

INFLUENCE OF INDOOR HUMIDITY AND MOLD EXPOSURE ON PATIENTS WITH CHRONIC BRONCHITIS

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Abstract: *Background: Chronic bronchitis is a common form of chronic obstructive pulmonary disease (COPD) marked by persistent productive cough and airway inflammation. While smoking remains the leading cause, indoor environmental factors such as excessive moisture and mold growth may significantly aggravate symptoms.*

Objective: *This study aimed to explore how indoor humidity levels and exposure to household mold affect symptom severity, lung function, and exacerbation rates in individuals diagnosed with chronic bronchitis.*

Methods: *A cross-sectional study was conducted among 150 patients attending an urban tertiary care hospital. Indoor humidity levels were measured using digital hygrometers, and mold exposure was evaluated through home inspections and structured questionnaires. Clinical evaluation included spirometry testing and assessment of annual exacerbation frequency. Statistical models were adjusted for potential confounders including smoking history and age.*

Results: *Participants living in homes with humidity levels above 60% and visible mold growth experienced more frequent exacerbations and demonstrated lower lung function values compared to those in drier environments. Mold exposure was independently associated with increased wheezing and hospital admissions.*

Conclusion: *Elevated indoor moisture and mold presence are important environmental risk factors that worsen respiratory health in chronic bronchitis patients. Addressing indoor air conditions should form part of comprehensive disease management.*

Keywords: *Chronic bronchitis, indoor humidity, mold exposure, respiratory exacerbation, indoor environment, COPD*

INTRODUCTION

Chronic bronchitis is clinically defined as a productive cough lasting at least three months per year for two consecutive years. It represents a major contributor to respiratory morbidity worldwide. Although tobacco smoking is the primary risk factor, increasing attention has been directed toward environmental contributors that may influence disease severity.

Urban populations spend most of their time indoors, where environmental conditions such as poor ventilation, dampness, and fungal growth can affect respiratory health. High humidity promotes the growth of mold species including *Aspergillus*, *Penicillium*, and *Cladosporium*. Inhalation of fungal spores may trigger airway inflammation, hypersensitivity responses, and worsening bronchial obstruction.

This study was designed to assess whether household humidity and mold exposure are associated with poorer clinical outcomes in patients with chronic bronchitis.

Materials and Methods

Study Design and Participants

This analytical cross-sectional study was carried out over a one-year period in the Department of Internal Medicine at a tertiary hospital. A total of 150 adults aged 40–75 years with confirmed chronic bronchitis were enrolled.

Patients with other significant lung conditions such as tuberculosis, bronchiectasis, lung cancer, or recent respiratory infections were excluded to avoid confounding effects.

Clinical Evaluation

Each participant underwent:

- Detailed medical history assessment
- Documentation of smoking exposure (pack-years)
- Recording of exacerbation frequency during the past year
- Spirometry testing to measure FEV₁, FVC, and FEV₁/FVC ratio

Environmental Assessment

Indoor environmental conditions were evaluated using:

- Digital hygrometers placed in living areas for 48 hours
- Classification of humidity levels:
 - 30–50% (optimal)
 - 51–60% (moderately elevated)
 - 60% (high)
- Visual inspection for mold growth on walls, ceilings, bathrooms, and kitchens
- Survey of housing characteristics including ventilation and history of water leakage

Statistical Analysis

Data were analyzed using appropriate statistical software. Continuous variables were expressed as mean \pm standard deviation, and categorical variables as percentages. Comparisons between exposure groups were performed using t-tests and chi-square tests. Logistic regression analysis was conducted to determine independent associations, adjusting for smoking and demographic factors. A p-value <0.05 was considered statistically significant.

Results

Participant Profile

Among the 150 participants, the average age was 62 years, and most were male. The majority had a history of smoking.

Indoor Environmental Findings

Nearly half of the participants lived in homes where indoor humidity exceeded 60%. Visible mold growth was observed in more than one-third of households. A significant proportion of patients were exposed to both elevated humidity and mold.

Association with Respiratory Outcomes

Patients residing in high-humidity environments experienced:

- More frequent disease exacerbations
- Greater nighttime cough and wheezing
- Increased reliance on rescue inhalers
- Lower average FEV₁ values

Those exposed to visible mold showed a higher likelihood of hospital admissions and persistent wheezing symptoms. After adjusting for smoking history, mold exposure remained a significant predictor of increased exacerbation frequency.

Discussion

The findings of this study suggest that indoor environmental conditions play a meaningful role in the clinical course of chronic bronchitis. Excessive moisture creates an environment conducive to fungal proliferation and dust mite growth, both of which can provoke airway irritation and chronic inflammation.

While smoking remains the dominant risk factor, our results indicate that environmental exposures may independently contribute to symptom worsening and lung function decline. This emphasizes the importance of considering home environmental assessment as part of routine patient evaluation.

Clinical Implications

Managing chronic bronchitis should extend beyond pharmacological treatment. Practical environmental interventions may include:

- Maintaining indoor humidity between 30–50%
- Improving natural or mechanical ventilation
- Repairing water leaks promptly
- Using dehumidifiers where necessary
- Regular cleaning of damp surfaces to prevent mold growth

Incorporating these measures may reduce exacerbation frequency and improve quality of life.

Limitations

The cross-sectional nature of this study limits the ability to establish direct causality. Additionally, mold assessment was based on visual inspection rather than

laboratory spore analysis. Future longitudinal studies using microbiological sampling would strengthen evidence in this area.

Conclusion

Indoor dampness and mold exposure are significantly associated with worse respiratory outcomes in patients with chronic bronchitis. Environmental control strategies should be integrated into patient education and long-term disease management plans to reduce morbidity and healthcare burden.

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