

short communication

HIGH PREVALENCE OF TUNGIASIS IN A SHANTYTOWN IN FORTALEZA,
NORTHEAST BRAZIL

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Introduction

Tungiasis is caused by the penetration of the female sand flea Tunga penetrans into the epidermis, mostly on the feet, and its subsequent hypertrophy. The sand flea originally occurred on the South American continent and the Caribbean Islands, but has been inadvertently introduced into sub-Saharan Africa in the late 19th century (Hoepli 1963). Today, it is endemic in many Latin American, Caribbean and sub-Saharan African countries (Heukelbach *et al.* 2001).

Recently, it has been suggested that tungiasis is an important ectoparasitosis associated with considerable morbidity, but that its individual and public health importance has been neglected by both: the health care providers and the scientific community (Heukelbach & Feldmeier 2001).

In fact, a clinico-microbiological study showed that lesions caused by T. penetrans are almost constantly infected with pathogenic bacteria (Feldmeier H *et al.*, manuscript submitted). Sequels seen by clinicians include lymphedema, sepsis, and loss of toenails (Chadee 1998; Mashek *et al.* 1997; Melo & Melo 1989). In addition, tetanus has been described as a life-threatening complication in areas with low vaccination coverage (Obengui 1989; Soria & Capri 1953; Tonge 1989).

As tungiasis is a health problem of people living in severe poverty, this may explain why reliable prevalence data do not exist. To fill this gap for a typical tungiasis-endemic area in northeast Brazil we conducted a cross-sectional community study.

Study Area and Study Population

The study was performed in the area Morro de Sandras of the favela Vicente Pinzón II, a typical shantytown in Fortaleza, the capital of Ceará State, northeast Brazil. The favela is close to the beach and has a total population of about 15.000 inhabitants. Morro de

Sandras is a delimited area of the favela of known high risk for parasitic diseases with about 1500 inhabitants. Unemployment and illiteracy rates are high. About 60% of the households have access to piped water. Many houses are made of improvised materials and do not have a concreted floor. Waste collection and sewage disposal are insufficient, and hygienic conditions are precarious.

All 327 households of this area were visited by one of the investigators (T.W.) in the period of four weeks in March 2001. After explaining the objectives of the study and obtaining informed oral consent, each member of the family was thoroughly examined for the presence of embedded or recently penetrated fleas.

The following findings were considered to be pathognomonic for tungiasis: an itching red-brownish spot with a diameter of one to two mm (early stage), circular lesions presenting as a white patch with a diameter of four to ten mm with a central black dot (mature stage), black crust surrounded by necrotic tissue (late stage with dead parasite), as well as lesions altered through manipulation by the patient (partly or totally removed fleas leaving a characteristic sore in the skin as well as suppurative lesions caused by the use of non-sterile perforating instruments).

In case of absent family members, the household was revisited twice. In total, 1185 out of 1467 (80.7%) household members were included in the study.

Data were entered into a database using Epi Info software package (version 6.04d) and checked for validity. Ninety-five % confidence intervals of point prevalence rates were calculated using the respective Epi Info module. Chi square test was used where appropriate.

Results and Discussion

Thirty-four percent of the inhabitants showed direct or indirect signs of tungiasis (pathognomonic lesions or lesions altered through manipulation) with a significant predominance of males ($p < 0.0001$). The highest prevalence rate was observed in the five to nine year old age group: 66% of boys and 48% of the girls were infected (table 1). The prevalence rate decreased significantly from the 10 – 14 to the 15 - 19 years age groups ($p < 0.003$).

Surprisingly, already in children less than one year old the prevalence rate was high; tungiasis was found in 15.4% (95% CI: 5.9% - 30.5%) of the infants.

Sixteen percent of the population had lesions in early or mature stage (living parasite), 15.7% lesions in late stage (dead parasite), and 25.7% lesions altered through manipulation by the patient or its caretaker. Again, females showed lower infestation rates irrespective of the stage of the lesion ($p < 0.0001$, table 2).

The data show that tungiasis is hyperendemic in the study area. So far, the only published prevalence study from Brazil is from the far South of the country where socio-economic conditions are different from the northeast. Nevertheless, in four poor communities in Rio Grande and Gravataí (Rio Grande do Sul State) prevalence rates ranged from 40% to 83% (Matias 1989). In poor communities in Nigeria and in Trinidad, prevalence rates have been observed from 21% to 42% (Ade-Serrano & Ejezie 1981; Arene 1984; Chadee 1998; Ejezie 1981; Nte & Eke 1995).

However, it remains uncertain whether morbidity was similar in the different areas studied so far. Morbidity depends mainly on the number of lesions present. Twenty-eight percent of the examined individuals had one lesion, whereas 59% had three or more lesions. The median number of lesions was 7.8 (males: 8.7, females: 6.6). Similar

information is only available from five communities in Trinidad, where the mean number of lesions has been reported to be 8.0 (8.8 in males and 6.7 in females). However, the prevalence rate in these communities was only 21% (Chadee 1998). In agreement with other studies in Africa and the Caribbean, children were predominantly affected. The preponderance of the male sex has also been noted previously (Ade-Serrano & Ejezie 1981; Arene 1984; Chadee 1994; Chadee 1998). In fact, this is not surprising, as boys more frequently play in the unpaved streets and thus have higher exposure rates (Heukelbach *et al.* 2001). Females did not only have a lower prevalence rate of vital lesions but also of manipulated ones. Thus, it can be assumed that girls and women have a lower prevalence rate, mainly because they expose themselves less and not due to different health-oriented behaviour after being infected, i.e. taking out penetrated fleas more rigorously than males.

Why tungiasis is predominantly a disease of childhood may have several reasons. Firstly, children frequently walk barefooted and therefore have much more direct contact with soil than adults. Secondly, increased keratinisation of the skin during adolescence and adulthood may impede the penetration of fleas (Ade-Serrano & Ejezie 1981; Chadee 1994). Thirdly, when becoming older, people get accustomed and trained to remove fleas without help. Finally, it cannot be excluded that acquired immunity develops with increasing age.

The fact that people older than 60 years showed increased prevalence rates can be explained by an increased difficulty to take out embedded sand fleas with increasing age.

Our data give credit to the assumption that in poor communities, at least in Northeast Brazil, tungiasis is a very frequent and important health issue predominantly affecting young children.

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Table 1: Prevalence of tungiasis in a poor neighbourhood in Fortaleza, northeast Brazil, stratified by age and sex (n=1185).

Age group	both sexes (95% CI)	males (95% CI)	females (95% CI)
0-4	40.3% (34.2-46.7)	53.4% (44.0-62.6)	28.5% (20.9-37.0)
5-9	56.5% (48.7-64.2)	66.3% (54.8-76.4)	47.7% (37.0-58.6)
10-14	44.6% (37.2-52.3)	57.1% (46.7-67.1)	29.1% (19.4-40.4)
15-19	23.0% (16.0-31.4)	30.4% (17.7-45.8)	18.8% (10.9-29.0)
20-39	16.5% (12.6-21.2)	16.9% (10.7-25.0)	16.2% (11.3-22.2)
40-59	24.3% (16.8-33.2)	29.2% (17.0-44.1)	20.9% (11.9-32.6)
>=60	38.1% (23.6-54.4)	57.1% (28.9-82.3)	28.6% (13.2-48.7)
<1	15.4% (5.9-30.5)	13.3% (1.7-40.5)	16.7%(4.7-37.4)
Total	33.6% (30.9-36.4)	43.7% (39.4-48.1)	25.6% (22.4-29.2)

Table 2: Prevalence rates of tungiasis in a poor neighbourhood in Fortaleza, northeast Brazil, stratified by sex and stage (n=1185).

	both sexes (95% CI)	males (95% CI)	females (95% CI)
Early or mature stage (living parasite)	15.5% (12.5-18.9)	22.8% (18.4-27.2)	9.6% (5.8-13.4)
Late stage (dead parasite)	15.7% (12.5-18.9)	21.8% (17.4-26.2)	10.9% (7.0-13.8)
Lesions altered through manipulation	25.7% (23.2-28.2)	34.3% (30.4-38.0)	18.8% (15.3-22.3)
any stage	33.6% (30.9-36.4)	43.7% (39.4-48.1)	25.6% (22.4-29.2)