidly increasing population, with people originating from throughout PNG. Other factors that could promote the spread of yaws include lack of access to water, the decreasing use of injectible penicillin and an immunologically naive population susceptible to yaws.

The impact of yaws on communities is hard to assess. The tertiary form of yaws can result in grossly disfiguring, destructive lesions of skin and bones. However, these tend to occur 10 to 15 years after the initial infection. We have noted that bone/joint symptoms may interfere with the education of affected children through prolonged absence from school.

Monthly and seasonal trends of yaws are

hard to interpret as the numbers may have been affected by an increasing awareness amongst the patients and their families. Clinic staff awareness and interest in the disease may also have affected the results. One may expect an increase in numbers during the dry season when access to water is limited.

The age distribution of cases is similar to that discussed in the literature. 90% were aged between 2 and 18 years old. There may well have been some overlap and diagnostic inaccuracies in the adults presenting with ‘yaws’ and syphilis as they both are diagnosed by a positive VDRL and TPHA. Clinically, the rashes of secondary syphilis and secondary yaws in adults may also be similar. However, benzathine penicillin is appropriate treatment for both.

‘Yaws unspecified’ was the most common classification of clinical presentation and reflected a number of issues. Firstly, some of these patients were symptomatic contacts of known yaws patients who had positive VDRL tests and were treated for yaws. Secondly, due to staff shortages the data entry was not always complete.

However, in those patients in whom there was a clear clinical presentation documented, 47% had bone/joint symptoms alone, and 11% had bone/joint symptoms in association with yaws sores at presentation. It has been the observation of the clinic staff that for a child from this area who presents with sore joints or bones, with no history of injury and without

**TABLE 3**

PREVALENCE SURVEY OF YAWS CASES AMONGST CHILDREN UNDER 16 YEARS OLD IN 4 PERIURBAN SETTLEMENTS OF PORT MORESBY, PAPUA NEW GUINEA

| Location     | Number with yaws sores | Number with painful joints | Total examined |
|--------------|------------------------|----------------------------|----------------|
| Sabusa       | 26 (23.2%)             | 13 (11.6%)                 | 112            |
| Lareba       | 0 (0%)                 | 0 (0%)                     | 19             |
| Keto         | 3 (6.8%)               | 3 (6.8%)                   | 44             |
| Laloki       | 4 (7.7%)               | 4 (7.7%)                   | 52             |
| <b>Total</b> | 33 (14.5%)             | 20 (8.8%)                  | 227            |

**TABLE 4**

WORLD HEALTH ORGANIZATION RECOMMENDED POLICY FOR YAWS

| <b>Percentage of population serologically positive</b> | <b>Prevalence of active yaws sores in community</b> | <b>Recommended treatment</b>  |
|--|---|---|
| >60%   | Hyperendemic: >10%                                  | Total mass treatment with benzathine penicillin   |
| 10-59%   | Mesoendemic: 5-10%                                  | Mass treatment for all juveniles <15 years old, cases and known contacts with benzathine penicillin |
| <10%   | Hypoendemic: <5%                                    | Treatment of cases and known contacts with benzathine penicillin                                    |

From Treponemal Infections (11)

signs of sepsis or rheumatic fever, the likely diagnosis is yaws. The commonly affected joints are wrists, elbows, knees and ankles. These joints are usually affected in a symmetrical pattern. The possibility exists, therefore, that an outbreak of yaws may be reported as an outbreak of oligoarthritis, arthralgias or ‘sore knees and ankles’.

The World Health Organization (WHO) Technical Reports advise that in areas of known endemicity the prevalence of cutaneous yaws can be used as a guide for community assessment and control. Seroprevalence studies using VDRL testing can also be a guide, but is more difficult in rural areas than clinical examination alone (11).

The WHO recommended policy for yaws is shown in Table 4. Each community with active yaws should be assessed annually. At least 80% of the population should be assessed each time. When <0.5% of the population has active yaws, the mass treatment phase settles and the consolidation phase begins.

The July 2001 follow-up surveys were initially an attempt to control the disease with case-finding only. They were carried out in areas thought by the clinic staff to have a high prevalence of yaws. Even within areas of relative ethnic and climatic homogeneity there are pockets of very high prevalence. The survey was not done in accordance with WHO

guidelines in that only juveniles less than 16 years old were examined. However, the presence in Sabusa of 23% of juveniles with active yaws sores and a further 12% with bone/joint symptoms is an indication that yaws is a serious problem there.

Assuming that at least 40% of the population of Sabusa is less than 16 years old and that 90% of yaws cases are in the younger age groups, the WHO recommendations would suggest that a mass treatment campaign is indicated for the children of Sabusa. This is currently being planned. Other areas within 8 and 9 Mile settlements, and the other periurban settlements of Port Moresby should be surveyed to assess the yaws burden and the requirement for mass treatment.

**Conclusions**

Yaws is a re-emerging disease in Papua New Guinea. The majority of cases occur in children. Clinicians in PNG should be aware that patients with yaws often present with bone/joint pains in the absence of sores. Yaws is once again a significant public health issue throughout PNG. It is treated easily with a single dose of penicillin and there are clear guidelines regarding community assessment and control. Thus, yaws requires resources and expertise for monitoring, assessment and control.

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