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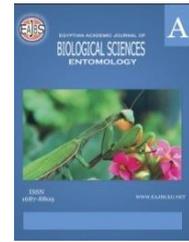
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Case Report: Severe Infestation with Tungiasis in a Coastal Community in Badagry Lagos, Nigeria.

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ABSTRACT

Tungiasis is an ectoparasitic infection caused by the invasion of the skin of a man, dog, pig, or bird with gravid female *Tunga* species. Prevalence may reach up to 50% in impoverished areas of South America, the Caribbean and Sub-Saharan Africa. Very severe cases characterized by more than 30 embedded sand fleas may be found but are not common. Few studies have been done in Nigeria, and in endemic communities of Lagos, a prevalence as high as 45.2% has been reported. We hereby report a severe case of Tungiasis in Ilaje, an endemic community in the Badagry Local Government area of Lagos during an active surveillance conducted between August 2021 to May 2022 involving Eighteen (18) communities. This case is a 54-year-old male farmer who presented with pain, inflammation, ulceration, and deformation of digits, heels and soles of his limbs. He reported a burning sensation, and pruritus and was observed to have difficulties in walking which was evidenced by a noticeable totter. Embedded fleas in clusters numbering between 30 to 60 per limb were extracted by manual removal and the wounds were treated topically. Tungiasis morbidity often leads to poor health and impoverishment. Although tungiasis is rare in nonendemic areas, however, with the increased travel and opening up of Badagry as a seaport and tourist site, this ectoparasite may further be disseminated if still neglected. It is therefore imperative to investigate the occurrence, create awareness and implementation of preventive measures among local inhabitants. Physicians should be familiarized with this infestation for easy diagnosis and treatment.

INTRODUCTION

Tungiasis is a neglected cutaneous parasitic infection caused by invasion of the skin with gravid female *Tunga* species which are sand fleas belonging to the Family Tungidae in Class Insecta. Depending on the endemic zones where this infestation is common, it is known by various names such as jigger, chigoe, bicho, nigua, and pico. This hematophagous flea, representing the smallest known flea (1 mm), is very common in tropical and subtropical

regions of the globe (Santos *et al.*, 2017), especially in impoverished areas of South America, the Caribbean and Sub-Saharan Africa. *Tunga* species usually penetrates the skin of homeothermic hosts such as a man, dog, pig, and bird (Tapia *et al.*, 2011).

The prevalence in endemic areas may reach up to 50% with cases being observed predominately among children, the elderly and tourists. The infestation cycle of the flea lasts for about a month and consists of an on-host and off-host phase (Nsanzimana *et al.*, 2019). The female sand flea produces eggs after copulation and swells in size as the eggs develop thereby causing stress to the surrounding skin tissues (Hyuga *et al.*, 2022). The appearance of the external site of the afflicted skin is characterized by a white papule or nodule with a central black dot at the onset of infection (Abarzua *et al.*, 2014). Eggs are released through the exposed wound site into the environment where they are found lodging in dry, sandy soils, to develop into larvae, pupae and adult flea (Feldmeier *et al.*, 2014). In endemic settings, re-infection is common and parasite load gradually accumulates over time (Miller *et al.*, 2019).

Several environmental, demographic, and behavioral factors have been associated with disease incidence. These include age groups, low socioeconomic status, lack of access to social amenities, illiteracy, low hygiene and poor health behaviors (Hyuga *et al.*, 2022). *Tunga* species have been documented to thrive on dry sandy warm soil of deserts, beaches and close to farms, especially in rural areas. Seasonal fluctuations have been implicated in influencing the infestation rate with higher jigger prevalence recorded during the dry season (Heukelbach *et al.*, 2005; Otubanjo *et al.*, 2016).

The intensity of tungiasis is often classified as light (1–5 lesions), moderate (6–30 lesions), or severe (>30 lesions) (Elson *et al.*, 2019), with light infection being commonly encountered. However, very severe cases of tungiasis with heavy infestation characterized by more than 30 embedded female sand fleas may be found but are not common. Being an ancient skin infection, there are very few systematic epidemiological studies on its distribution or impact in economically deprived populations in Nigeria. The causes of underreporting possibly include the habit of the removal of the embedded insect by individuals themselves, the social stigmatization associated with being infected, inaccessibility to the remote endemic areas and the lack of interest among healthcare providers, and the scientific community (Maco *et al.*, 2013).

Tungiasis has been reported in approximately 70 nations, higher range of this infection has been found in Nigeria, Brazil, and Trinidad and Tobago (Deka, 2020). Few studies, majorly cross-sectional, have been done in Nigeria, and in endemic communities of Lagos State, a prevalence as high as 45.2% has been reported (Ade-Serrano and Ejezie, 1981; Otubanjo *et al.*, 2016; Ugbomoiko *et al.*, 2007; Ugbomoiko *et al.*, 2016). The distribution is limited to poor resource-deficient rural communities.

We hereby report a severe case of Tungiasis in an endemic community in the Badagry Local Government area of Lagos during an active surveillance exercise.

MATERIALS AND METHODS

Study Area and Population:

The study was carried out in Ijaje, a tungiasis-prone, remote, rural coastal community of Badagry Local Government Area (LGA) in Lagos State, located between latitude 6.39554 and longitude 2.89169.

Badagry is one of the local government areas in Lagos state with a population of 241,093 based on the 2006 census results. Badagry consists of three Local Council Development Areas (LCDAs) namely, Olorunda, Badagry Central and Badagry West. The major occupation of the populace is fishing and farming while a few are office workers in

Badagry township areas. The predominant ethnic groups of the inhabitants are Yoruba and Egun.

Ilaje community has close to 200 inhabitants with the sole occupation of the men being fishing, while women traded the fish. It is a poor community lacking social amenities such as electricity, water supply and health facilities. Most of the houses are located in large compounds and are roofed with grass materials, with the majority not having a concrete floor. The community was observed to be very sandy and this makes the community inaccessible by vehicles. The village can be accessed by taking long treks through the sandy bushy paths after taking a 5 minutes boat ride from the port located in Badagry town. Animals such as dogs, chickens and cats were sited roaming freely around the houses in the community. Children and adults seen in the community do not wear shoes while they are at home or when playing or walking in the community.

Ethics Consideration:

The study was approved by the Ethical committee of Nigeria Institute of Medical Research (NIMR), Lagos with IRB approval number IRB/21/053. Approval for the study was also sought from Badagry Local Government Area Public Health Board. The traditional community leader (Baale) and elders of Ilaje also approved the study. The objective of the study was explained to the community inhabitant and both oral and written consents were obtained for the administration of questionnaires and clinical examination. It was emphasized that participation in the study was voluntary and participants are free to withdraw from the study at any time without further obligations.

RESULTS

Case Report:

This case was encountered during a longitudinal survey conducted between August 2021 to May 2022 involving Eighteen (18) Badagry communities and the case was identified /seen during the survey in Ilaje community. This case is a 54-year-old male farmer. A questionnaire was used to document his demographic and socioeconomic status. He lived in an isolated part of the community with his wife and child in a grass-roofed hut with a sandy floor. The house was surrounded by bushes (Fig. 1). He looked unkempt and had dirty feet.

When interviewed using the questionnaire, the man reportedly often walks barefooted and sometimes wore open slippers around the community. At clinical examination, he presented with pain, inflammation, ulceration, and deformation of the digits of his limbs including the heels and soles (Fig. 2). He reported a burning sensation, and pruritus and was observed to have difficulties in walking which was evidenced by a noticeable totter when he walked. Nodular lesions were observed, with blackened central elevation, in large numbers, around his heel and sole of both limbs. The subungual and interdigital areas were heavily infested pointing to the habit of walking bare-footed. To protect his privacy and obtain his cooperation, other regions of the body were not examined.



Fig. 1: The hut of a heavily infected man.



Fig. 2: Left foot during excision of embedded fleas

Embedded fleas in clusters numbering between 30 to 60 per limb were extracted by manual removal with sharp sticks and a surgical blade by one of the locals after cleaning the leg with disinfectant (Fig.3). The specimen was placed in a 95% ethanol solution (Fig. 4). Immediately after the examination, the man's wound was treated topically.



Fig. 3: Right foot showing heavily infested toes



Fig. 4: Extracted *Tunga* fleas in sample bottle numbering about 30 excised from one foot.

When asked for reasons for the heavy infestation and scarring of the feet (Fig. 5), the man reported the inability to completely remove the fleas due to a large number of embedded parasites, secondly, inability to get local assistance due to stigmatization and thirdly the few inexperienced removals of the fleas left the massive, ulcerated region on the skin which has an attendant significant risk of superinfection.



Fig. 5: Deformed infected leg

He however reported that his wife removes embedded fleas from their child who also frequently gets infected. Removal of an embedded flea is believed to destroy the flea before it lays eggs and also breaks the life cycle (Mwangi *et al.*, 2015). Complications are believed to occur when patients manipulate their own lesions leading to superinfection. It was quite shocking to discover such a severe case of advanced level of infestation and the event will remain memorable to the majority of the team of investigators who had never seen such a sight of heavy infestation of tungiasis in their lifetime.

DISCUSSION

We documented a case of heavy infestation with tungiasis in Ilaje, a rural fishing community in Badagry LGA in Lagos state. Few studies have been done in Nigeria, and in endemic communities of Lagos State, a prevalence as high as 45.2% has been reported (Ade-Serrano and Ejezie, 1981; Otubanjo *et al.*, 2016; Ugbomoiko *et al.*, 2007; Ugbomoiko *et al.*, 2016). Tungiasis morbidity often leads to poor health and impoverishment due to various disabilities which include pain and itching, lack of sleep, and difficulty in walking and grasping (Mwai *et al.*, 2018).

Human infection with this gravid flea is linked to sociocultural factors strongly associated with poverty such as sharing houses and resting spaces with animals, walking barefooted, low personal hygiene and generally poor living and working conditions. It was also observed that no health care center was located in the surveyed community and tungiasis was considered to be an endemic infection and well-known to the locality by the indigene. Furthermore, the knowledge, attitude and practice among the villagers, and particularly this infested individual revealed a very poor health seeking behavior. The need for education and awareness cannot be overemphasized.

Ugbomoiko *et al.*, (2016) presume that the absenteeism rate in severely infested schoolchildren would be more a result of itching, pains and insomnia which are associated with the infection. They also conclude that concentration in class and the learning ability of such children will be reduced which would result in low grades and illiteracy. On the other hand, heavily infested adults aside from being ostracized are inhibited from running their day-to-day activities (Ugbomoiko *et al.*, 2008).

Infestation is more concentrated on the legs of affected individuals and on areas of the body placed on the soil close to their breeding and resting sites because the *Tunga* flea is a poor jumper.

Conclusion/Significance:

Tungiasis is a highly neglected skin ectoparasite with few but very severe cases occurring in settings where the afflicted lack health care and are poverty-stricken. It has a large impact on human society in endemic areas, but it has not gained adequate attention. Currently, tungiasis is not classified as an NTD but meets all the criteria to be classified as one, since it typically occurs in populations living in poverty, with poor housing conditions, inadequate sanitation and in close contact with domestic animals causing significant morbidity (Nyangacha *et al.*, 2019; Wright, 2017).

Locals in endemic areas, commonly affected by the disease are able to diagnose tungiasis with a higher degree of certainty than health professionals (Ariza *et al.*, 2010). The Ilaje rural inhabitants recognize tungiasis and the lesions are managed locally by extraction of the flea once it is noticed. It was also observed that the locals prefer to extract the fleas by using sharp sticks cut out from plant materials used in building their huts and rejected the disposable hypodermic needles offered to them. There were myths associated with tungiasis infection in Ilaje community. It is popularly believed that female fleas prefer certain types of blood and that such individuals will become heavily infested when compared to others in

the community. The majority of them also believed that constant infection has spiritual implications.

Generally, within 24 hours of the penetration of flea, the site gets irritated, and within 2-3 days it gets painful (Mørkve, 2013). The infected individuals rarely visit health centers, and although the community had no health center the infection was not considered serious enough to warrant hospital visitation. If not treated, very severe cases may continually contribute to the continued existence and spread of the infection and may likely end in fatal disease. Although tungiasis is rare in nonendemic areas but with the increased foreign travel and opening up of Badagry as a seaport and tourist site, this ectoparasite may further be disseminated to new geographical areas if it is still neglected. It is therefore imperative to investigate the occurrence, create increased awareness and consider the implementation of preventive measures for tungiasis among local inhabitants of this community. Also, physicians should be familiarized with this epidermal ectoparasitic infestation for easy, early diagnosis and treatment.

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