Assessment of Medical Students' Knowledge Regarding Mycetoma Disease Prevention at Al-Farabi College for Science and Technology, Sudan

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ABSTRACT

Background: Mycetoma is a subcutaneous tissue infection caused by actinomycetes or fungi, primarily found in tropical and subtropical regions like Senegal, Sudan, Mexico, and India. The World Health Organization recently designated it as a neglected tropical disease, with an estimated prevalence of two per 100,000 people. **Aim of the study:** This study aimed to assess the knowledge of medical students regarding mycetoma disease prevention at al-Farabi college Khartoum, Sudan. **Subjects and methods: Study design:** A descriptive cross-sectional study design was used. **Setting:** It was conducted at Al-Farabi College for Science and Technology, Sudan during the period of July – September 2022. **Subjects:** 279 students were enrolled in this study. **Tools of data collections:** Data were collected by using two tools; self-administered interviewing questionnaire developed by the researcher and medical students' knowledge assessment questionnaire. **Results:** 261 (93.5%) of the participants were in the 20–30 age range, and the majority were in the medical laboratory. According to the participants' knowledge, 105 (37.6%) said that the causal organisms of mycetoma were found in soil, 140 (50.7%) said that they were found in water, and 80 (20.1%) said that they were found in air. Of those who thought it was discovered in water, 29.1% thought it was found in air, 9.4% thought it was found in air, and 10.8% thought none of the above. According to 29 students (10.8%), wearing shoes is the best way to prevent it. 107 (38.4%) and 97 (53%) said the operation was successful. **Conclusion:** The findings demonstrated that our participants were well knowledgeable about mycetoma disease prevention at all stages of preventive. **Recommendations:** the active involvement and support of the community, including its leaders, volunteers, and the entire population, play fundamental roles in shaping the success of engagement efforts. Empowering the community to participate in determining its health and socioeconomic priorities is essential.

Keywords: Knowledge, Medical students. Mycetoma, Prevention, Sudan.

Introduction

It is now well established that mycetoma is a granulomatous, chronic subcutaneous infection brought on by either bacteria (actinomycetoma) or fungus (eumycetoma) that are found in soil and water. Through a breached skin barrier, the bacterial and fungal pathogens enter subcutaneous tissue, where they locally incubate and multiply before developing into obvious clinical lesions. Mycetoma usually manifests as a triad of released grains in pus, many sinuses and fistulas, and painless subcutaneous tumor-like enlargement **(Fahal et al., 2018).**

The infections can cause severe consequences such as disfigurement, deformity, disability, amputation, and even death if left untreated **(Agarwal, 2021; Abbas et al., 2018).** They can also cause significant medical and economic burdens on social communities by spreading through muscular fascial spaces, or lymphatics, into muscles and bones **(Van de Sande, 2013).**

All ages are affected by mycetoma; however, males are more often affected than women. The "Mycetoma Belt," an area of dry, equatorial Africa, Latin America, and Asia, is where mycetoma often strikes low-income agricultural populations. In 2017, a global burden assessment reported 17,607 documented cases of mycetoma between 1944 and 2017, with an estimated prevalence ranging from 0.1 to 2 cases per 100,000 individuals. Early recognition of mycetoma is crucial for improving patient outcomes, highlighting the importance of medical students being well-informed about the disease **(WHO, 2017).**

Mycetoma is an implantation mycosis characterized by large swellings in the extremities, mainly caused by bacterial and fungal microorganisms. Common agents include Marella mycetomata and Actinomadura maduro. The disease is mainly found in tropical and subtropical regions, with most patients from Mexico, Senegal, Sudan, and India. The true prevalence and incidence are not well defined, and there are no rapid diagnostic tools. Treatment is unsatisfactory, leading to high morbidity and limb amputation. Symptoms include lower extremity lesions, painless subcutaneous nodules, purulent fluid, and raining sinuses **(Hao et al., 2022).**

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 programs 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, 2022).**

Prevention advice are focused on avoiding percutaneous inoculation of the infectious organism, which is thought to be the most likely route of infection by researchers and healthcare professionals, as the precise path of infection has not been established. Preventive measures include wearing closed-toe shoes and apparel that can shield the skin from harm. Additionally, it may be preventative to clean and disinfect skin wounds if they occur in areas where mycetoma is visible **(CDC, 2024).**

Significance of the study

Community-based survey conducted in Eastern Sennar locality demonstrated a prevalence of 0.87% (i.e., approximately 870 cases per 100,000 individuals) among 41,176 people surveyed (Rowa Hassan , 2021) Moreover, in a single endemic village in White Nile State, prevalence reached

as high as 14.5 cases per 1,000 inhabitants (1,450 per 100,000), significantly higher than national country-wide estimates **(Fahal, 2015)** until recently, only those who experienced and received treatment for mycetoma were aware of its existence, as well as a tiny number of dedicated activists and researchers. Beginning in 2013, many prominent organizations intensified their efforts to overcome gaps in mycetoma awareness and activism.

Therefore, we should raise awareness of this uncommon and neglected disease for an earlier management. This study was designed to determine the knowledge and increase awareness of students at Al-Farabi college of science and technology, Khartoum, Sudan towards Mycetoma disease. With this background, the present study emphasizes on assessment of medical students' knowledge regarding mycetoma disease prevention at Al-Farabi College for Science and Technology, Sudan.

Aim of the study

This study aimed to assess the knowledge of medical students regarding mycetoma disease prevention at Al-Farabi College for Science and Technology, Sudan.

Study objectives

This aim achieved through the following objectives:-

1. Evaluate the overall knowledge of medical students at Al-Arabiya College, Khartoum, Sudan, about mycetoma disease.
2. Assess students' understanding of the causes and risk factors of mycetoma.
3. Examine students' knowledge of the modes of transmission of the disease.

Research questions

1. What is the level of medical students' knowledge regarding prevention of mycetoma at Al-Farabi College for Science and Technology, Sudan?
2. What is the level of nurses' practice regarding prevention of mycetoma at Al-Farabi College for Science and Technology, Sudan?

Subjects and methods

Research design

A descriptive cross-sectional study design was used.

Study setting

The study carried at Al-Farabi College of Science and technology, Sudan, Khartoum state, Ebadi khatam street. SQ 66 the college stablished at 2017 it includes of seven specialities (Nursing `Medical laboratory, medicine, IT, Management, Architectural, Electrical Engineering).

Study subjects

Medical students at Al-Farabi College of Science and technology which started from July to September 2022. the following criteria were used: medical students who agree to involve in study.

Sample size

After returning to the Statistics Bureau of the al Farabi college and knowing the number of medical student (933). the sample size is calculated according to the following:

$$n = \frac{\left(\frac{z}{d}\right)^2 \times (0.50)^2}{1+\frac{1}{N}\left[\left(\frac{z}{d}\right)^2 \times (0.50)^2 - 1\right]}$$

Richard Geiger equation:
N= Total population.
n= Sample size

z= Stander normal deviation 0.95 = 1.96
d= degree of accuracy.

According to Richard Geiger equation: the sample size was (279)

Tools of data collection

The present study used of the following two tools:

Tool 1: Self-administered interviewing questionnaire:

Based on pertinent literature, the researchers developed a questionnaire to evaluate medical students' knowledge regarding mycetoma prevention **(Hassan et al., 2022)**. It included the following closed ended questions (age and percentage of each program).

Tool II: Medical students' knowledge assessment questionnaire: This part was concerned with assessment medical students' knowledge regarding mycetoma, it is composed of 34 questions in the form of multiple-choice questions including three sections as the following:

First section: It included 11 questions about Students knowledge regarding clinical presentation and common anatomical sites of mycetoma.

Second section: It included 12 questions about students' awareness of mycetoma etiology, mode of entry, and environmental sources.

Third section: It included 10 questions about students' knowledge of mycetoma treatment and prevention methods.

Knowledge scoring system

For the knowledge items, a correct answer was valued one point, and an incorrect answer was valued zero. The mean score for each area of expertise was calculated by adding up all the item scores and dividing the total by the number of items. These scores were converted into percentage scores. Knowledge was deemed satisfactory if the percent score was ≥75% and unsatisfactory if it was under 75%, according to statistical analysis.

Contents validity and reliability

It has been established for face and content validity by a panel of five expertise that revised the tools for clarity, relevance, applicability, comprehensiveness, understanding, and ease for implementation. The study materials were then updated to include the recommended changes. Furthermore, Cronbach's alpha values were calculated, and the value for the adapted tool was 0.89, which indicates high internal consistency.

Field work

The director of the Al-Farabi College for Science and Technology, Sudan granted the researcher all the approvals they required. The researchers went to the study locations, spoke with the director, and described the objectives of the study and the data collection procedure to get their participation. The researchers also planned the schedule to avoid interfering with the medical students' studies.

The researchers distributed a self-administered questionnaire to students and explain instructions on how to fill. The researcher is always available to answer questions or correct any ambiguities. The completed form is then collected and verified for accuracy, taking 20 to 30 minutes on average for each student.

Pilot study

A total of 28 medical students 10% of the study population, took part in the pilot study. In addition to identifying any potential issues with data collection, the pilot's goals were to confirm the tools' viability, application, and clarity. Additionally, useful was estimating the time needed to finish the

forms. Participants in the pilot study were incorporated into the main study sample since the instrument remained unaltered.

Administrative and ethical considerations

First, the study proposal was accepted Ethical approval was obtained from institute review board of Al Farabi college for sciences & technology with ethical code 004554 Participant provided their informed consent to participate. Participants were given the right to refuse participation and were informed that they could withdraw at any time while filling out the questionnaire. They were given the assurance that the information would be kept confidential and used only for research.

Statistical analysis

Data collected, entered, coded, and analyzed by the Statistical Package for Social Sciences version (22). Quantitative data was expressed using the mean ± SD and range, whilst qualitative data was expressed using absolute frequencies (number) and relative frequencies (%). Using descriptive statistics frequency and percent for factors that are associated and chi squire and p value for correlation between these factors and demographic data considering 0.01 as significant correlations.

Results

The demographic data of the participants age group was from 20-25 represent 261 (93.5%77.8%), and the rest representing only 18 (6.6%%) and most of the participants were medical laboratory105 (37.6%), as shown in **table (1).**

Table (2) data shows that half of the students (50.0%) correctly defined mycetoma as a chronic infectious disease of the subcutaneous tissue with high morbidity, while the remaining half held misconceptions, with 24.1% considering it an acute disease of fatty tissue, 17.3% identifying it as chronic skin inflammation with low morbidity, and 8.6% describing it as a chronic infection of fatty tissue with high mortality. Regarding clinical presentation, most students (40.5%) recognized the hallmark combination of sinuses, discharge, and swelling, whereas others identified only partial symptoms, such as painless swelling (31.2%), discharge with grains (20.4%), or sinus formation alone (7.9%). In terms of body sites affected, 43.0% of students correctly acknowledged that mycetoma can occur in all of the listed sites, although a considerable proportion limited their responses to specific locations such as the foot (28%), hand (13.3%), back (8.2%), or abdomen (7.5%). Overall, these findings suggest that while students demonstrated a moderate level of knowledge, significant gaps and misconceptions remain, particularly in disease definition and comprehensive recognition of clinical features, highlighting the need for targeted educational interventions.

Table (3) the data reveals that most students (37.0%) correctly identified that mycetoma can be caused by both bacteria and fungi, while smaller proportions attributed it solely to fungi (28.3%) or bacteria (24.7%), and a few (9.0%) incorrectly considered parasites as a cause. Regarding the route of entry, nearly half of the students (48.0%) recognized that mycetoma can enter the body through all listed pathways, including small skin wounds, injuries from sharp objects, and poor hygiene, whereas others identified specific routes such as following a sharp object (25.8%) or a small wound in the skin (18.3%). Concerning the habitat of the causative organisms, half of the students (50.7%) correctly indicated that they are commonly found in soil, followed by water

(29.1%), air (9.4%), and a smaller proportion (10.8%) incorrectly believed they are not found in any of these environments. Overall, the findings suggest that while students have a reasonable understanding of the causes, routes of entry, and habitats of mycetoma organisms, there remain gaps and misconceptions that warrant further educational reinforcement.

Table (4) shows that regarding treatment, many students (38.4%) believed that mycetoma should be treated surgically, while 31.9% indicated treatment with medicines, and 23.2% selected pharmacological options. A small proportion (6.5%) incorrectly thought that no treatment was necessary. In terms of prevention, more than half of the students (53%) recognized wearing shoes as an effective preventive measure, followed by 23.7% who identified medications, and 15.1% who considered vaccinations as a preventive strategy. Overall, the findings suggest that while students have a general awareness of treatment and prevention methods, misconceptions remain, particularly regarding the appropriate medical management and preventive measures for mycetoma.

Discussion

From our results. 261(93.5%) their age between 20-30, this agree study done in Sudan where their participants age between this finding agree with Previous study which showed that the most common 60.1% age group between (21-25) years old, majority (37.6%) of participants were medical laboratory 105 (37.0%) Regarding the participants knowledge of the participants describe causes as abacterial and fungal 105 (37.0%), comparing with another study done in Hayaat university in Khartoum (63.4%) of students said that the main cause of the mycetoma was virus, but the facts said that the disease caused by true fungi or by certain bacteria **(Mohammed et al., 2020)**. This finding was disagreed with al-Hayat study and these showed that student in al-Farabi college known well about causes of mycetoma.

140 (50.7%) respondents that mycetoma causative organism found in soil, (29.1%) believed that it found in water, 80 (29.1%) and 27 (9.4%) found in air, (10.8%) this agree with study done in Sudan their finding showed that mycetoma causative organism found in soil, (29.1%) **(Mohammed et al., 2020).** In another way 113 (40.5%) of participants said that the presentation of mycetoma was asinine ,swelling ,discharge were the main signs & symptoms of mycetoma this result disagree with another study which showed that the students' knowledge regarding mycetoma, the majority 100 (35.7%) of them said that painless & oedema was signs & symptoms of it, No studies were published to assess knowledge of students but facts and studies in Sudan dictated that most of cases presented with swelling **(Mohammed et al., 2020).**

According to the result most students (50.0%) correctly recognized mycetoma as a high-morbidity, chronic infectious illness of the subcutaneous tissue. This is disagreed with results done in Hayat which mentioned that 53.0% of students 53.0% not heard about mycetoma. Nonetheless, a significant percentage (24.1%) misinterpreted it as an acute infectious fatty tissue illness, suggesting a lack of knowledge regarding its pathogenesis and chronic nature. Clearer educational outreach is necessary, as seen by the remaining replies, which show misunderstanding between infection and inflammation as well as between morbidity and death **(Mohammed et al., 2022).**

Most students 97 (53.0%) said that wearing shoes were best prevention of it, and only 23.7% mentioned that medications were effective. this finding agrees with another study which mentioned that the two-third 97 (53.0%) supposed that shoes was prevented from the disease 66 (23.7%) **(Queiroz-Telles, et al., 2011)** by this result student showed that known well about prevention of mycetoma. But some of them 41(15.1%) said that mycetoma can prevent by vaccinations. Our finding agree with study done showed that population believed that port of enter of mycetoma were Through small wound in the skin, following sharp object or injury, poor hygiene ,defection, they answered that causative organism entered by all of the above which represent 134(48.0%) hygiene, (25.5%) believed that mycetoma port of enter by following sharp objective or injury, (6.8%) believed that by poor hygiene, defection through small wound on the skin **(Ueiroz-Telles et al., 2010)**

Conclusion

The study's conclusions show that most Al-Farabi College of Science and Technology students in Khartoum have a generally decent understanding of mycetoma, especially when it comes to its causes, mode of transmission, and preventative measures. Most were aware that wearing protective footwear is a useful preventive step, and a significant portion acknowledged soil as the organism's main reservoir. Misconceptions still exist, nevertheless, such as the idea that mycetoma can be prevented by vaccination or brought on by viruses. Participants' levels of awareness of the clinical presentation varied, with some concentrating

Recommendations

1. Improve targeted education: include targeted teaching modules in the medical curriculum to dispel some myths, especially those pertaining to the causes and ways to avoid mycetoma.
2. Encourage practical awareness activities: plan workshops and community-based awareness campaigns to help students reaffirm their understanding of the clinical presentation and transmission of mycetoma.
3. Enhance preventive practices: make sure kids can speak out in favour of protective footwear and other preventive measures in public places.
4. Encourage research and ongoing education: to promote lifelong learning and better illness management abilities, encourage students to work on research projects and stay current on mycetoma science.

Authors' contributions

Authors played a key role in a research study. They were responsible for organizing references, manuscript design, and journal submission. They contributed significantly to data collection and conclusion development. F.S.O.A supervised all stages of the research, prepared the first draft of the manuscript, and served as the corresponding author.

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Declaration of conflicting interest

The authors declare that there is no conflict of interest.

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Table (1): The Frequency and Percentage Distribution of the Studied Nurses' Demographic Characteristics (n=279)

Variable	No.	Percent (%)
Age by years		
20-30	261	93.5
>30-<40	18	6.6
Program title		
Medical laboratory	105	37.6
Medicine	92	33.0
Nursing	82	29.3

Table (2): Students' Knowledge, Clinical Presentation, and Common Anatomical Sites of Mycetoma (n=279)

Items	Frequency	Percent (%)
mycetoma define as		
Chronic infectious disease of the subcutaneous tissue with a high morbidity	139	50.0
It is a cute infectious disease of fatty tissue with a high morbidity	70	24.1
Is a chronic inflammation of the skin with low morbidity	49	17.3
Is a chronic infectious disease of the fatty tissue with a high mortality	24	8.6
Mycetoma presentation		
Painless swelling	87	31.2
Discharge and grains	57	20.4
Sinuses formation	22	7.9
Sinuses, discharge, swelling	113	40.5
Mycetoma seen in		
Foot	78	28.0
Hand	37	13.3
Back	23	8.2
Abdomen	21	7.5
All of the above	120	43.0

Table (3): Students' Awareness of Mycetoma Etiology, Mode of Entry, and Environmental Sources (n=279)

Items	Frequency	Percent (%)
Myeloma causes		
Bacteria	69	24.7
Fungi	79	28.3
Parasite	28	10.04
Bacteria and fungi	103	37.0
Mycetoma port of enter		
Through small wound in the skin	51	18.3
Following sharp object or injury	72	25.8

Poor hygiene, defection	22	7.9
All of above	134	48.0
Mycetoma causative organism found on		
Soil	140	50.7
Water	80	29.1
Air	27	9.4
Non above	29	10.8

Table (4): Students' Knowledge of Mycetoma Treatment and Prevention Methods (n=279)

Items	Frequency	Percent (%)
Mycetoma can be treated by		
Medicines	89	31.9
Surgery	107	38.4
Pharmacological	65	23.2
No need to treat	18	6.5
Mycetoma prevention		
Wearing shoes	97	53.0
Medications	66	23.7
Vaccinations	41	15.1

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