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Multi-centre Observational Study on Epidemiology, Treatment, and Outcome of Mucormycosis in India

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malignancy or hematopoietic stem cell transplant (HSCT) (11 patients), use of immunosuppressing medications (11 patients), and invasive procedures. (9 patients). At the time of diagnosis, only six patients were on an antifungal with mold activity. Eight patients died during hospitalization. The distribution of cases over time was compared with weather data for Colorado. A cluster of cases occurred in 2013 (6 cases) and in 2017 (8 cases). A majority of cases were diagnosed during the summer and fall months with July being the month with the most number of cases. There were higher levels of precipitation that occurred prior to or during the cluster of cases.

Conclusion. Cases of mucormycosis at UCH were associated with DM, hematologic malignancy/HSCT, use of immunosuppressive therapy, and invasive procedures. The increase of cases seen 2013 and 2017 occurred in the summer and fall months after higher levels of precipitation were observed in Colorado. Providers at UCH may consider modifying antifungal prophylaxis to include mold coverage in patients with >2 risk factors for mucormycosis who are admitted during the summer and fall.

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399. Multi-centre Observational Study on Epidemiology, Treatment, and Outcome of Mucormycosis in India

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Background. Though the rise in number of mucormycosis cases has been reported globally, the rise in India is alarming especially in uncontrolled diabetics. However, multiple gaps exist in the understanding of the disease in this country.

Methods. To describe the epidemiology, diagnosis, treatment practices, and outcome of mucormycosis in India. A single-arm prospective observational study was conducted in the network of 17 tertiary care centres across India during April 2016 through September 2017. All consecutive proven mucormycosis patients were enrolled in this study. Clinical data including risk factors, investigations, and treatment were collected. All isolates and histopathological specimens were sent to Mycology Reference Laboratory at Chandigarh for final identification (phenotypic and sequencing) and drug susceptibility testing.

Results. A total of 474 cases were enrolled between the study period. Rhino-orbito-cerebral mucormycosis was common (42.7%) presentation with 22.8% patients had brain involvement, followed by pulmonary (14.6%), cutaneous (11.8%), isolated renal (3.9%), and intra-abdominal (2.8%) mucormycosis. The underlying disease or predisposing factors were noted in 79.7% cases (84.9% diabetes mellitus, 12.9% steroids, 10.3% trauma or history of surgery, 9.7% malignancy, and 9.2% transplant). The most common agents isolated were *Rhizopus* species (75.9%, *R. arrhizus* [74.3%] and *R. homothallicus* [6.7%]) followed by *Apophysomyces variabilis* (7.4%), *Mucor* species (6%), and *Lichtheimia corymbifera* (4%). The patients were managed by medical therapy in 82.8%, surgery in 56.8% while 51.7% received combined medical and surgical management. Amphotericin B (96.8%) either lipid formulations (65.7%) or conventional form (39.1%) was the common antifungal used. The mortality of patients was 30.4%; of which, 80.3% patients died within 6 weeks of their diagnosis. 24.3% patients left hospital against medical advice while 50.1% survived.

Conclusion. Rhino-orbital-cerebral mucormysosis in uncontrolled diabetics is common presentation in India. *R. arrhizus* followed by *A. variabilis* are common species isolated from those patients. Survival was noted only in half of the patients despite increased awareness and diagnosis.

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400. The Frequency and Clinical Characteristics of Positive Galactomannan Assay Results in Patients With Mucormycosis

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Background. Discrepancies between histomorphologic finding and indirect test results such as galactomannan (GM) assay make diagnosis of invasive fungal infection difficult. We investigated the frequency and clinical characterisitics of positive GM assay results in patients with mucormycosis.

Methods. Patients who met the modified criteria for proven or probable mucormycosis and had serum and/or bronchoalveolar lavage (BAL) fluid GM assay result were enrolled at a tertiary hospital from July 2009 to October 2017. Proven mucormycosis was defined as histologic evidence of tissue invasion of hyphae with positive mucormycosis immunohistochemistry (IHC) test result and the recovery of agents of mucormycosis (*Rhizopus* spp., *Cunninghamella* spp., *Apophysomyces* spp., *Saksenaea* spp., *Absidia* spp., *Mucor* spp.) by culture from sterile specimens. Probable mucormycosis was defined as histologic evidence of tissue invasion of hyphae with positive mucormycosis IHC test result with or without recovery of agents of mucormycosis by culture from nonsterile specimens.

Results. Among 50 patients of proven or probable mucormycosis, 20 (40%) patients were positive for serum and/or BAL fluid GM assay results; 13 of 20 (65.0%) were positive in serum, nine of 12 (75.0%) were positive in BAL fluid, and two of 12 (16.7%) were positive in both. There were more patients with gastrointestinal infections (4 of 20 [20%] vs. 0 of 30 [0%], $P = 0.021$) and diagnosed as histomorphologically aspergillosis (6 of 20 [30%] vs. 1 of 30 [3%], $P = 0.012$) in GM positive group than GM negative group.

Conclusion. These results suggest that positive GM assay results are not uncommon in mucormycosis. GM assay results from the patients with mucormycosis appear to be related with gastrointestinal infections and histomorphologic diagnosis of aspergillosis. Further studies are needed on the mechanism of positive GM results in patients with mucormycosis and possible coinfection with other fungi such as *Aspergillus* species in these patients.

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401. *Pneumocystis jirovecii* Pneumonia in Renal Transplant Recipients After a 6-Month Trimethoprim–Sulfamethoxazole Prophylaxis: A Case–Control Study

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Background. *Pneumocystis jiroveci* pneumonia (PCP) is an important cause of morbidity and mortality in kidney transplant recipients (KTRs). Chemoprophylaxis with trimethoprim-sulfamethoxazole (TMP-SMX) is recommended about 6–12 months after solid-organ transplantation. However, PCP occasionally occurs after the recommended prophylaxis periods. The aim of this study was to investigate the incidence and risk factors for PCP in KTRs with 6-month TMP-SMX prophylaxis.

Methods. We performed a case–control study of adult patients diagnosed with PCP from 1999 to 2015 in a tertiary care hospital. All patients received 6-month PCP prophylaxis with TMP-SMX after kidney transplantation (KT). If there were rejection episodes, PCP prophylaxis was provided for additional 3 months. During the study period, CMV viremia was not indication of PCP prophylaxis because of the concern of the nephrotoxicity of TMP-SMX. We defined the classification of early or late-onset PCP as one year after transplantation.

Results. Among 3,941 kidney or pancreas-kidney transplant recipients, 67 (1.7%) patients developed PCP after the discontinuation of TMP-SMX prophylaxis. Among them, patients who was transferred from other hospitals ($n = 14$) and pancreas-kidney transplant recipients ($n = 6$) were excluded. Finally, 47 of KT PCP and 94 control patients were included. Of the 47 patients with PCP, 24 (51%) revealed early PCP while the remaining 23 (49%) exhibited late PCP. Duration of PCP prophylaxis was similar between case and control (median 6 months, respectively). In multivariate analysis, rejection (OR, 3.9; 95% CI, 1.4–11.1) and cytomegalovirus infection (OR, 2.4; 95% CI, 1.0–5.8) were independently associated with the development PCP after TMP-SMX prophylaxis. Rejection or CMV viremia were observed in 70% of patients with PCP patients. Time to development of PCP after rejection (median 6 months; IQR 5–19 months) was slightly shorter than that after CMV viremia (median 9 months; IQR 5–12 months), although this difference did not reach any statistical significance ($P = 0.18$).

Conclusion. Rejection and CMV viremia appear to be risk factors for the development of PCP after completing early transplantation period chemoprophylaxis. Our data suggest that at least 6- to 9-month chemoprophylaxis for PCP may be needed for KTRs with rejection or CMV viremia.

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402. Breakthrough *Pneumocystis jirovecii* Pneumonia Among Cancer Patients: Opportunity for Antimicrobial Stewardship?

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