

Respiratory Adverse Drug Reaction Profile at a Rural Tertiary Care Hospital: A Five-Year Retrospective Study

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Abstract: Introduction: Respiratory adverse Drug Reactions (ADRs) are important safety concerns that require timely recognition and reporting. Objective: To characterize respiratory ADRs reported at Pravara Rural Hospital, Loni, with respect to patient demographics, clinical manifestations and suspected causative drugs. Methods: A descriptive retrospective study analyzed 208 respiratory ADR reports submitted between December 2020 and December 2025. Data were summarized using descriptive statistics and expressed as frequencies and percentages. Results: Males accounted for 112 reports (53.8%) and females for 96 (46.2%). Patients aged 60–80 years constituted 46% of cases. Rebound nasal congestion was the most frequently reported reaction (81; 38.9%), followed by dry cough (54; 26.0%), dysphonia (45; 21.6%), and dyspnoea (28; 13.5%). Rebound congestion was primarily associated with xylometazoline and oxymetazoline. Angiotensin-converting enzyme inhibitors were chiefly associated with dry cough, inhaled corticosteroids with dysphonia, and ACE inhibitors, beta-blockers, and non-steroidal anti-inflammatory drugs with dyspnoea. Conclusion: The observed respiratory ADRs showed consistent drug-specific associations, supporting causality assessment under the Pharmacovigilance Programme of India (PvPI).

Keywords: Respiratory adverse drug reactions, pharmacovigilance, rhinitis, cough, dyspnoea

1. Introduction

Suspected adverse drug reactions involving the respiratory tract can present as symptoms that overlap with the illnesses for which patients seek treatment. Nasal obstruction, cough, voice change and breathlessness may therefore require a review of medicine exposure alongside assessment of the underlying disease. In India, the Pharmacovigilance Programme of India (PvPI) provides a framework for reporting and evaluating suspected ADRs. Institutional reporting contributes information about the types of reactions recognised in routine care and can support local patient-safety activities. [1]

Several commonly used medicine classes have documented associations with respiratory symptoms. Prolonged use of topical nasal vasoconstrictors has been associated with rebound swelling and nasal hyperreactivity. [2] Angiotensin-converting enzyme inhibitors (ACEIs) can cause cough; a randomised comparison in patients with previous ACEI-related cough found more cough with lisinopril than with losartan or hydrochlorothiazide. [3] Inhaled corticosteroid (ICS) exposure has also been associated with dysphonia in a large case-control study. [4] These associations provide pharmacological context for investigating compatible symptoms, although they do not establish causality in an individual report.

Breathlessness is particularly challenging to interpret because it is a symptom rather than a specific pathological diagnosis. Evidence from patients with asthma and cardiovascular

disease indicates that respiratory effects differ between non-selective and cardio-selective beta-blockers. [5] Aspirin challenge studies have demonstrated altered airway mediator responses in aspirin-sensitive asthma. [6] Consequently, a report linking dyspnoea to a medicine requires details of the clinical phenotype, timing, underlying disease and alternative explanations.

A retrospective description of institutional reports can identify which respiratory complaints are most frequently recognised and which medicines are commonly suspected. Such a study is useful for selecting local medication-review priorities, but its findings depend on reporting practices and cannot directly measure the risk among all exposed patients. The present study aimed to describe the demographic distribution, symptom pattern and suspected drug associations of respiratory ADR reports from a rural tertiary care hospital in Loni, Maharashtra.

2. Literature Survey

Previous studies have established associations between commonly used medications and respiratory adverse drug reactions (ADRs).

Graf reported that prolonged use of topical nasal decongestants, particularly oxymetazoline and xylometazoline, may induce rebound nasal congestion, tolerance, and nasal hyperreactivity [2, 8].

Ramsay and Yeo demonstrated a higher occurrence of cough with lisinopril compared with losartan and hydrochlorothiazide in patients with a previous history of ACE inhibitor-associated cough [3].

Naunheim et al. reported a significant association between inhaled corticosteroid use and dysphonia [4]. Furthermore, Morales et al. highlighted the differential respiratory effects of beta-blockers, particularly in patients with asthma and cardiovascular disease [5], while Szczeklik et al. demonstrated altered airway inflammatory mediator responses in aspirin-sensitive asthma following aspirin challenge [6].

The WHO–Uppsala Monitoring Centre system provides a standardised framework for assessing suspected drug-related causality [7]. Collectively, these studies establish the pharmacological basis for investigating respiratory ADRs; however, systematic characterisation of their reported patterns in rural tertiary care settings remains important for strengthening institutional pharmacovigilance and promoting rational drug use.

3. Problem Definition

Respiratory adverse drug reactions (ADRs) are clinically significant drug-safety concerns that may be difficult to distinguish from underlying respiratory disorders.

Limited institutional data on their reported patterns and suspected drug associations in rural tertiary care settings necessitate systematic evaluation to strengthen pharmacovigilance and promote rational drug use.

Research Question

What is the pattern of reported respiratory ADRs and their suspected drug associations in a rural tertiary care hospital over five years?

4. Methodology / Approach

Study design and setting

A retrospective descriptive study was conducted using ADR reports submitted from Pravara Rural Hospital, Loni, Maharashtra, India, associated with Dr. Balasaheb Vikhe Patil Rural Medical College, Pravara Institute of Medical Sciences (Deemed to be University). The analysis focused on reports documenting suspected respiratory adverse reactions.

Data source and report selection

The study dataset comprised 208 respiratory ADR reports. The source records were institutional ADR reports rather than a cohort assembled from all patients receiving the suspected medicines.

Causality severity and outcomes

The reported drug–reaction relationships were treated as suspected associations. A recognised drug association alone was not used to assign a causality category. The WHO–Uppsala Monitoring Centre framework considers the case history, chronology, alternative explanations and available information on withdrawal or re-exposure; it cannot prove a drug–event connection.

Statistical analysis

Categorical data were summarised using frequencies and percentages

5. Results and Discussion

Demographic distribution

A total of 208 respiratory ADR reports were included. Reports involving male patients numbered 112 (53.8%), whereas 96 reports (46.2%) involved female patients (Table 1). Patients aged 60–80 years constituted the largest reported age category, accounting for approximately 46% of reports.

Table 1: Sex distribution of respiratory ADR reports

Recorded sex	Number	Percentage
Male	112	53.8
Female	96	46.2
Total	208	100

Pattern of respiratory reactions

Rebound nasal congestion was the most frequently reported manifestation, occurring in 81 reports (38.9%). Dry cough was recorded in 54 (26.0%), dysphonia in 45 (21.6%), and dyspnoea in 28 (13.5%) (Table 2). Rebound nasal congestion and dry cough together accounted for 135 reports (64.9%).

Table 2: Distribution of reported respiratory manifestations

Reaction	Number	Percentage
Rebound nasal congestion	81	38.9
Dry cough	54	26
Dysphonia	45	21.6
Dyspnoea	28	13.5
Total	208	100

Suspected drug associations

Rebound nasal congestion was reported as almost exclusively associated with xylometazoline and oxymetazoline. ACEIs were the principal suspected drugs for dry cough, while dysphonia was predominantly associated with ICS. Dyspnoea had a broader range of suspected associations, including ACEIs, beta-blockers and NSAIDs (Table 3).

Table 3: Qualitative associations between symptoms and suspected medicines

Manifestation	Suspected medicines and reported pattern
Rebound nasal congestion	Almost exclusively linked to xylometazoline and oxymetazoline
Dry cough	ACEIs were the principal suspected medicine class
Dysphonia	Predominantly associated with ICS
Dyspnoea	Associated with ACEIs, beta-blockers and NSAIDs

ACEI, angiotensin-converting enzyme inhibitor; ICS, inhaled corticosteroid; NSAID, non-steroidal anti-inflammatory drug. Drug-specific counts were not available.

6. Conclusion

Among 208 institutional reports of suspected respiratory ADRs, rebound nasal congestion was the most frequent manifestation, followed by dry cough, dysphonia, and dyspnoea.

The main suspected medicines/classes were topical nasal decongestants, ACE inhibitors, inhaled corticosteroids, beta-blockers, and NSAIDs.

These descriptive findings identify local priorities for medication review and systematic ADR documentation, but do not establish individual causality or drug-specific incidence.

7. Future Scope

Future research should employ prospective, multicentre pharmacovigilance studies with standardised adverse drug reaction reporting and appropriate drug-exposure denominators to validate the observed patterns of respiratory adverse drug reactions. Detailed clinical assessment, structured causality evaluation, and longitudinal follow-up may help clarify drug-event associations, identify risk factors, and determine clinical outcomes. Integration of electronic health records and prescription data could further improve signal detection, risk stratification, and the early identification of potentially preventable drug-induced respiratory adverse reactions.

8. Limitations

The retrospective report-based design is vulnerable to incomplete ascertainment, selective reporting and missing clinical details

The absence of an exposed population denominator precludes incidence, prevalence and comparative drug-risk estimates. The study is institution based and the findings may not be generalizable to other health care institutions and patient population.

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Ethical Approval: Approved by Institutional Ethics Committee according to the approved study protocol.

Data Availability: The analyzed dataset is available from corresponding author subject to institutional and ethical requirements.

References

- [1] Indian Pharmacopoeia Commission. Pharmacovigilance Programme of India: guidance documents [Internet]. Ghaziabad: Indian Pharmacopoeia Commission; [cited

2026 Oct 17]. Available from: <https://www.ipc.gov.in/PvPI/toolkit.html>

- [2] Graf P. Long-term use of oxy- and xylometazoline nasal sprays induces rebound swelling, tolerance, and nasal hyperreactivity. *Rhinology*. 1996;34(1):9-13. PMID: 8739860.
- [3] Ramsay LE, Yeo WW; Losartan Cough Study Group. Double-blind comparison of losartan, lisinopril and hydrochlorothiazide in hypertensive patients with a previous angiotensin converting enzyme inhibitor-associated cough. *J Hypertens Suppl*. 1995;13(1):S73-6. doi:10.1097/00004872-199507001-00011.
- [4] Naunheim MR, Huston MN, Bhattacharyya N. Voice disorders associated with the use of inhaled corticosteroids. *Otolaryngol Head Neck Surg*. 2023;168(5):1034-7. doi:10.1002/ohn.198.
- [5] Morales DR, Lipworth BJ, Donnan PT, Jackson C, Guthrie B. Respiratory effect of beta-blockers in people with asthma and cardiovascular disease: population-based nested case control study. *BMC Med*. 2017;15(1):18. doi:10.1186/s12916-017-0781-0.
- [6] Szczeklik A, Sladek K, Dworski R, Nizankowska E, Soja J, Sheller J, et al. Bronchial aspirin challenge causes specific eicosanoid response in aspirin-sensitive asthmatics. *Am J Respir Crit Care Med*. 1996;154(6 Pt 1):1608-14. doi:10.1164/ajrccm.154.6.8970343.
- [7] World Health Organization. The use of the WHO-UMC system for standardised case causality assessment [Internet]. Geneva: World Health Organization; 2013 [cited 2026 Oct 17]. Available from: <https://www.who.int/publications/m/item/WHO-causality-assessment>
- [8] Graf P, Juto JE. Decongestion effect and rebound swelling of the nasal mucosa during 4-week use of oxymetazoline. *ORL J Otorhinolaryngol Relat Spec*. 1994;56(3):157-60. doi:10.1159/000276633.