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Recent increase of Mucormycosis (black fungus) in Sri Lanka - Part I

This is the first article of two in a series on "Recent increase of Mucormycosis (black fungus) in Sri Lanka"

Overview of Mucormycosis

Mucormycosis is a serious fungal infection caused by molds belonging to the Mucorales order that can cause various types of infections. It is commonly called as "Black fungus". The infection occurs when fungal spores are inhaled, ingested or enter the body through cuts or abrasions. The species most frequently isolated from patients are *Rhizopus oryzae, Rhizorpus microsporus, Apophysomyces elegans, Cokeromyces recurvatus, Cunninghamella bertholletiae, Lichtheimia (Absidia) corymbifera, Rhizomucor pusillus, Saksenaea vasiformis & Syncephalastrum recemosum*. The term mucormycosis is frequently used interchangeably with zygomycosis. The latter term referred to infections caused by fungi of the former phylum Zygomycota (comprising Mucorales, Entomophthorales, and others), which became obsolete with phylogenetic reanalysis of the kingdom Fungi.

This group of organisms has a propensity for vascular invasion, leading to thrombosis, tissue infarction and necrosis, which has earned it the name "Black fungus." Found worldwide, it thrives in soil, decaying organic matter and various environmental settings. These fungi can be present both indoors and outdoors, as well as in dust and on decaying food items.

Mucormycosis, previously known as zygomycosis, was first identified in the late 19th century. The earliest documented case of the disease was reported by the German pathologist Fürbringer in 1885. The disease has typically been rare but has gained prominence, particularly in the context of increasing numbers of immunocompromised patients due to diseases like uncontrolled diabetes mellitus, following chemotherapy and conditions requiring immunosuppressive therapies.

The incidence of mucormycosis is rising globally, but in 2017, the rise is very high in India and China among patients with uncontrolled diabetes mellitus. The Leading International Fungal Education (LIFE) portal has estimated the burden of serious fungal infections globally. According to their estimate, the annual prevalence of mucormycosis might be around 910,000 cases globally.

The COVID-19 pandemic significantly impacted the global landscape of mucormycosis, especially in countries like India, where a dramatic surge in cases was observed among COVID-19 patients, particularly those with diabetes or those receiving corticosteroids. This highlighted the interplay between viral infections and opportunistic fungal infections, drawing global attention to mucormycosis and emphasizing the need for early diagnosis and effective treatment.

Mucormycosis is not a new clinical entity in Sri Lanka; the tropical climate facilitates the presence of fungal spores in the environment. The infection presents unique challenges, especially concerning treatment costs and access to healthcare resources. Since the COVID-19 outbreak in 2021, there has been a notable increase in mucormycosis cases in Sri Lanka, particularly among individuals with uncontrolled diabetes mellitus and organ transplantation.

High risk categories

In immunocompetent people, the spores of Mucorales that reach the respiratory tract adhere to the nasal mucus and are eliminated either by swallowing or sneezing. If there is any wound in the mucous membranes, the polymorphonuclear neutrophils phagocytose and destroy the fungal structures. Neutrophils are the host defense against these infections; therefore, individuals with neutropenia or neutrophil dysfunction are at the highest risk.

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It primarily affects immunocompromised individuals, such as those with diabetes, cancer patients following chemotherapy as well as those undergoing immunosuppressive treatments. Rarely, patients without apparent immunological defects may be infected. Patients with COVID -19 illness (active/ recovering / post-discharge) who are known diabetics and treated with systemic steroids are at higher risk of mucormycosis.

Major risk factors :

- Prolonged or profound neutropaenia
- Diabetes mellitus (type I and II)
- Metabolic acidosis
- Malnutrition
- Steroid usage
- Treatment with iron-chelating agents
- Iron overload (hemochromatosis)
- HSCT recipients
- Solid organ transplant recipients
- Patients with haematological malignancies
- Patients with burn injuries
- Injection drug users
- Widespread use of voriconazole
- Patients with HIV/AIDS

Clinical features

Mucormycosis infections are following inhalation of spores in air. As a result, nasal sinuses and lungs are the commonest initial sites of infection. Also cutaneous, percutaneous infections have been reported following inoculation, such as traumatic disruption of skin barriers, catheter insertion sites and following injections. Cases have been reported following ingestion of contaminated food also. It presents with a range of symptoms that vary based on the site of infection. Early recognition of these clinical features is critical, as mucormycosis can progress rapidly and is often associated with significant morbidity and mortality.

Rhino-Orbito-Cerebral Mucormycosis (ROCM):

Rhino-Orbito-Cerebral Mucormycosis (ROCM) is the most common presentation of mucormycosis, primarily affecting the nasal cavity, orbit, and brain. It is often seen in immunocompromised patients, particularly those with uncontrolled diabetes mellitus. Signs and symptoms include nasal blockage or congestion, bloody or brown/black nasal discharge, unilateral facial pain, numbness, or swelling. Patients may experience headache, lethargy, fever, and seizures, as well as slurred speech and mental confusion. Additionally, they may exhibit partial paralysis, diplopia (double vision), blurred vision, or loss of vision, along with proptosis (bulging of the eye). Complications can lead to frontal lobe necrosis and abscess formation, resulting in severe neurological impairment.

Pulmonary mucormycosis:

Pulmonary mucormycosis is characterized by fungal infection in the lungs and is more common in patients with significant immune compromise. This includes those undergoing chemotherapy, uncontrolled diabetes mellitus or hematopoietic stem cell transplantation. Signs and symptoms of pulmonary mucormycosis include fever, cough, chest pain, hemoptysis (coughing up blood), pleural effusion, and worsening respiratory distress. It commonly affects patients with uncontrolled diabetes mellitus, neutropenic patients with underlying hematological malignancies, allogeneic hematopoietic stem cell transplant (HSCT) recipients, and solid organ transplant (SOT) recipients.

Gastrointestinal mucormycosis:

Gastrointestinal mucormycosis can occur following the ingestion of spores or due to translocation in immunocompromised individuals. Symptoms typically involve abdominal pain, nausea, vomiting, and gastrointestinal bleeding. Complications can include perforation of the gastrointestinal tract, which may lead to peritonitis and sepsis.

Cutaneous mucormycosis :

Cutaneous mucormycosis generally occurs after direct inoculation of the fungus into the skin, often due to trauma or in post-surgical wounds. It presents with raised, indurated lesions featuring a central necrotic area and ulceration covered with a characteristic black eschar. In some cases, there is a potential for systemic dissemination, especially in immunocompromised patients.

Disseminated mucormycosis :

Disseminated mucormycosis can occur in patients with multiple comorbid conditions, complicating the identification of specific symptoms attributable to the infection. General symptoms may include fever, chills, and malaise. If the central nervous system is involved, patients may exhibit mental status changes or even coma.

All-cause mortality rates for mucormycosis range from 40% to 80% with varying rates depending on underlying conditions and sites of infection. Case fatality rate (CFR) of mucormycosis is around 35% with no underlying predisposing cause, 44% in patients with diabetes mellitus, 66% in patients with malignancies. CFR can vary according to site of infection as well, 62% in rhino cerebral mucormycosis, 76% in pulmonary mucormycosis, 85% gastro-intestinal mucormycosis and 96% in disseminated mucormycosis.

Higher survival rate among diabetes mellitus patients due to easiness of reverting underlying ketoacidosis than among malignancies. Higher CFR has observed in pulmonary mucormycosis patients due to its difficulty in diagnosing the disease.

Mucormycosis is considered a medical emergency due to its rapid progression and high mortality rate. Immediate initiation of treatment is crucial, even before laboratory confirmation of the diagnosis. The treatment protocol involves starting with amphotericin B, either the conventional deoxycholate formulation or the liposomal preparation, without delay while awaiting investigation results. Amphotericin B serves as the mainstay of treatment, being effective against the fungal agents responsible for mucormycosis.

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To be continued...

Table 1: Selected notifiable diseases reported by Medical Officers of Health 21st – 27th Sep 2024 (39th Week)

RDHS	Dengue Fever		Dysentery		Encephalitis		En. Fever		F. Poisoning		Leptospirosis		Typhus F.		Viral Hep.		H. Rabiies		Chickenpox		Meningitis		Leishmania-		Tuberculosis		WRCD	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	T*	C**
Colombo	143	9211	1	29	0	11	0	47	0	22	8	407	0	8	0	9	0	0	27	450	1	34	0	2	28	1612	**100**	100
Gampaha	91	4270	0	37	0	30	0	13	2	77	34	618	1	11	1	9	0	0	21	351	6	113	0	23	19	925	**70**	100
Kalutara	48	2281	0	26	0	2	0	31	0	36	40	633	0	8	1	10	0	1	22	508	1	53	0	1	18	468	**93**	100
Kandy	75	3694	2	34	0	3	0	9	0	56	7	203	0	28	0	11	0	2	6	331	0	13	0	46	19	493	**100**	100
Matale	12	634	0	13	0	1	0	8	3	24	2	83	1	4	0	6	0	0	5	129	0	13	9	269	1	97	**100**	100
Nuwara Eliya	8	299	8	118	0	7	0	10	1	202	2	149	1	38	1	8	0	0	6	206	1	16	0	1	4	207	**85**	100
Galle	46	1742	0	43	1	21	0	12	1	93	38	673	3	99	1	10	0	1	26	646	1	69	0	3	4	331	**90**	100
Hambantota	10	715	0	26	0	3	0	5	0	45	7	394	1	46	0	6	0	2	0	262	0	26	22	402	4	129	**100**	100
Matara	22	844	0	8	0	6	0	2	0	26	18	418	3	23	4	13	0	0	3	296	0	65	2	95	7	133	**94**	100
Jaffna	15	5250	1	58	0	2	1	25	0	34	0	17	11	461	0	7	0	1	12	193	3	28	0	1	0	199	**93**	93%
Kilinochchi	2	288	2	17	0	0	0	2	0	2	0	18	0	11	0	0	0	2	0	9	0	6	0	1	1	20	**100**	100
Mannar	4	278	0	9	0	0	0	1	0	4	0	22	0	12	0	1	0	0	0	8	0	5	0	1	3	46	**100**	100
Vavuniya	0	166	0	13	0	1	1	2	0	21	1	87	0	5	0	4	0	0	2	39	1	22	0	9	2	33	**100**	100
Mullaitivu	1	203	0	8	0	0	0	0	0	18	0	67	0	11	0	0	0	2	0	6	0	5	0	10	0	27	**83**	100
Batticaloa	15	1432	3	108	0	13	0	7	0	58	1	65	0	2	0	20	0	2	6	108	1	43	0	4	3	124	**100**	100
Ampara	2	227	0	29	0	3	0	0	0	19	2	166	0	1	0	5	0	1	1	100	1	34	1	21	0	97	**100**	100
Trincomalee	2	630	0	15	0	1	0	3	0	9	2	136	0	12	0	3	0	0	3	78	1	20	0	16	0	94	**100**	100
Kurunegala	28	1963	3	45	0	32	0	3	0	351	21	537	0	24	2	7	0	4	14	454	5	227	9	486	4	393	**97**	100
Puttalam	16	954	0	8	1	4	0	3	0	3	6	210	1	34	0	4	0	1	2	115	1	59	2	32	21	171	**85**	100
Anuradhapura	9	650	1	32	0	6	0	2	1	39	8	363	0	29	2	14	0	1	11	238	3	47	24	703	0	225	**91**	100
Polonnaruwa	8	332	1	21	0	3	0	1	1	16	3	233	0	2	0	51	0	0	3	127	0	29	13	421	0	86	**78**	100
Badulla	9	737	1	31	0	6	0	7	0	56	9	430	0	36	2	35	0	0	6	298	1	32	1	37	6	183	**94**	100
Monaragala	21	711	3	18	0	4	0	3	1	85	2	586	1	30	0	40	0	1	11	132	3	88	3	204	2	98	**91**	100
Ratnapura	40	2337	2	96	0	7	0	8	4	25	47	1519	1	25	3	25	0	2	13	288	1	112	0	140	6	263	**100**	100
Kegalle	25	1741	1	18	1	8	0	9	1	12	29	610	2	27	1	10	0	1	21	712	5	60	0	23	9	281	**82**	100
Kalmunai	5	676	0	17	0	0	0	2	0	28	1	64	0	5	0	4	0	0	3	197	0	13	0	0	3	112	**92**	100
SRILANKA	**657**	**42265**	**29**	**877**	**3**	**174**	**2**	**215**	**15**	**1361**	**288**	**8708**	**26**	**992**	**18**	**312**	**0**	**24**	**224**	**6281**	**36**	**1232**	**86**	**2951**	**164**	**6781**	**93**	99%

Source: Weekly Returns of Communicable Diseases (esurvillance.epid.gov.lk). T=Timeliness refers to returns received on or before 27th Sep, 2024 Total number of reporting units 358 Number of reporting units data provided for the current week: 358 **C****-Completeness

A = Cases reported during the current week. B = Cumulative cases for the year.

Table 2: Vaccine-Preventable Diseases & AFP

21st – 27th Sep 2024 (39th Week)

Disease	No. of Cases by Province									Number of cases during current week in 2024	Number of cases during same week in 2023	Total number of cases to date in 2024	Total number of cases to date in 2023	Difference between the number of cases to date in 2024 & 2023
	W	C	S	N	E	NW	NC	U	Sab					
AFP*	01	01	00	00	00	00	00	01	01	02	00	56	72	-22.2 %
Diphtheria	00	00	00	00	00	00	00	00	00	00	00	00	00	0 %
Mumps	01	00	01	00	01	00	02	01	00	06	06	224	180	24.4 %
Measles	00	00	00	00	00	00	00	00	00	00	40	285	567	-49.7 %
Rubella	00	00	00	00	00	00	00	00	00	00	00	02	05	-60%
CRS**	00	00	00	00	00	00	00	00	00	00	00	00	02	0 %
Tetanus	00	00	00	00	00	00	00	00	00	00	00	05	06	-16.6 %
Neonatal Tetanus	00	00	00	00	00	00	00	00	00	00	00	00	00	0 %
Japanese Enceph-alitis	00	00	00	00	00	00	00	00	00	00	00	06	02	200 %
Whooping Cough	00	00	00	03	01	00	01	00	01	06	00	53	07	657.1 %

Key to Table 1 & 2

Provinces: **W**: Western, **C**: Central, **S**: Southern, **N**: North, **E**: East, **NC**: North Central, **NW**: North Western, **U**: Uva, **Sab**: Sabaragamuwa.

RDHS Divisions: **CB**: Colombo, **GM**: Gampaha, **KL**: Kalutara, **KD**: Kandy, **ML**: Matale, **NE**: Nuwara Eliya, **GL**: Galle, **HB**: Hambantota, **MT**: Matara, **JF**: Jaffna, **KN**: Killinochchi, **MN**: Mannar, **VA**: Vavuniya, **MU**: Mullaitivu, **BT**: Batticaloa, **AM**: Ampara, **TR**: Trincomalee, **KM**: Kalmunai, **KR**: Kurunegala, **PU**: Puttalam, **AP**: Anuradhapura, **PO**: Polonnaruwa, **BD**: Badulla, **MO**: Moneragala, **RP**: Ratnapura, **KG**: Kegalle.

Data Sources:

Weekly Return of Communicable Diseases: Diphtheria, Measles, Tetanus, Neonatal Tetanus, Whooping Cough, Chickenpox, Meningitis, Mumps., Rubella, CRS,

Special Surveillance: AFP* (Acute Flaccid Paralysis), Japanese Encephalitis

CRS =**Congenital Rubella Syndrome

NA = Not Available

Take prophylaxis medications for leptospirosis during the paddy cultivation and harvesting seasons.

It is provided free by the MOH office / Public Health Inspectors.

Comments and contributions for publication in the WER Sri Lanka are welcome. However, the editor reserves the right to accept or reject items for publication. All correspondence should be mailed to The Editor, WER Sri Lanka, Epidemiological Unit, P.O. Box 1567, Colombo or sent by E-mail to **chepid@sltnet.lk. Prior approval should be obtained from the Epidemiology Unit before publishing data in this publication**

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