CASE REPORT

# Disseminated nocardia in a 12-year-old girl with immune complex mesangiocapillary glomerulonephritis: A case report

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## ABSTRACT

Nocardia is an uncommon opportunistic organism that mainly infects immunocompromised patients. These Gram-positive, aerobic, branching filamentous actinomycetes may cause nocardiosis, a potentially lethal infection with the ability to spread to multiple organs, including the lungs, brain, spinal cord, and skin. We report a case of a 12-year-old girl with mesangiocapillary glomerulonephritis on immunosuppressive treatment who presented with fever and respiratory distress requiring mechanical ventilation, followed by seizures. High-resolution CT chest showed consolidation of the left lung with internal necrosis, while MRI brain revealed many irregular ring-enhancing lesions. Microbiological culture of the brain biopsy and brain pus samples grew Nocardia species. The child showed quick neurological improvement after start of trimethoprim-sulfamethoxazole and obtained complete resolution within 12 months. This case underscores the clinical significance of considering nocardiosis in children on immunosuppressive treatment and highlights the value of early imaging, microbiological, and pathological assessment for early diagnosis and optimal management of disseminated disease.

**Keywords:** Actinomycetes, Brain abscess, Immunocompromised, Nocardiosis

## BACKGROUND

Nocardia, an uncommon, opportunistic bacterial species that leads to nocardiosis, particularly in immunocompromised individuals.[1] These Gram-positive, aerobic, catalase-positive branching actinomycetes can disseminate to the lungs, brain, skin, and other bodily organs in disseminated nocardiosis. Early diagnosis through imaging, microbiological, and pathological assessments is important, principally in patients receiving immunosuppressive treatment.[2, 3]

We herein present a case of disseminated nocardiosis in a 12-year-old girl who was receiving immunosuppressive treatment for mesangiocapillary glomerulonephritis.

## CASE REPORT

A 12-year-old girl presented with a 10-day history of sore throat and generalized swelling. She had hypertension (blood pressure, 142/94 mmHg), anemia (hemoglobin of 9.1 g/dl), proteinuria (3+), and impaired renal function (serum creatinine increasing from 1.04 mg/dl to 3.9 mg/dl) during hospitalization. Renal biopsy revealed immune complex-mediated mesangiocapillary glomerulonephritis (MCGN) with crescent formation. She was treated with intravenous methylprednisolone for five days followed by oral prednisolone and two doses of cyclophosphamide.

One week after the second dose, she developed high-grade fever, respiratory distress, and septic shock, necessitating ICU admission and mechanical ventilation. Investigations showed leukopenia (WBC count of $0.7\times10^9$/L), severe neutropenia (245/µL), and rising creatinine (3.9 mg/dL) levels. Chest X-ray showed consolidation of the left upper lobe and abscess formation. Sputum cultures revealed multidrug-resistant *Acinetobacter* and later on, blood cultures grew *Candida* species, which were treated with vancomycin, colistin, meropenem, and fluconazole.

Despite initial improvement, she later presented with respiratory distress and was found to have a left hydropneumothorax and necrotizing pneumonia. HRCT showed a gross pyopneumothorax with lung collapse and mediastinal shift (Figure-I). Sputum culture and modified Ziehl-Neelsen staining confirmed *Nocardia* species. She was started on linezolid, amikacin, and

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trimethoprim-sulfamethoxazole (TMP-SMX), followed by surgical decortication.

During recovery, she developed seizures, hemiparesis, and aphasia. Brain MRI revealed multiple abscesses in the bilateral frontal, right parietal, and left occipital lobes, consistent with disseminated nocardiosis (Figure-II). Craniotomy with abscess drainage was performed, and cultures again confirmed *Nocardia*. With continued antimicrobial therapy, her neurological deficits resolved and renal function returned to baseline. She completed 12 months of TMP-SMX therapy and made a full recovery.

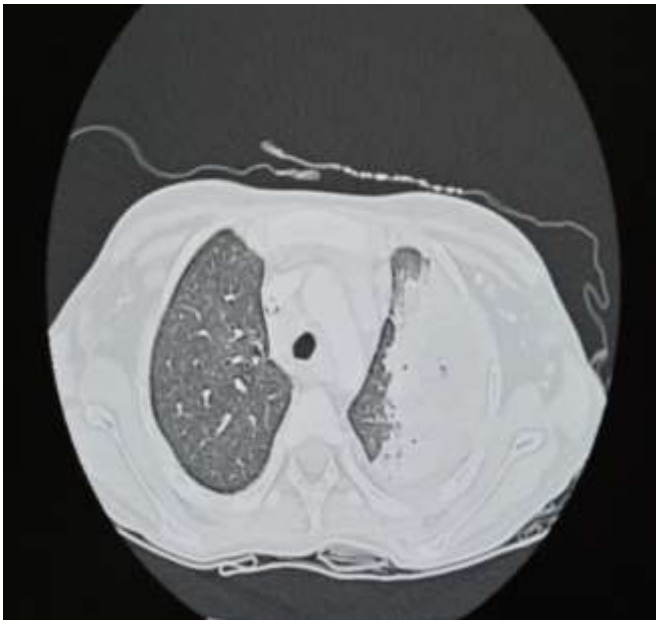

**Figure-I: High resolution CT scan showing extensive consolidation of left lung.**

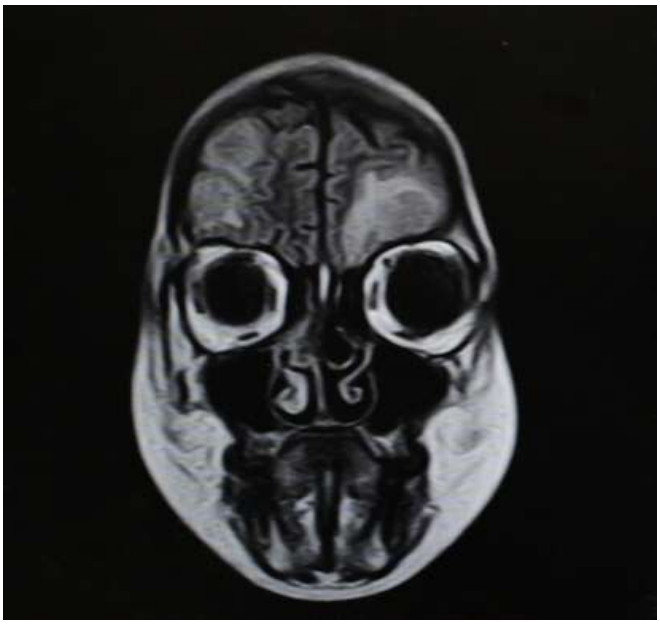

**Figure-II: MRI brain with contrast showing multiple rings enhancing lesions in bilateral frontal lobe.**

## DISCUSSION

Nocardiosis is uncommon in pediatric populations and is usually seen in immunocompromised hosts.[1] The *Nocardia* genus, first described by Edmond Nocardia in 1888, comprises aerobic, catalase-positive, filamentous actinomycetes found in soil and decaying organic matter. Infection typically occurs via inhalation, with the lungs being the primary site, and may disseminate hematogenously to the skin or central nervous system (CNS).[1-3]

Disseminated nocardiosis most often occurs in patients with impaired cell-mediated immunity. Key risk factors include corticosteroid use, organ transplantation, malignancy, chronic pulmonary disease, and autoimmune conditions requiring immunosuppression. Among these, corticosteroid therapy is particularly significant.[4,5]

Clinical manifestations depend on the organ involved. Pulmonary disease often mimics bacterial pneumonia or tuberculosis, presenting with cough, fever, and cavitary lesions. Other differentials of pulmonary nocardiosis include lung abscess, septic pulmonary emboli, actinomycosis, *Rhodococcus equi* infection, and invasive fungal infections including aspergillosis, histoplasmosis, cryptococcosis, and blastomycosis. Non-infectious conditions that may resemble pulmonary nocardiosis include primary lung carcinoma, metastases, pulmonary vasculitis such as granulomatosis with polyangiitis, sarcoidosis, and pulmonary infarction, particularly when imaging shows cavitary lesions, nodules, or consolidation. CNS involvement occurs in about 40–45% of disseminated cases, often presenting as headaches, seizures, or focal neurological deficits.[6,7] Ring-enhancing lesions of the brain have a wide differential diagnosis that includes infectious, neoplastic, inflammatory, demyelinating, vascular, and other causes. Other common infectious etiologies include pyogenic brain abscess, tuberculoma, neurocysticercosis, toxoplasmosis (particularly in immunocompromised patients), and fungal infections such as aspergillosis or cryptococcosis.[6,7]

Diagnosis requires a high index of suspicion and specialized laboratory testing, as *Nocardia* species can be slow-growing and may be missed on routine cultures. Modified Ziehl-Neelsen staining and culture on selective media remain the diagnostic standards.

TMP-SMX is the drug of choice due to its high efficacy and tissue penetration.[8] *Nocardia* species generally

show good susceptibility to sulfonamides, linezolid, imipenem, amikacin, and amoxicillin-clavulanate. The duration of treatment depends on the infection site and immune status. Localized infections may resolve with 3–6 months of therapy, whereas CNS or disseminated infections typically require at least 6–12 months of treatment.[9-11]

This case is notable for the rapid onset of disseminated nocardiosis shortly after immunosuppressive therapy for MCGN. The remarkably short duration between the start of cyclophosphamide and the onset of infection highlights the deep impact of immunosuppression on host immunity. Early surgical treatment in the form of thoracotomy and craniotomy and compliance with extended antibiotic treatment were critical for complete recovery.

## Conclusion

*Nocardia* infection can easily be misdiagnosed in immunocompromised patients due primarily to its nonspecific signs and symptoms. Clinicians should keep a high index of suspicion in patients presenting with intractable pneumonia, neurological symptoms, or abscess formation in patients on corticosteroid or cytotoxic treatment. Early and accurate diagnosis and extended antimicrobial treatment are imperative for favorable outcomes in disseminated nocardiosis.

## CONFLICT OF INTEREST

None

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Declared none

## AUTHOR CONTRIBUTION

**Mir Alyaan Hashmi:** Study conception, data collection, manuscript writing, critical revisions, final approval, accountable for all aspects of publication.

**Habib Qaiser:** Critical revisions, manuscript writing, critical revisions, final approval, accountable for all aspects of publication.

**Muhammad Mubarak:** Critical revisions, critical revisions, final approval, accountable for all aspects of publication.

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