



KNOWLEDGE, AWARENESS AND ATTITUDE ABOUT MUCORMYCOSIS AMONG DENTISTS IN TUMAKURU DISTRICT, KARNATAKA - A QUESTIONNAIRE BASED SURVEY

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Abstract:

Background: Mucormycosis is highly fatal opportunistic fungal disease, caused by a group of filamentous molds belong to order Mucorales and class Zygomycetes, which primarily affects diabetic and immunocompromised individuals. It has lately been observed to impact numerous COVID-19-affected patients in India. Many Indian states and union territories have proclaimed it as epidemic due to its unusual emergence, which has negatively impacted the already weakened health system of the nation.

Aim: To assess the knowledge, awareness and attitude about mucormycosis among dentists in Tumakuru district, Karnataka.

Methodology: This self-administered questionnaire survey was conducted to evaluate the knowledge, awareness and attitude about mucormycosis among dentists in Tumakuru district, Karnataka over a period of two months (January – February 2022). It comprised of 14 questions and was circulated through both online and offline among post graduate (MDS) students, MDS faculty members working as academicians in dental colleges of Tumakuru region and private practitioners in the same region.

Results: A total of 120 dentists, ranging in age from 21 to 45 years, with a mean age of 25.89 years were participated in this research. Among them, 64 (53.3%) were MDS, whereas 56 (46.7%) were BDS. The overall mean knowledge and awareness score of participants were 74.15% & 83.52%.

Conclusion: The improvement of dentists' understanding and views of mucormycosis, a new public health issue, is essential. Early identification, reversal of risk factors, and underlying illness are necessary for the usual care of mucormycosis. When this disease manifests in a patient with risk factors, the doctor must have a high index of suspicion to diagnose it in any of its forms. It emphasises the need of the interprofessional team in diagnosing and treating people with this illness.

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INTRODUCTION:

Mucormycosis is an uncommon but widespread fungal condition that has a substantial mortality and morbidity rate. It is distinguished by a rapidly evolving angioinvasion course with thrombosis and tissue disintegration.¹ Mucormycetes belong to the order Mucorales, subphylum Mucoromycotina. It is a condition that has been around for a long time. It is characterised clinically according to anatomic location, such as rhino-orbital-cerebral (ROCM), pulmonary, gastrointestinal, cutaneous, renal and diffuse mucormycosis, disseminated or other relates to unusual or rare types, including endocarditis, osteomyelitis, peritonitis, renal, etc.²

This condition was originally described by Fürbinger in 1876 when he wrote about a patient who died of cancer and whose right lung had a hemorrhagic infarct with fungal hyphae and a few sporangia. The first instance of widely disseminated mucormycosis was first described by Arnold Paltauf in 1885 and was given the term "Mycosis mucorina." He concluded that *Lichtheimia corymbifera* was most most likely the source of the infection after drawing the etiologic agent and demonstrating the existence of sporangiophores and rhizoid-like structures. Between 1980 and 1990, there was an exponential increase in the number of mucormycosis cases, which were mostly seen in immunosuppressed patients. According to a prevalence analysis, infection amplification was 7.4% annually.^[2,3]

Mucormycosis often referred as black fungus, which is a misnomer, since it refers to a different class of fungi called dematiaceous fungi.⁴

It has risen dramatically as a result of the Covid-19 virus outbreak. CAM (COVID-19-associated mucormycosis) has been documented in a number of nations, including Austria, Brazil, Egypt, France, India, Iran, Italy, and the US. According to a recent systematic review, 0.3% of COVID-19 coinfections are caused by CAM. India is not unfamiliar with mucormycosis; the case rate prior to 2019 was about 70 times higher than in developed nations. India is expected to have 140 cases of mucormycosis per million people.^[5,6] A GoI website allegedly listed more than 31,000 CAM cases by June 13, 2021, according to an editorial in-press from the Indian Journal of Medical Microbiology. The number of cases increased to 40,000 by July 2021.⁷ While India was experiencing difficulties during the second wave of COVID-19, there has been an unexpected increase in CAM cases. As a result, the Government of India declared it a notifiable disease, and several state

governments declared it an epidemic. Various control measures and guidance on obtaining and allocating treatment drugs to all states were quickly implemented.⁶

The oral symptoms of mucormycosis include pain, tooth mobility, bad breath, nasal stuffiness and discharge (which can be black purulent), epistaxis, pain in the para nasal sinuses, draining sinuses, nasal and facial erythema, ulcerations in the palate, blackish discoloured skin, erythema and edema of the peri orbital area, ptosis, and pain in the orbit.⁸ The earlier mucormycosis is detected, the more effectively it may be treated. Because this deadly disease necessitates immediate and intensive treatment, early imaging is critical for determining the amount of the disease's involvement. The gold standard for radiographic diagnosis is gadolinium enhanced MRI with CT-PNS with contrast serving as adjuvant imaging.^{5,6}

Reversal or termination of underlying predisposing factors, early delivery of active antifungal medications at the optimal dose, full excision of all infected tissues and the use of various adjuvant therapies are all part of a successful therapy strategy for mucormycosis.³

Dentists play a critical role in controlling the spread of this fungal infection and are a critical lethal weapon in enabling early detection. With early identification and preventive interventions, this lethal fungal infection can be controlled with little morbidity and death. As a result, dentists must have sufficient knowledge and awareness of the subject. Hence, this research was conducted to assess the knowledge, awareness and practice towards Mucormycosis among dentists in Tumkur, Karnataka.

MATERIALS AND METHODS:**Informed consent and Ethical clearance:**

The ethical clearance (Ref No. SSMC/Dent/IEC-21/Dec 2021) was obtained from the ethical committee of Sri Siddhartha medical college, Tumakuru, Karnataka, prior to the start of the research. The research participants were notified priorly that the survey is completely voluntary based. They were allowed to quit at any moment, and submitting the questionnaire was considered their acceptance for participation.

Study Design: It was a cross sectional study that was open, prevalidated, and anonymous which emphasised on knowledge, attitude and practices regarding mucormycosis among dentists.

Study Participants:

This study comprises of post graduate (MDS) students, MDS faculty members working as academicians in dental colleges of tumakuru region and private practitioners in the same region. List of dentists was obtained from different sources like teaching institution in tumakuru, dentists registered in Indian Dental Association, tumakuru, dentists registered in Karnataka State Dental Council. Compiling all the sources, total numbers of dentists practicing in Tumakuru are 187.

Sample size calculation and technique:

The sample size was estimated using the formula:

$$\frac{z^2 \times p(1-p)}{e^2} \\ 1 + \left[\frac{z^2 \times p(1-p)}{e^2} \right]$$

Purposive sampling technique was considered and the sample size was calculated using the above mentioned formula (Slovin's formula) with a margin of error of 5%, and confidence interval 95% and the population size of 187 and rounding off to 120.

Questionnaire validation:

A Pilot study was conducted to ascertain the test-retest reliability of the survey questions among 10 senior specialized dentists. Cronbach's alpha was used to evaluate the questionnaire's reliability, and it was determined to be 0.89, which indicated high reliability. Following that, a validated survey was constructed after the questionnaire was further improved with changes and exclusions to make it more pertinent and specific to the study's objective.

Methodology:

This cross sectional study was conducted to evaluate the knowledge, awareness and attitude about mucormycosis among registered dentists in Tumakuru district, Karnataka over a period of two months (January – February 2022). The self administered questionnaire comprises of 14 questions in English language made specifically for the study. Both online and offline methods were used to perform this research. Prior to the data collection, In order to collect offline data, hard copies of the questionnaire were personally

distributed to the dentists working in private institutions and private clinics. For the online data collection, the "Google Form" link was shared via social media platforms, such as WhatsApp Messenger, text messaging, and email.

STATISTICAL ANALYSIS:

Data was analyzed using the statistical package **SPSS 22.0** (SPSS Inc., Chicago, IL) and level of significance was set at **p<0.05**. **Descriptive statistics** was performed to assess the proportion of each category of the respective groups. **Inferential statistics** was done using **chi square test for proportion**.

RESULTS:**Demographic characteristics of the study:**

A total of 120 dentists, ranging in age from 21 to 45 years, with a mean age of 25.89 years were participated in this research. Among them, 64 (53.3%) were MDS, whereas 56 (46.7%) were BDS and out of 64 MDS Specialists, 28.2% were Pedodontics and preventive dentistry, 20.3% conservative dentistry and endodontics, 14.1% Orthodontics and Dentofacial Orthopedics and Prosthodontics, 12.5% Periodontics and oral implantology, 7.8% Oral and maxillofacial surgery, 3% Public health dentistry. Regarding, the educational experiences of the research participants, more than half of them 56 (46.7%) were clinicians, 53 (44.1%) were post graduate students, 9 (7.5%) of them were both clinicians and academicians, and 2 (1.7%) were academicians.

Participants' knowledge appraisal:

The overall mean knowledge score of participants was 74.15%. Regarding the mucormycosis, four questions were incorporated in the questionnaire to assess the participants' knowledge. In this survey study, mucormycosis is not a contagious disease was known to 71 participants (59.2%). 63.3% of the participants responded correctly to the mode of transmission of the mucormycosis. When asked about the predisposing factors of mucormycosis, 75.8% (91 participants) knew that uncontrolled diabetes mellitus, immunosuppression by steroids, prolonged ICU stay are the main factors. 98.3% of them answered atleast one of the correct clinical features of mucormycosis (Table 1, Graph 1).

Table 1- Assessment of Knowledge Level

		Overall score	Overall level of percentage
Knowledge	What is the mode of transmission of mucormycosis ?	63.3%	74.15%
	Is mucormycosis a contagious disease?	59.2%	
	Important predisposing factor of mucormycosis?	75.8	
	Clinical features of mucormycosis are?	98.3%	

Participants’ awareness appraisal:

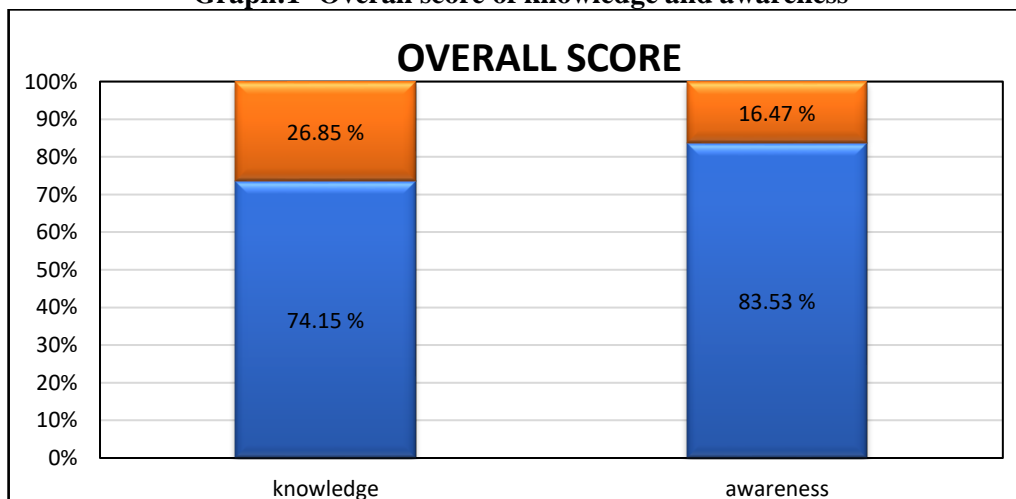
Regarding their awareness towards mucormycosis, only 58.3% claimed that mucormycosis as very dangerous type of condition followed by 40 % of them perceived it as moderately dangerous. However, 96.7% of them were aware that it is a serious health problem, For the purpose of preventing the disease, 98.3% of them thought it

was essential to educate the public about mucormycosis, regarding the dentist’s role in teaching the others 97 participants (80.8%) were recorded as highly significant, 21(17.5%) of them were recorded as moderately significant, 2 (1.7%) participants were recorded as not significant. Overall mean awareness score was around 83.52% (Table 2, Graph 1).

Table 2- Assessment of Awareness Level

1. How do you perceive mucormycosis?				
	Frequency	Percentage	P value (chi square test)	MOST APT RESPONSE
Moderately dangerous	48	40.0	0.0001*	58.3%
Not dangerous	2	1.7		
Very dangerous	70	58.3		
Total	120	100.0		
2. Do you know mucormycosis is a serious health issue ?				
	Frequency	Percentage	P value (chi square test)	MOST APT RESPONSE
No	4	3.3	0.0001*	96.7%
Yes	116	96.7		
Total	120	100.0		
3. Is it important to educate the people about mucormycosis to prevent the disease?				
	Frequency	Percentage	P value (chi square test)	MOST APT RESPONSE
No	2	1.7	0.0001*	98.3%
Yes	118	98.3		
Total	120	100.0		
4. What do you think about the dentist’s role in teaching others about mucormycosis?				
	Frequency	Percentage	P value (chi square test)	MOST APT RESPONSE
Highly significant	97	80.8	0.0001*	80.8%
Moderately significant	21	17.5		
Not significant at all	2	1.7		
Total	120	100.0		

Graph:1- Overall score of knowledge and awareness



Participants’ attitude appraisal:

According to their assessment of their attitudes, 59.2% were reluctant to treat those who had mucormycosis despite the fact that 73.3% had recently encountered them and recognised the need for treatment. 80.8% of the participants answered that dentists need to treat cases with mucormycosis in first line. Of the 120 participants, 93 dentists

(77.5%) knew the proper ways to diagnose mucormycosis, and 87 dentists (72.5%) knew the proper treatment modality. 95% of the participants were willing to treat patients who had recovered from mucormycosis and 78.3% of respondents suggested the patients' distinctive long-term prospects (Table 3).

Table 3- Assessment of Attitude level

		Frequency	Percentage	P value (chi square test)
Have you come across any person recently affected by mucormycosis?	No	88	73.3	0.0001*
	Yes	32	26.7	
If yes, do you treat patients affected by mucormycosis in your practice?	No	71	59.2	0.0001*
	Yes	49	40.8	
Do you think dentists should treat mucormycosis in first line?	No	23	17.5	0.0001*
	Yes	97	80.8	
How will you diagnose mucormycosis?	CT scan of lungs, sinuses etc	34	28.3	0.0001*
	CT scan of lungs, sinuses etc, Fine needle aspiration	3	2.5	
	CT scan of lungs, sinuses etc, Tissue biopsy	15	12.5	
	CT scan of lungs, sinuses etc, Tissue biopsy, Fine needle aspiration	9	7.5	
	Fine needle aspiration	9	7.5	
	Tissue biopsy	44	36.7	
	Tissue biopsy, Fine needle aspiration	6	5.0	
How will you treat mucormycosis patient?	Antifungal therapy for atleast 4 to 6 Weeks.	11	9.2	0.0001*
	Antifungal therapy for atleast 4 to 6 Weeks., All of the above	3	2.5	
	Antifungal therapy for atleast 4 to 6 Weeks., Surgically debriding of necrotic (dead) tissues	10	8.3	
	Antifungal therapy for atleast 4 to 6 Weeks., Surgically debriding of necrotic (dead) tissues, All of the above	1	.8	
	Installation of the peripherally inserted central catheter (PICC line)	1	.8	
	Installation of the peripherally inserted central catheter (PICC line), Antifungal therapy for atleast 4 to 6 Weeks., Surgically debriding of necrotic (dead) tissues, All of the above	3	2.5	
	Surgically debriding of necrotic (dead) tissues	4	3.3	
Will you treat the patients who have recovered from mucormycosis	No	6	5.0	0.0001*
	Yes	114	95.0	

DISCUSSION:

Mucorales fungi are responsible for the aggressive, invasive, and possibly fatal opportunistic illness known as mucormycosis, also known as zygomycosis or phycormycosis. According to a 2019-2020 estimate, the prevalence of mucormycosis varies from 0.005 to 1.7 per million people worldwide, although it is about 80 times greater (0.14 per 1000) in India than in affluent

nations. Because the medicine targets areas of eukaryotic pathogens closely mirroring those of the human host, there are few treatment alternatives for treating deep fungal infections like Mucormycosis.⁹ Taking into consideration of severity and mortality of this disease, it is important to engage the dentists to detect it at an early stage. Understanding the knowledge, awareness, attitude among dentists is valuable in this regard.

This study used an online and offline questionnaire survey to assess the knowledge, awareness, and attitude of dental professionals in Tumkur. Despite the fact that 59.2% of participants had strong knowledge about it, nearly half of them thought it was a communicable illness. It reveals the participants' lack of knowledge towards mucormycosis. Fungi can spread by direct contact with an open wound in the mouth or through inhalation of spores. It is a hallmark of this illness because fungal spores through angioinvasion produce thrombosis, which then results in tissue necrosis.^{9,10} 63.3% of participants correctly responded when asked about the fungi's mechanism of transmission, stating that it spreads by skin contact, burns, and spore inhalation.

Individuals with graft versus host disease and severe neutropenia frequently develop pulmonary mucormycosis, whereas diabetic individuals frequently show with rhino orbital illness. In a comprehensive study by Singh et al., confirmed instances of mucormycosis in people with COVID 19 were reported; 80% of these patients had diabetes mellitus, and 76.3% were using corticosteroids.¹⁰ In our study, 75.8% of participants accurately responded to the question on predisposing variables.

Piyush Dongre et.al in his review mentioned about the clinical characteristics of the condition that includes Mobility of teeth, halitosis, tooth ache, palatal ulceration, intraoral draining sinuses, stuffy nose, epistaxis-associated nasal discharge, blackish discharge, erythema of the mucosa of the nose, erythema on a single side of the face, facial erythema, blackening of the skin, redness, and edema around the eyes, in our study 98.3% of the individuals had given correct information.¹¹

According to our study, 83.53% of them aware that mucormycosis is an alarming condition, and proper education about the condition should be provided to the public by dentists. Regarding the diagnosis and management of mucormycosis, to confirm the diagnosis with contrast-enhanced CT, which is helpful in characterising the extent of the disease, cytopathology, histology, and cultures were performed. MRI is regarded as the gold standard for radiographic diagnosis, while CT-PNS with contrast is the adjuvant imaging. Early therapy initiation, surgical debridement of diseased tissue, antifungal therapy, and care of underlying illness are all required in the treatment of mucormycosis. The first-line treatment of choice is amphotericin B (AmB), after which posaconazole and isavuconazole are administered.^{11,12} 84.8 % of the Participants answered questions about the diagnosis and treatment of mucormycosis in this

study correctly as well, demonstrating their reliable assessment.

In our study's findings, only a small number of dentists in Tumkur had seen mucormycosis infected patients, and 59.2% of them were hesitant to treat them. Oladele et al., assessed the knowledge and awareness of invasive fungal infections amongst resident doctors in Nigeria, across 7 tertiary hospitals in 5 geopolitical zones. They concluded that the knowledge and awareness was acceptable and there is need of training for resident doctors.¹³ In accordance with that, we had assessed the knowledge, awareness and attitude towards mucormycosis among dentists in Tumkur. The study's findings led us to the conclusion that although dentists in the Tumkur region had strong knowledge, awareness, and an acceptable attitude, they still need more instruction and training in terms of providing care.

CONCLUSION:

Mucormycosis is a fulminating illness with great potential for quick progression. It has been demonstrated that a multidisciplinary approach by a group of clinicians with an emphasis on taking a thorough history, clinical examination, early detection, and diagnosis, preventive antifungal medication, surgical management, prosthetic rehabilitation, and correction of surgical defect can reduce mortality and enhance people's quality of life. It is important to keep in mind published studies on posaconazole (injectable), a triazole antifungal medication that significantly reduces the pressure and offers patients much-needed and timely therapy alternatives, as well as straightforward procedures like saline nasal irrigations, when managing this illness. In order to effectively contribute to the preservation and welfare of humanity, dentists and other healthcare professionals have a duty to advance their fields of knowledge about mucormycosis.

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