World Health Organization

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Mycetoma

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Key facts

- **Mycetoma is a chronic, progressively destructive infectious disease of the subcutaneous tissues that spreads to affect the skin, deep tissues and bone.**
- **Mycetoma can be caused by different species of bacteria or fungi.**
- **Mycetoma occurs in tropical and subtropical environments characterized by short rainy seasons and prolonged dry seasons that favour the growth of thorny bushes.**
- **Global burden is unknown, but the disease is endemic in Africa, Asia, Europe and Latin America.**
- **Mycetoma has numerous adverse medical, health and socioeconomic consequences for patients, communities and health services in affected areas.**
- **People living in or travelling to endemic areas should be advised not to walk barefoot, as footwear and clothing in general can protect against puncture wounds.**

Mycetoma is a chronic disease usually of the foot but any part of the body can be affected. Infection is most probably acquired by traumatic inoculation of fungi or bacteria into the subcutaneous tissue. So far more than 70 different bacteria and fungi have been indicated as causative agents.

The disease commonly affects young adults, mostly males aged between 15 and 30 years in developing countries. People of low socioeconomic status and manual workers such as agriculturalists, labourers and herdsmen are the most commonly affected.

Mycetoma has numerous adverse medical, health and socioeconomic impacts on patients, communities and health authorities. Accurate data on its incidence and prevalence are not available. However, early detection and treatment are important to reduce morbidity and improve treatment outcomes.

Mycetoma was first reported in the mid-19th century in Madurai, India, and hence was initially called Madura foot.

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Distribution

The causative organisms of mycetoma are distributed worldwide but are endemic in tropical and subtropical areas in the so called 'Mycetoma belt', which includes among others, the Bolivarian Republic of Venezuela, Chad, Ethiopia, India, Mauritania, Mexico, Senegal, Somalia, Sudan, Thailand, and Yemen. The number of cases reported differs per country, however at the moment most cases have been reported from Mexico and Sudan.

Transmission

Transmission, most probably occurs when the causative organism enters the body through minor trauma or a penetrating injury, commonly thorn pricks. There is a clear association between mycetoma and individuals who walk barefooted and are manual workers.

Clinical characteristics

Mycetoma is characterized by a combination of painless subcutaneous mass, multiple sinuses and discharge containing grains. Within the grain, the causative agent is found. It usually spreads to involve the skin, deep structures and bone, resulting in destruction, deformity and loss of function, which may be fatal. Mycetoma commonly involves the extremities, back and gluteal region but any other part of the body can be affected. Given its slow progression, painless nature, lack of awareness, and scarcity of medical and health facilities in endemic areas, many patients present late with an advanced infection where amputation may be the only available treatment. Secondary bacterial infection is common, and that may cause increased pain, disability and fatal septicaemia (severe infections involving the entire human system), if untreated. Infection is not transmitted from human to human.

Diagnosis

The diagnosis of mycetoma is based on clinical presentation and identification of the causative organisms which can be detected by directly examining the grains that are discharged by the sinuses. The samples can be obtained by Fine Needle Aspiration (FNA) or surgical biopsy. Although grains microscopy is helpful in detecting the causative organism, it is important to further identify these by culture but even then misclassification occurs. Identification by Polymerase chain reaction (PCR) is the most reliable method but has high cost and lacks standardized techniques. There is no point-of-care rapid diagnostic test that can be used in the field. Imaging techniques including X-rays, ultrasound, magnetic resonance and computer tomography can be used to assess the extent of lesions and planning the clinical management.

Treatment

The treatment depends on the causative organism. For bacterial mycetoma, treatment consists of a combination of antibiotics whereas for fungal mycetoma treatment consists of a combination of antifungal drugs and surgery. The treatment is lengthy, has many side effects, expensive not available in endemic areas and most importantly often unsatisfactory. For fungal mycetoma, amputations and recurrent infections are common.

Prevention & Control

Mycetoma is not a notifiable disease (a disease required by law to be reported) and a global surveillance system is still being developed. There are no control programmes for mycetoma yet, except for Sudan. Preventing infection is difficult, but people living in or travelling to endemic areas should be advised not to walk barefooted.

WHO and global response

To build national capacities on mycetoma, the Government of Sudan and WHO convened the First International Training Workshop on Mycetoma in Khartoum on 10–14 February 2019. Drawing on the expertise of the Mycetoma Research Centre in Khartoum, the workshop - attended by approximately 70 health staff from many mycetoma-endemic countries. It provided a unique opportunity to share experiences and standardize practices relating to diagnosis, treatment and surveillance.

The workshop was followed by the Sixth International Conference on Mycetoma in Khartoum on 15-17 February 2019. The Conference adopted the ‘Khartoum Call for Action on mycetoma’ which calls on a wide range of actors to take specific public-health and policy measures to address the burden of mycetoma.

Opportunities

Elaborating a public health strategy for the prevention and control of Mycetoma requires collection of epidemiological data on burden of disease, investment in research and product development, so that cost-effective prevention, diagnosis, early treatment and case management can be practiced in low-resource settings.

At present, active case-finding with early diagnosis and treatment with currently available tools is the most appropriate approach for lessening Mycetoma's disease morbidity and disability. However, important public health actions are required to tackling the burden of mycetoma. Some of these include:

- **including mycetoma in national surveillance systems and establishing a registry in affected countries;**
- **Integrating mycetoma detection within the skin-NTDs approach to enhance early detection**
- **improving access to diagnostics and medicines and refinement of protocols for case-management;**
- **strengthening preventive measures (e.g. wearing shoes) to decrease incidence;**
- **reinforcing awareness among affected communities and building capacities of health staff.**

Currently, the Drugs for Neglected Diseases initiative (DNDi) and other partners are investigating the safety and efficacy of fosravuconazole in treating fungal mycetoma in Sudan. In addition to an expected higher cure rate, if successful, the adoption of the results of this treatment would allow for a shorter therapeutic protocol, boosting compliance with treatment and saving financial resources.