

Clinical and Epidemiological Profile of Mycetoma Foot: Observations from Eastern India

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Background and Study Aim:

Mycetoma, also known as Madura foot, is a chronic, progressive, granulomatous infection that affects the skin, subcutaneous tissue, and bone. It is typically caused by fungal or bacterial pathogens and is characterized by the formation of nodules, sinuses, and draining abscesses. Treatment of mycetoma often involves a combination of antifungal or antibacterial medications, surgical debridement of affected tissues, and long-term follow-up to prevent recurrence. The present study explored the cases of mycetoma foot in a tertiary care set-up in eastern India.

Patients and Methods: The study included diagnosed cases of mycetoma foot which were treated in the facility. Epidemiological data and detailed clinical data were noted in all cases. The discharging materials: purulent exudates with grains (granules) were sent for

staining and culture to the microbiology department and microbiological data were noted. All patients were commenced on treatment as per the standard protocol.

Results: Our study noted 10 cases of mycetoma. The mean age of presentation was 38.4 years with male preponderance. Most of the cases affected right foot. On microbiological examination, gram-positive narrow filamentous branching bacilli were seen. Surgical debridement was necessitated in all cases except one, and bone debridement was needed in three cases.

Conclusion: Delayed diagnosis or inadequate treatment can lead to severe deformities, disabilities, and even limb loss. Mycetoma foot requires multidisciplinary management involving dermatologists, infectious disease specialists, orthopaedic surgeons, and microbiologists for optimal outcomes.

INTRODUCTION

Mycetoma is a chronic granulomatous infection that affects the skin, subcutaneous tissue, and bones. It is a disease in tropical and subtropical countries [1]. The earliest documentation of the disease dates back to the ancient Indian Sanskrit text of Atharva Veda mentioning it as padavalmikam: “anthill foot.” Gill first recognized mycetoma as an entity in 1842 in the south of Madura, since then the term “Madura foot” has become prevalent. The first mycetoma case was reported from Madras, India by Godfrey. “Mycetoma” (meaning fungal tumour) name was given by

Carter and thereafter, this name is used for this disease entity [2]. Mycetoma may be caused by true fungi (eumycetoma) or by the filamentous bacteria (actinomycetoma). It is clinically characterized by a classical triad of tumefaction, draining sinuses and discharging colonial grains [3]. Actinomycotic mycetoma is caused by aerobic species of actinomycetes which belong to genera *Nocardia*, *Streptomyces*, and *Actinomadura* with *Nocardia brasiliensis*, *Actinomyces duramaduriae*, *Actinomadura pelletieri* and *Streptomyces somaliensis* being most common. Eumycotic mycetoma is caused by varied fungi, most

commonly *Madurellamyces*. Clinically, different colours of grains are produced which varies according to the species [4].

Almost all cases present initially as small, painless, subcutaneous nodules at the site of injury which ulcerates later to produce a viscous, purulent, or serosanguinous fluid discharge containing characteristic granules. The granules made of colonies of the etiological organism, constitute the hallmark of mycetoma and vary in size, colour, and consistency depending on the causative species. With time, papules, pustules and nodules appear which break down to form draining sinuses developing on the skin surface. The overlying skin is usually smooth and shiny, and fixed to the underlying tissue. Hyper-pigmented skin may be present, with signs of both old healed, and active sinuses. The disease gradually progresses to involve the surrounding tissues which get swollen, indurated, and deformed by fibrous tissue reaction and multiple sinus formation. The condition is usually painless but can be painful in the event of bone involvement or secondary bacterial infection. Nerves and tendons are rarely affected [1].

Mycetoma is a localized disease usually but can spread slowly by direct contiguity along the fascial planes, invading the subcutaneous tissue, fat, ligaments, muscles, and bones. Gross swelling with deformity of the affected part occurs [1]. If left untreated, the disease progresses, and bacterial superinfection occurs which results in increased morbidity due to local abscess formation, cellulitis, and bacterial osteomyelitis. In advanced cases, deformities or ankylosis may occur [1]. Diagnosis of mycetoma is based on the presence of the classic triad. Diagnosis of the etiological organism can be made by microscopic observation of grain only. Histopathology and culture are usually not necessary for diagnosis [1].

The exact burden of the disease is not very clear due to sparse data. However, a review reported Mauritania and Sudan as countries with the highest prevalence with prevalence of the disease being 3.49 and 1.81 cases per 100,000 inhabitants respectively. The prevalence of mycetoma cases in India was reported as <0.01 per 100,000 [5].

In India, most of the cases documented are from Rajasthan and South India. While actinomycetoma is reported more from South India, Rajasthan, and Chandigarh, eumycetoma

is reported mainly from Northern India and central Rajasthan [6]. There is scanty literature regarding mycetoma foot from Eastern India. The present study explored the cases of mycetoma foot in a tertiary care set-up in eastern India.

PATIENTS/MATERIALS AND METHODS

A prospective, observational, single-centre study was carried out over 3 years in the department of tropical medicine of a tertiary care hospital. The study included diagnosed cases of mycetoma foot which were treated in the facility. Those not consenting to be part of the study were excluded.

Epidemiological data and detailed clinical data were noted in all cases. The discharging materials: purulent exudates with grains (granules) were sent for staining and culture to the microbiology department and microbiological data were noted. All patients were commenced on treatment as per the standard protocol (detailed in the results).

Data was statistically analysed. Descriptive statistics were represented as mean, standard deviation, frequency, and percentages. All statistical tests were conducted on standard statistical software like GraphPad Prism (GraphPad Prism 8.0.2, San Diego, CA, USA) and Microsoft Excel.

Statistical analysis

Data was statistically analysed. Descriptive statistics were represented as mean, standard deviation, frequency, and percentages. All statistical tests were conducted on standard statistical software like GraphPad Prism (GraphPad Prism 8.0.2, San Diego, CA, USA) and Microsoft Excel.

RESULTS

Our study noted 10 cases of mycetoma. The mean age presentation was 38.4 years, ranging from 28 years to 51 years. Out of 10 cases, there were 2 females, hinting at male preponderance. The majority of the cases were employed in agricultural occupations. Duration is grossly varied from 6 to 11 months, with the mean being 8.35 months. 6 cases affected the right foot and the rest the left one. Each case had a firm, non-tender swelling with sinus and discharging grains of yellow colour and yellowish white colour (Table 1).

The initial lesion started as a single nodule over the dorsum of the foot, followed by multiple nodules that appeared within the next few months (2 to 3). Nodules first burst to develop sinuses with the intermittent discharge of yellow-coloured granules and pain development in the foot leading to walking difficulty and grossly swollen feet (Figure 1).

On microbiological examination, gram-positive narrow filamentous branching bacilli were seen.

Surgical debridement was necessitated in all cases except one, and bone debridement was needed in three cases. Parenteral Amikacin (15 mg/kg/day divided into 2 daily doses) was given during the first 3 weeks along with oral trimethoprim+ sulfamethoxazole (TMP-SMX) (2 DS tablets twice daily), followed by oral trimethoprim+ sulfamethoxazole (TMP-SMX) (2 DS tablets twice daily) for a total of 6 to 12 months depending on response (Table 1).



Figure 1. Figure (a, b, c, d) showing mycetoma foot- multiple discharging sinuses and ulcerations.

Table 1. Characteristics of the Cases Observed

Case No	Gender	Age (years)	Occupation	Duration (months)	Cutaneous lesions	Location of lesions	Bone erosion	Treatment
1	Male	42	Agricultural	10	Firm, non-tender nodules with discharging sinuses	Right foot	No	Parenteral Amikacin - first 3 weeks along with oral trimethoprim+sulfamethoxazole Followed by oral trimethoprim+sulfamethoxazole (TMP-SMX) (2 DS tablets twice daily)
2	Female	51	Homemaker	12		Right foot	Yes	
3	Male	44	Agricultural	7		Leftfoot	Yes	
4	Female	39	Agricultural	9		Right foot	No	
5	Male	41	Agricultural	8		Right foot	Yes	
6	Male	33	Agricultural	6		Right foot	No	
7	Male	43	Agricultural	7		Left foot	Yes	
8	Male	29	Agricultural	9		Left foot	No	
9	Male	28	Agricultural	11		Left foot	No	
10	Male	34	Mason	10		Rightfoot	No	

DISCUSSION

Mycetoma foot is a neglected tropical disease affecting people of lower socio-economic status in tropical and subtropical countries [7]. The tropical and subtropical countries from where the maximum cases are reported constitute the “mycetoma belt”, which includes India along with countries like Sudan, Somalia, Yemen, Senegal, Mexico, and Venezuela [8]. As the patients are mostly from poor and rural communities, the disease presents to clinicians at an already advanced stage owing to a lack of access to healthcare facilities, thus delaying diagnosis and treatment. Due to this factor, the World Health Organization (WHO) has classified mycetoma as a “neglected tropical disease” [7]. Worldwide, actinomycetoma contributes to 60% of total cases of mycetoma [9]. 75% of mycetomas are actinomycotic in India [10]. In India, *Nocardia* species and *Madurella grisea* constitute the most common causes of mycetoma [11]. In our study, all cases were actinomycetoma.

Mycetoma is reported to affect males more than females (3:1), probably attributed to men being

more commonly involved in agricultural work. [12]. It also noted similar findings in our study with male preponderance.

Mycetoma is reported to be present mainly in the age group of 20 to 50 years [13]. This finding corroborates with our study, where we found the average age presentation as 38.4 years, ranging from 28 years to 51 years.

As reported in the literature, the foot is the most commonly affected site with the dorsum of the left foot predominating over the right foot [14]. However, in our study, we noted 6 cases affecting the right foot and 4 of the left foot.

Microbiological diagnosis of mycetoma foot by isolation of etiological organisms is challenging and often not possible. So, in endemic regions, diagnosis is mainly clinical relying on the presence of the classical triad. Microbiological diagnosis involves a battery of tests from simple direct microscopic examination of discharging grains to culture isolation of organisms to sophisticated molecular tests [15]. In our study, a classical triad of swelling, draining sinuses, and discharging grains was present in all cases. So, the diagnosis was done clinically in our study.

On direct microscopic examination, grains were seen, and gram-positive narrow filamentous branching bacilli were seen, but we could not isolate any micro-organism in any case. Direct microscopic examination serves to be a simple, rapid test in resource-limited settings. It has poor specificity and low accuracy as discharging grains from open sinuses are usually non-viable and contaminated [16].

Radiology also serves an important role not only in diagnosis but for the assessment of bone invasion, size, site, and extent of the disease which is very important from the surgical point of view. Simple X-rays are very cost-effective and can be used to identify bone erosions. CT and MRI are other tests. The dot in the circle sign is a diagnostic feature of mycetoma foot, seen on USG or MRI. It is characterised by discrete small round hyperintensity circles with central hypointense dots [15]. In our study, 4 cases had bone erosions demonstrated on X-ray feet.

The current treatment recommendation for mycetoma foot includes a combination therapy of cotrimoxazole and aminoglycoside. Welsh regimen and Ramman regimen are the commonly followed regimens of treatment with slight modifications as per the clinical scenario [14, 15]. In the Welsh regimen, cotrimoxazole is given with an injection of amikacin in one to four five-week cycles. Ramman regimen advocates the use of gentamicin and cotrimoxazole for four weeks (intensive phase) followed by cotrimoxazole and doxycycline for 5 to 6 months (maintenance phase). Other drugs that may be added include rifampicin, dapsone, and streptomycin [18]. In our study, we followed a modified Welsh regimen for treatment.

All cases were followed up to 1 year. Although there was resolution of the lesions and stoppage of the discharge with therapy, the cases with bone erosion had permanent deformity.

CONCLUSION

This report of mycetoma cases from Eastern India may be the tip of the iceberg. Delayed diagnosis or inadequate treatment can lead to severe deformities, disabilities, and even limb loss. Mycetoma foot requires multidisciplinary management involving dermatologists, infectious disease specialists, orthopaedic surgeons, and microbiologists for optimal outcomes. The prognosis depends on various factors including

the extent of the disease, the causative organism, and the timely initiation of appropriate therapy. Early diagnosis and prompt initiation of therapy are essential to prevent complications and improve prognosis. More detailed studies are needed to explore this disease entity.

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Ethical consideration: according to Indian authorities and compliant to Helsinki rules.

HIGHLIGHTS

- Mycetoma is characterized by nodules, abscesses, and sinuses.
- Delayed diagnosis or inadequate treatment can lead to severe deformities, disabilities, and even limb loss.
- Mycetoma foot requires multidisciplinary management involving dermatologists, infectious disease specialists, orthopaedic surgeons, and microbiologists for optimal outcomes.

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