

Post-lung Transplantation Fungal Infections: A Multicenter Real-World Analysis (2005–2024)

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BACKGROUND AND AIMS

Fungal infections remain a major cause of morbidity and mortality post-lung transplant due to the unique exposure of the allograft to the external environment and the intensity of immunosuppression. Single-center studies have described variable rates of fungal infections.¹ Contemporary population-level data with temporal trends, pathogen distribution, and associated outcomes are limited. Leveraging a large multicenter real-world dataset, the authors aimed to characterize incidence, prevalence, and clinical outcomes of fungal infections among adult lung-transplant recipients.²

MATERIALS AND METHODS

Data were obtained from the TriNetX™ (TriNetX, LLC, Cambridge, Massachusetts, USA) Global Collaborative Network (160

healthcare organizations). Adult lung-transplant recipients (≥ 18 years) were identified between 2005–2024, using International Classification of Diseases (ICD) and Current Procedural Terminology (CPT) procedure codes. Patients with solid organ transplants other than lung, combined-organ transplants, or stem-cell transplants, and patients with HIV were excluded. Patients with pre-transplant fungal infections were also excluded. Pre-transplant characteristics included demographics, comorbidities within a year, laboratory values within 7 days, and medication within 90 days before transplantation. Post-transplant fungal infections were identified using ICD-10 codes for *Aspergillus*, *Candida*, *Cryptococcus*, *Mucorales*, *Histoplasma*, *Blastomyces*, *Coccidioides*, and *Pneumocystis*. TriNetX platform was utilized for statistical analysis. Incidence and prevalence of infections, all-cause mortality, and transplant rejection were analyzed.

RESULTS

A total of 12,857 adult lung-transplant recipients were identified. The mean age at transplantation was 57.6 ± 13.4 years, with a male predominance of 57%, and majority were White (65%). Average BMI was 26.8 ± 5.7 kg/m². The most common pulmonary conditions were COPD (15%), pulmonary fibrosis (17%), pulmonary hypertension (9%), bronchiectasis (3%), and cystic fibrosis (3%). Pre-transplant fungal and viral screening assays were rarely available ($<1\%$). Medication exposure within 90 days prior to transplant demonstrated prednisone prescription (17%), methylprednisolone (7%), tacrolimus (6%), and mycophenolate mofetil (7%). Azathioprine and basiliximab were used in 2% each. Systemic antifungals

(voriconazole, posaconazole, or fluconazole) in approximately 1% each.

The overall incidence of post-transplant fungal infection was 3% across the full study period, rising to 7% in the modern era (2015–2024). Most frequently identified pathogens were *Candida spp.* (4.8%) and *Aspergillus spp.* (2.9%), followed by *Pneumocystis Jirovecii* (0.5%). Infection rates increased from 22 per 1,000 (2005–2014) to 75 per 1,000 (2015–2024; [Table 1](#)).

CONCLUSION

In this large multicenter cohort of adult lung-transplant recipients, the incidence of post-transplant fungal infections increased substantially in the modern transplant era. The rise from 22 per 1,000 recipients in 2005–2014 to 75 per 1,000 recipients in 2015–2024 likely reflects a combination of improved fungal diagnostics, more systematic post-transplant surveillance, better electronic health record capture, and longer survival after transplantation, allowing more time for

Table 1: Incidence and prevalence of fungal infections in lung transplant recipients.

Fungal pathogen	Incidence (%) 2005–2014	Prevalence (%) 2005–2014	Incidence (%) 2015–2024	Prevalence (%) 2015–2024	Relative change (post-2015)	Cases per 1,000 (2015–2024)
<i>Aspergillus spp.</i>	0.86	0.86	2.81	2.91	↑ 3.3×	29
<i>Candida spp.</i>	1.38	1.38	4.60	4.84	↑ 3.3×	48
<i>Cryptococcus spp.</i>	0.14	0.14	0.13	0.14	↓ 1.1×	1
<i>Histoplasma spp.</i>	0.14	0.14	0.14	0.16	Stable	2
<i>Blastomyces spp.</i>	0.00	0.00	0.08	0.08	New detection	1
<i>Coccidioides spp.</i>	0.00	0.00	0.11	0.11	New detection	1
<i>Mucorales spp.</i>	0.14	0.14	0.16	0.17	↑ 1.2×	2
<i>Pneumocystis jirovecii</i>	0.14	0.14	0.51	0.51	↑ 3.7×	5
Any fungal infection	2.20	2.20	7.13	7.48	↑ 3.2×	75

Because infections were assessed only during the post-transplant period and typically represented single discrete events, reported incidence and prevalence values are nearly identical within each era. In TriNetX™ (TriNetX, LLC, Cambridge, Massachusetts, USA), prevalence is cumulative within the same observation window, which overlaps with incidence when events occur acutely.

opportunistic infections to emerge.^{3,4} *Candida* and *Aspergillus* were the most identified fungal pathogens, consistent with the high susceptibility of lung-transplant recipients to airway colonization, invasive mold infection, and opportunistic infections related to intense immunosuppression.

The authors' study highlights a rising burden of fungal infections among lung-transplant recipients with potential implications for early post-transplant surveillance and antifungal prophylaxis strategies.

References

1. Chang A et al. Epidemiology of invasive fungal infections in lung transplant recipients in Western Australia. *Transpl Infect Dis.* 2019;21(3):e13085.
2. Wahab A et al. Post lung transplantation fungal infections: a multicenter real-world analysis (2005-2024). Poster 918. ATS International Conference, May 15-20, 2026.
3. Hosseini-Moghaddam SM et al. Incidence and outcomes of invasive fungal infection among solid organ transplant recipients: a population-based cohort study. *Transpl Infect Dis.* 2020;22(2):e13250.
4. Baker AW et al. Invasive fungal infection after lung transplantation: epidemiology in the setting of antifungal prophylaxis. *Clin Infect Dis.* 2020;70(1):30-9.