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CASE REPORT

Culture and sensitivity analysis in rhinitis atrophic: case series

Shelly Tjahyadewi[1], Rahayu Rahayu[2], Rano Aditomo[1], Agung Sulistyanto[1], Nurfauziati Pasaribu[3]

[1]Department of Otorhinolaryngology-Head and Neck, Faculty of Medicine, Universitas Islam Sultan Agung, Semarang, Central Java, Indonesia
[2]Department of Microbiology, Faculty of Medicine, Universitas Islam Sultan Agung, Semarang, Central Java, Indonesia
[3] Study Program of Medical Doctor Profession, Faculty of Medicine, Universitas Islam Sultan Agung, Semarang, Central Java, Indonesia
*Correspondence: Shelly Tjahyadewi; Address: Department of Otorhinolaryngology-Head and Neck Faculty of Medicine, Universitas Islam Sultan Agung, Semarang, Central Java, Indonesia; Email address:shelly.tjahyadewi@gmail.com

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ABSTRACT

Atrophic rhinitis is a rare condition affecting the nasal mucosa, characterized by progressive nasal congestion, foul odor, and thick nasal secretions. It is classified into two types: primary (idiopathic), where the cause remains unknown, and secondary, which develops due to another underlying condition. Primary atrophic rhinitis, often called ozaena (from the Greek word for "stench"), has also been described as acute necrotizing rhinitis, catarrhal atrophic rhinitis, or coryza foetida. This condition predominantly affects women, with a reported ratio of 6:1.5. It is more prevalent in tropical regions and among populations with low socioeconomic status and poor hygiene, although its exact etiology remains unclear. Diagnosis is primarily clinical, based on a triad of symptoms: fetor, greenish nasal crusts, and an abnormally wide nasal cavity, often observed in advanced cases. This case series presents two rare instances of atrophic rhinitis, highlighting distinct characteristics and risk factors while contributing valuable insights into understanding this uncommon disorder.

1. Introduction

Atrophic rhinitis is a chronic degenerative nasal condition defined by a classic triad of progressive atrophy of the nasal mucosa, crust formation, and a pronounced foul odor (Sumaily *et al.*, 2023). This disorder, also referred to as acute necrotizing rhinitis, catarrhal atrophic rhinitis, or coryza foetida, is classified into primary and secondary forms. Primary atrophic rhinitis occurs spontaneously and progresses gradually, while secondary atrophic rhinitis stems from underlying factors such as rhinoplasty, radiation therapy, or granulomatous disorders. Women are predominantly affected, with a ratio of 6:1.5 (Mishra *et al.*, 2020). It is more prevalent in tropical regions (Sarkar *et al.*, 2022; Somani, 2017) and among individuals from low socioeconomic backgrounds with inadequate hygiene (Syarifa *et al.*, 2020).

Numerous factors have been linked to the development of atrophic rhinitis, including nutritional deficiencies (e.g., iron, vitamins, proteins), autonomic dysfunction, endocrine imbalances (particularly a shortage of estrogen), immunological dysfunction, and biofilm formation (Somani, 2017). Despite these associations, no definitive causative factor has been established. The diagnosis of atrophic rhinitis relies on clinical features, characteristic odor, greenish crusts, and enlarged nasal cavities. Imaging techniques, such as computed tomography (CT) scans of the paranasal sinuses, can aid in excluding secondary causes (Ly *et al.*,

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2009), while additional evaluations, including complete blood counts and nutritional assessments, are essential for ruling out anemia, infections, or malnutrition (Dutt & Kameswaran, 2005).

The treatment of atrophic rhinitis includes both local and systemic therapies. Nasal irrigation is a key treatment, with saline solutions improving mucociliary clearance (El-Barbary *et al.*, 1970; Sumaily *et al.*, 2023). Targeted systemic antibiotic therapy based on culture results, such as tetracycline, aminoglycosides, or ciprofloxacin, has proven effective (Chhabra & Houser, 2009; Moore & Kern, 2001; Leong, 2015). Nutritional supplements, including iron, zinc, and vitamins A and D, may improve outcomes. In severe cases, surgical interventions aim to restore nasal physiology and alleviate symptoms, comorbidities, and overall quality of life (Thamboo *et al.*, 2020; Kamedien *et al.*, 2020).

Although atrophic rhinitis is rare in Indonesia, its incidence remains undocumented. This study investigates two cases of atrophic rhinitis—a primary case and a secondary one—focusing on differences in risk factors, treatment approaches, and outcomes. These cases also compare cultural and sensitivity findings concerning this uncommon but significant condition.

2. Case(s)

2.1. Case 1

A 46-year-old female patient presented to the Ear, Nose, and Throat (ENT) clinic at Sultan Agung Islamic Hospital with a one-year history of progressive anosmia, which culminated in a complete loss of smell over the last month. The former furniture craftsman patient reported chronic exposure to wood dust during her employment. She also experienced recurrent epistaxis, nasal discharge, intermittent dizziness, sore throat, and a foul-smelling purulent nasal discharge described as resembling a rotten odor. There was no history of allergies in the patient or her family.

Nasal endoscopy revealed mucopurulent discharge, significant atrophy of the nasal mucosa, and middle and inferior conchae bilaterally. Yellowish-green crusts and open osteomeatal complexes were also observed (Figure 1). A CT scan of the paranasal sinuses demonstrated right frontal sinusitis, bilateral maxillary sinusitis, bilateral ethmoiditis, right sphenoiditis, leftward nasal septal deviation, and conchal hypertrophy.

Microbiological analysis of surgical tissue specimens identified Gram-negative rod-shaped bacteria with a positive culture for Klebsiella pneumoniae (Figure 2). Sensitivity testing showed the isolate was susceptible to a broad range of antibiotics, including amoxicillin-clavulanic acid, ceftriaxone, levofloxacin, and meropenem. The patient was managed conservatively with nasal irrigation, antibiotics (isoniazid 1 × 100 mg), and vitamin D supplementation.

This case highlights the association between chronic occupational exposure to wood dust and the development of sinonasal pathology, emphasizing

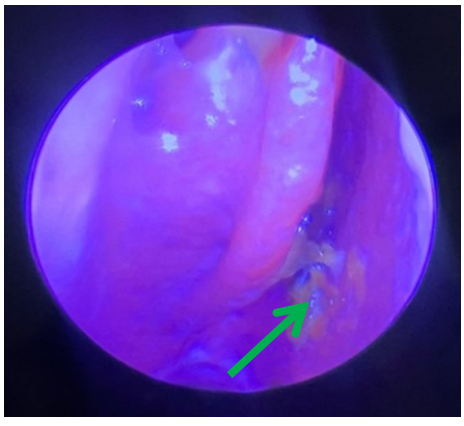
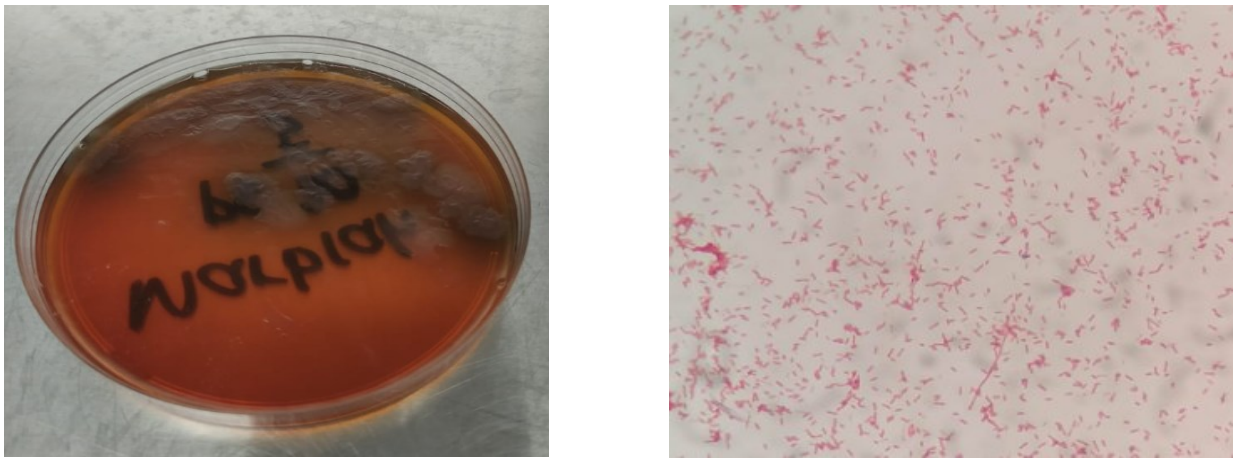
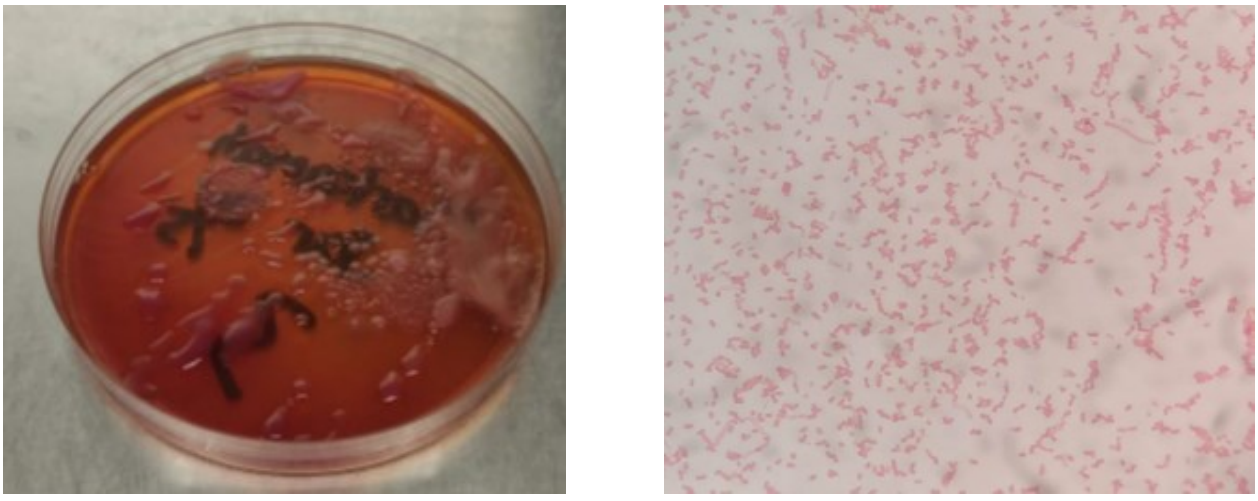


Figure 1. Nasal Endoscopy of the patient in case 1 (Green arrow shows the Yellowish-green crusts and open osteomeatal complexes)



(a) (b)

Figure 2. Microbiological analysis of surgical tissue specimens of the patients in case 1: (a) Culture, (b) Microscopic analysis of the Klebsiella pneumoniae



(a) (b)

Figure 4. Microbiological analysis of surgical tissue specimens of the patients in case 2: (a) Culture, (b) Microscopic analysis of the Klebsiella pneumoniae

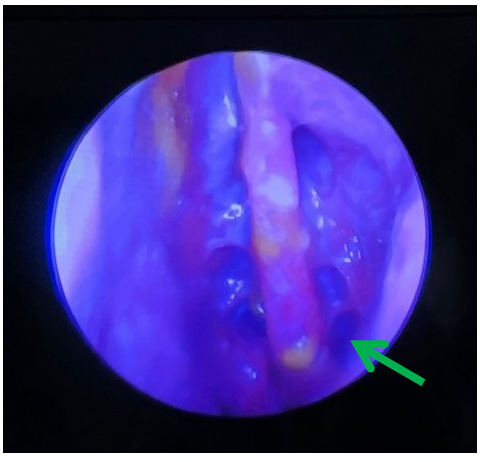


Figure 3. Nasal Endoscopy of the patient in case 2 (Green arrow shows the Yellowish-green crusts and open osteomeatal complexes)

the importance of thorough clinical, microbiological, and imaging evaluations in diagnosing and managing complex cases of atrophic rhinitis with secondary bacterial infection.

2.2. Case 2

A 66-year-old female patient presented to the ENT clinic at Sultan Agung Islamic Hospital with a three-year history of a persistent, strong foul nasal odor accompanied by intermittent thick green nasal discharge, nausea, vomiting, headaches, and dizziness. The symptoms initially began 12 years ago with recurrent colds and foul-smelling rhinitis that progressively worsened. The patient reported no nasal obstruction, facial pain, or postnasal drip. Her medical history included two rhinoplasty procedures in 2012 and 2019 but was otherwise unremarkable for allergies, hypertension, or diabetes mellitus.

Nasal endoscopy revealed bilateral mucopurulent discharge, atrophy of the nasal mucosa, and middle and inferior nasal conchae. Yellowish-green dry crusts and open osteomeatal complexes were observed in both nasal cavities (Figure 3). CT imaging of the paranasal sinuses showed evidence of bilateral maxillary, ethmoid, and sphenoid sinusitis, nasal septal deviation to the right, conchal hypertrophy, and bilateral osteomeatal complex obliteration.

Microbiological analysis of surgical tissue specimens revealed Gram-negative rod-shaped bacteria, with a positive culture for Klebsiella pneumoniae (Figure 4). Antibiotic sensitivity testing demonstrated susceptibility to sulbactam-cefoperazone, piperacillin-tazobactam, gentamicin, amikacin, meropenem, and trimethoprim-sulfamethoxazole.

The patient was managed conservatively with nasal irrigation, antibiotics (isoniazid 1 × 100 mg), and vitamin D supplementation. This case emphasizes the role of detailed clinical, endoscopic, and microbiological evaluations in managing chronic sinonasal infections, particularly in patients with a history of nasal surgery and recurrent symptoms.

3. Discussion

Environmental factors play a significant role in developing atrophic rhinitis (ozaena). Studies have shown that 69.6% of patients live in suburban areas with hot, dry, and dusty environments, and 43.5% are industrial workers. Chronic exposure to irritants, such as industrial dust, is believed to contribute to the disease. In the case 1, the patient worked as a furniture craftsman, a profession characterized by significant exposure to particulate matter. Prolonged exposure to wood dust can harm the nasal mucosa, ranging

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from ciliary dysfunction to severe structural changes, including mucosal gland hyperplasia, increased trophic cell activity, and pathological abnormalities such as squamous cell metaplasia or carcinoma in situ.

The earliest effect of dust exposure on the nasal mucosa is ciliary dysfunction. The nasal mucociliary transport rate (NMTR) slows, delaying particle evacuation into the choana. This disruption allows particles to remain trapped in the mucosa, potentially penetrating it and causing abnormalities (Syarifa *et al.*, 2020).

Case 2 highlights the association between rhinoplasty and atrophic rhinitis. Atrophic rhinitis can be classified into two types: primary and secondary. Primary atrophic rhinitis arises spontaneously, develops slowly, and is attributed to nonspecific etiologies such as hereditary or infectious factors. Conversely, secondary atrophic rhinitis results from conditions such as chronic rhinosinusitis, granulomatous diseases, overly aggressive nasal or sinus surgeries, trauma, or radiation therapy. Common clinical findings in both types include nasal crusting, mucosal atrophy, paradoxical nasal congestion, enlarged nasal cavities, and nasal turbinate resorption (Bernát, 1968).

Both cases were managed conservatively with nasal irrigation using physiological saline (NaCl 0.9%), isoniazid (300 mg daily), and vitamin D supplementation. Nasal irrigation is a cornerstone of treatment for atrophic rhinitis, as it helps restore mucociliary function. Vitamin D supplementation has positively influenced outcomes in atrophic rhinitis patients (Ghallab *et al.*, 2020).

As observed in these cases, the prevalence of atrophic rhinitis in women aligns with previous studies, suggesting a possible hormonal component. Abdelhakem *et al.* reported that most atrophic rhinitis patients are female, with a male-to-female ratio 1:3. Kapoor *et al.* (2022) confirmed a similar trend, noting a female predominance 2.5:1.

Advancements in the treatment of atrophic rhinitis remain limited compared to other rhinitis types, such as allergic rhinitis, which benefits from antihistamines, intranasal steroids, immunotherapy, and biologics (Sandbhor & Jain, 2023; Horiuchi, 2023). Emerging therapies targeting epigenetic changes, including histone deacetylase inhibitors, DNA methyltransferase inhibitors, and microRNA mimetics, offer the potential for addressing underlying mechanisms (Sumaily *et al.*, 2023). Additionally, the use of Lactococcus lactis strain plasma (LC-Plasma) to induce plasmacytoid dendritic cells and enhance Th1 responses shows promise in suppressing Th2 hypersensitivity conditions related to rhinitis atrophica (Gigante *et al.*, 2020).

Conservative measures, including improved hygiene, balanced nutrition, and smoking cessation, remain critical for preventing and managing rhinitis atrophic. While therapeutic options for this condition continue to evolve, integrating pharmacological, epigenetic, and lifestyle approaches may offer new avenues for more effective management of this challenging condition.

4. Conclusions

This report highlights two cases of atrophic rhinitis with similar symptoms but distinct etiologies. The first case was attributed to environmental exposure in a work setting, while the second was associated with prior nasal surgeries, which is characteristic of secondary atrophic rhinitis. These cases underscore that the clinical presentations and risk factors for primary and secondary atrophic rhinitis align with findings from previous studies.

In both cases, microbiological analysis revealed Klebsiella pneumoniae as the causative organism, with Gram-negative rod-form bacteria identified on Gram staining. Antibiotic sensitivity testing confirmed the bacteria's susceptibility to several antibiotics, providing valuable insights for targeted therapy. These findings emphasize the importance of identifying specific risk factors, utilizing microbiological testing, and applying appropriate conservative and antimicrobial treatment to optimize outcomes for patients with atrophic rhinitis.

Conflict of interest

All authors have no conflict of interest in this article.

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