

## Severe tungiasis in Western Tanzania: case series

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may cause severe morbidities. Further studies on risk factors and disease-related behavior of affected populations are needed to design adequate control measures.

### Introduction

Tungiasis is a common but highly neglected health problem in many of the economically depressed communities in sub-Saharan Africa, the Caribbean and South America.<sup>1-4</sup> After penetration, which takes place commonly on the feet, the female sand flea *Tunga penetrans* undergoes an impressive hypertrophy, expelling several hundred eggs during a period of about three weeks.<sup>1,5</sup> Typically, *T. penetrans* affects the periungual area of the toes, the heels and the soles. However, embedded sand fleas can be found on almost every part of the body, such as fingers, elbows, neck, buttocks and the genital region.<sup>1-4</sup> Tungiasis is associated with severe morbidities, such as local inflammations, severe itching and pain which may cause sleep disturbances, deformation and loss of nails, formation of fissures and ulcers and difficulty walking and severe itching.<sup>6,7</sup> In addition, tungiasis lesions may serve as entry points for pathogenic bacteria such as *Clostridium tetani*, the causative agent of tetanus.<sup>8</sup>

Many of the reported cases of tungiasis have been focusing on the clinical presentation of the disease in travelers who have returned from the tropical endemic countries, including Tanzania.<sup>9,10</sup> Most of these patients presented with few lesions and negligible clinical pathology.<sup>9,10</sup> This stands in contrast to reports from local populations, which are frequently suffering from severe disease.<sup>3,4,6,11</sup>

Recently, we published a case report of severe tungiasis from Tanzania, but information on the health effects of tungiasis in the indigenous communities living in endemic areas in this country are still limited.<sup>4</sup> Here we present the clinical findings, demographic and environment characteristics of five individuals identified during a cross-sectional study in Kasulu district, western Tanzania.

### Case Reports

We identified five cases of severe tungiasis during a cross-sectional study in Nyansha and Nyakitonto villages, which are located at Kasulu district in Kigoma region, western Tanzania. The two villages have a population of about 7500 inhabitants and are comprised of poor communities lacking appropriate urban services such as electricity, water supply, and

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health facilities. Most of the houses are located on relatively large compounds, and are roofed with grass materials, palm stems and do not have concrete floor. Waste and sewage disposal are insufficient and hygienic conditions are precarious.

Tungiasis infestation is highly common in the villages and is locally referred as *INZYOGO*, meaning the disease of the dirty people. Inhabitants cultivate maize, cassava, bananas, beans, groundnuts, and coffee. The area has two main rainy seasons that run from November to December and February to May, with the mean annual rainfall of 1100 mm. The annual minimum and maximum temperatures for the area are between 17°C and 31°C.

The presented cases were identified during a cross-sectional study that was carried out during the hot and dry season in August-September 2010, when the prevalence of tungiasis is known to be high.<sup>12</sup> Clinical examination was performed by inspecting carefully the legs, feet, hands and arms.<sup>13</sup> For ethical reasons and to guarantee privacy, other topo-

### Abstract

Tungiasis is caused by infestation with the sand flea (*Tunga penetrans*). This ectoparasitosis is endemic in economically depressed communities in South American and African countries. However, data on the epidemiology of tungiasis in Tanzania are very limited and the disease does not receive much attention from health care professionals. During a community cross sectional survey in northwest Tanzania, we identified five individuals extremely infested with high number of parasites. A total of 435 lesions were recorded with patients presenting with >75 lesions and showed signs of intense acute and chronic inflammation. Superinfection of the lesions characterized by pustule formation, suppuration and ulceration were common. Loss of nails and walking difficulty was also observed. In Tanzanian communities living under extreme poverty characterized by poor housing condition and inadequate health services, tungiasis

graphical regions of the body were not examined. Lesions were classified according to the *Fortaleza classification*, in which stages I to III correspond to vital sand fleas and stage IV to avital fleas.<sup>5</sup>

The study was approved by the joint Research and Publication Ethical Committee of the Weill-Bugando University, College of Health Sciences and Bugando Medical Center, Mwanza, Tanzania. Informed written consent was obtained from each participant. After the examination, all participants were assisted to extract the embedded sand fleas, washed the affected parts with disinfectant (Dettol™) and in the case of superinfection, oral antibiotics were given (500 mg Cloxacillin three times a day for five days was given for free). Other family members observed to be infested were advised to extract embedded fleas using boiled sewing needles and pins to reduce risk of transmission of diseases such as HIV/AIDS. Parents were advised to keep checking their own and their children's feet daily and to remove immediately any embedded fleas.

### Case #1

A 3-year-old girl living in a grass-roofed house with mud walls and sand floor. She slept on traditional bed type with other children and she did not use closed shoes. Garbage was disposed in the compound and the house had no toilet. The family kept chicken and goats all together in the same house and there was no water supply for the household. Her father died two years before and the mother is the only source of income; she was illiterate and did not have enough time to take care of her children.

On examination, the girl had dry and scaly skin especially in the sole and palm areas, covered with a layer of dirty. The sore was fissured. Both toes and fingers were infested with sand fleas. Mostly infected regions were the nail bed of both toes and fingers. Fingers were inflamed and ulcerated beneath the nails. Mixed vital and avital infections in the sole and toes of both feet.

She had a total of 95 *T. penetrans*-associated lesions. Of these, 60 (15 vital and 45 avital lesions) were located on the toes, soles and heels of both right and left feet. All toes were infested with sand fleas. Thirty five (38.9%) were found on ectopic sites, on fingers of both right and left hands. The lesions on hands impeded the girl from gripping. Most of the lesions were surrounded by erythema and oedema. Sleep was reported by her mother to be highly disturbed and she was reported to be crying during the night.

### Case #2

A 12-years-old primary school boy lived with his parents in a grass-roofed house, with mud brick wall and sand floor. He slept on a traditional made type of bed with other children

who were also infested with sand fleas. He reported not to wear shoes regularly. The family kept pigs and chicken within the house compound. Garbage was scattered within the compound, and the house had a pit toilet. On examination, the skin was dry and fissured. He was highly infested with sand fleas especially on the toes beneath the nails (Figure 1). Several toes were deformed and nails damaged. Erythematous, non-oedematous and non-inflamed toe skins with ulcerations were present. Watery discharges (pustules and suppurations) from the sand fleas lesion with bad smells were observed.

He had a total of 75 sand flea lesions, of which 45 (25 vital and 20 avital lesion) and 30 lesions (20 vital and 10 avital) were present on the right and left feet respectively. He reported difficult walking.

### Case #3

A 20-year-old illiterate mentally challenged woman lived with her parents in a grass-roofed house with mud bricks wall and sand (mud) floor. The informant (neighbours and parents) reported that she slept on traditional type of bed alone and she gets bath about once a month. The patient was reported to linger throughout the day from one house to another in the village. She had no shoes and always wore slippers made from used vehicle tyres. Garbage was observed to be scattered within the household compound, including the room she slept. On examination, the skin was scaly, rough and dry especially on the hands and feet. She experienced itching of most body parts, and all toes were infested with sand fleas. Toenails were deformed and some amputated, the first digits of both the feet had ulceration and inflamed. She experienced difficulty walk-

ing. There was no obvious discharge but bad smell was coming from the sand fleas lesion suggesting the presence of secondary infections. She had a total of 165 sand flea lesions on both right and left feet. Out of these, 90 (35 vital and 55 avital lesion) lesion and 75 (35 vital and 40 avital) lesions were present on the right and left feet respectively.

### Case #4

A 9-year-old school boy living with his family (polygamy family) in an iron sheet roofed house made up with mud bricks and sand (mud) floor. Children in the family were poorly taken care by parents. He put on slippers all the day and occasionally closed shoes and washed his body once a week. He reported to sleep on a traditional type of bed. In the compound where he lives, there is no proper garbage disposal system and garbage is scattered throughout the compound. On examination, the skin was dirty and very rough, dry and fissured especially on the sole and palms.



Figure 1. Typical tungiasis lesion located beneath the nails in a 12 years primary school boy in Kasulu district, Tanzania.

Table 1. Distributions of lesions according to topographic sites.

Topographical sites	Number of lesion	Vital lesion (stage I-III)	Avital lesion (stage IV-V)	Percentage of all lesions (n=435)
Feet-toes, soles and heels	400	190	210	91.95
Hands-fingers	35	30	5	8.1
Total	435	220	215	435

Table 2. Clinical findings in five patients with severe tungiasis.

Clinical pathology	Present in patients (%)
Acute inflammation	5/5 (100)
Chronic inflammation-oedema, desquamation and deformation of fingers	5/5 (100)
Ulcerations	4/5 (80)
Superinfection-Suppuration and pustules	2/5 (40)
Severe itching	5/5 (100)
Loss of nails and deformed nails + eggs attached to the nails	2/5 (40)
Difficult walking	2/5 (40)
Difficult gripping	1/5 (20)

Ulcerations were present on all the toes of both feet. Non-oedematous and non erythematous infected areas of the toes. White eggs on the surface of both infested toes signifying the presence of active infections was observed. No significant indicators of bacterial superinfection were observed. He had a total of 45 sand fleas lesion; 25 of these lesions were located on the toes, 10 on the soles of the feet and 10 on the heels. Of the total lesions, 20 were vital and 25 avital lesions.

### Case #5

A 90-year-old male, illiterate and traditional healer lived alone in a small house made of mud walls, grasses roofed with sand (mud) floor. He slept on the traditionally made carpet (*Mlago*), which was placed on the sand (mud) floor. The room was dirty and dusty and contains traditional materials necessary for his work. He had eye problems with reduced vision. There was no proper garbage disposal system and no water supply for the household. On examination, the skin was rough and scaly, very dry and looks dirty throughout exposed part of the body. The toes of both feet were infested and some toenails were deformed and other had already fallen off. Neither obvious inflammation nor oedema was present. Presence of fissures was obvious and he experience difficulty walking. Neither ulcerations nor discharge were observed, though there were obvious small white patches (eggs) on the infested toes, which signified the presence of active *T. penetrans* infestation. He had a total of 55 lesions, all located on right and left feet. Of the total lesions, 20 were located on the toes, 13 on the soles of the feet and 22 on the heels. No signs of bacterial superinfection were observed.

A total of 435 tungiasis lesions were recorded in five patients with a minimum number of 45 lesions and a maximum of 165 lesions. Of the 435 lesions, 400 (92%) occurred on the feet (Table 1). All patients had lesions on the toes and soles of the feet but the most affected part was the periungual region of the toe. Lesions on the hands were observed in only one patient. Clinical findings are presented on Table 2. Acute and chronic inflammation was common to all patients.

### Comment

Tungiasis continues to be an endemic Public health concern in countries hardest hit by poverty. However, data on the epidemiology such as disease burden, transmission dynam-

ics and risk factors of the disease in endemic African countries, including Tanzania, are still limited;<sup>3,4</sup> this makes planning for control program against tungiasis difficult. To continue raising awareness of the disease to public health professionals and other health stakeholders, here we present five cases of severe tungiasis with heavy infestation from Western Tanzania. Previously, only one endemic case of tungiasis from an indigenous Tanzanian patient with heavy infestation has been reported in the country.<sup>4</sup>

We observed patients living in underdeveloped and poor villages in rural Tanzania with up to 165 tungiasis lesions, in contrast to reports from travellers who rarely present with more than one lesion.<sup>9,10</sup> The types of lesions and environments where the patients lived were similar to observation from other previous studies from Brazil, Cameroon and Nigeria.<sup>3,11,14</sup> In our study, all patients were living in areas previously described to be high risk areas for tungiasis.<sup>15</sup>

*T. penetrans* has a predilection to particular sites of the body and most of the tungiasis associated lesion will be seen to these body parts. All of our patients had lesions in the toes, soles and heels. Two of the patients in our study presented with difficult walking and one with lesion on hand presented with gripping difficulties. These observations in our patients have also been reported from other endemic countries.<sup>3,11,13</sup> These types of lesions in primary schoolchildren may result into school absenteeism and in adult individuals they may be forced to suspend their economic activities e.g. agriculture or trades. Penetrations of the female sand flea into the skin of the host induce inflammatory response due to release of metabolically active substances (proteolytic enzymes) and continuous enlargement of the parasites. This results into severe itching, erythema, oedema, suppuration, pustules and pain. The lesion formed may be the portal of entry for pathogenic bacteria.<sup>8</sup> We observed two patients presented with bacterial superinfection indicated by the presence of pustules and suppuration.

In conclusion, we have shown that tungiasis is common in individuals living in a resource-poor communities in Tanzania. The disease may cause severe infestations and deformation in endemic communities. Tungiasis needs to be considered as a Public health concern in Tanzanian's endemic communities. Further studies on risk factors and disease-related behavior of affected populations are needed to design adequate control measures.

### References

1. Heukelbach J. Tungiasis. *Revista do Instituto de Medicina Tropical de São Paulo* 2005;47:307-13.
2. Heukelbach J, Oliveira FA, Hesse G, Feldmeier H. Tungiasis: a neglected health problem of poor communities. *Trop Med Int Health* 2001;6:267-72.
3. Ugbomoiko US, Ofoezie IE, Heukelbach J. Tungiasis: high prevalence, parasite load, and morbidity in a rural community in Lagos State, Nigeria. *Int J Dermatol* 2007; 46:475-81.
4. Mazigo HD, Bahemana E, Zinga M, Heukelbach J. Tungiasis infestation in Tanzania. *J Infect Dev Ctries* 2010; 4:187-9.
5. Eisele M, Heukelbach J, van Marck E, et al. Investigations on the biology, epidemiology, pathology and control of Tunga penetrans in Brazil: I. Natural history of tungiasis in man. *Parasitol Res* 2003;90:87-99.
6. Chadee DD. Tungiasis among five communities in southwestern Trinidad, West Indies. *Ann Trop Med Parasitol* 1998;92: 107-13.
7. Feldmeier H, Heukelbach J, Eisele M, et al. Bacterial superinfection in human tungiasis. *Trop Med Int Health* 2002;7:559-64.
8. Greco JB, Sacramento E, Tavares-Neto J. Chronic ulcers and myiasis as ports of entry for Clostridium tetani. *Braz J Infect Dis* 2001;5:319-23.
9. Veraldi S, Valsecchi M. Imported tungiasis: a reported of 19 cases and review of the literature. *Int J Dermatol* 2007;46:1061-6.
10. Swaminathan A, Gosbell IB, Zwar NA, Douglas MW. Tungiasis in recently arrived African refugees. *Med J Aust* 2005;183:51.
11. Feldmeier H, Eisele M, Sabóia-Moura RC, Heukelbach J. Severe tungiasis in underprivileged communities: case series from Brazil. *Emerg Infect Dis* 2003;9: 949-55.
12. Heukelbach J, Wilcke T, Harms G, Feldmeier H. Seasonal variation of tungiasis in an endemic community. *Am J Trop Med Hyg* 2005;72:145-9.
13. Heukelbach J, Wilcke T, Eisele M, Feldmeier H. Ectopic localization of tungiasis. *Am J Trop Med Hyg* 2002;67:214-6.
14. Collins G, McLeod T, Isaac Konfor N, et al. Tungiasis: A Neglected Health Problem in Rural Cameroon. *Int J Collab Res Intern Med Public Health* 2009;1:2-10.
15. Ugbomoiko US, Ariza L, Ofoezie IE, Heukelbach J. Risk factors for tungiasis in Nigeria: identification of targets for effective intervention. *PLoS Negl Trop Dis* 2007;1:e87.