

Rational of Corticosteroid Nebulisation in Chronic Cough

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ABSTRACT

Objective: The objective of this study was to evaluate the effect of corticosteroid nebulization in patients with chronic cough, specifically assessing changes in cough severity, frequency, and quality of life.

Study Design: Prospective observational study.

Place and Duration of Study: This study was conducted at the Pediatrics Department Niazi Medical and Dental College Sargodha from August 2022 to March 2023.

Materials and Methods: A total of 175 patients with chronic cough were enrolled in the study. These patients were selected based on specific inclusion and exclusion criteria. Inclusion criteria included individuals aged 18 years or older, presenting with a chronic cough lasting for more than eight weeks despite appropriate treatment for underlying causes. Patients with significant comorbidities or contraindications to corticosteroid nebulization were excluded from the study.

Results: Following corticosteroid nebulization, there was a significant reduction in cough severity score (mean baseline: 7.2, mean post-treatment: 3.8, $p < 0.001$) and cough frequency (mean baseline: 25, mean post-treatment: 12, $p < 0.001$). The quality-of-life score showed a substantial increase (mean baseline: 45, mean post-treatment: 75, $p < 0.001$). Additionally, 82% of the patients reported satisfaction with the treatment.

Conclusion: Corticosteroid nebulization demonstrated a positive effect in chronic cough patients, as evidenced by reduced cough severity and frequency, improved quality of life, and high patient satisfaction rates. These findings support the use of corticosteroid nebulization as a potential treatment option for chronic cough. However, further research with larger sample sizes, control groups, and longer follow-up durations is warranted to validate these results and optimize treatment approaches.

Key Words: Corticosteroid nebulization, chronic cough, cough severity, cough frequency, quality of life, patient satisfaction.

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INTRODUCTION

Chronic cough is a common respiratory symptom that can significantly impact an individual's quality of life. It is defined as a cough lasting for more than eight weeks and can be caused by various underlying conditions, including postnasal drip, asthma, gastroesophageal reflux disease (GERD), and upper airway cough syndrome.

Despite comprehensive diagnostic evaluations and treatment options, a subset of patients with chronic cough remains refractory to standard therapies.¹

In recent years, the use of corticosteroid nebulization has emerged as a potential therapeutic approach for managing chronic cough. Corticosteroids possess potent anti-inflammatory properties and are known to reduce airway inflammation, mucosal edema, and bronchial hyperresponsiveness.² Nebulization allows the direct delivery of corticosteroids to the airways, targeting the underlying inflammatory processes involved in chronic cough. The rationale behind corticosteroid nebulization in chronic cough lies in its ability to modulate the inflammatory response within the respiratory tract. In chronic cough, there is evidence of increased airway inflammation, characterized by the infiltration of inflammatory cells, release of pro-inflammatory mediators, and remodeling of airway tissues.³ These inflammatory processes contribute to the hypersensitivity and irritability of cough receptors, leading to the persistent and uncontrolled cough seen in chronic cough patients.⁴

By delivering corticosteroids directly to the airways through nebulization, the goal is to reduce airway inflammation, attenuate cough reflex sensitivity, and

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improve cough control. Nebulization enables the medication to reach the lower respiratory tract, where the inflammation is most prominent in chronic cough patients. The localized action of corticosteroids via nebulization minimizes systemic exposure and the associated risk of systemic side effects often observed with oral corticosteroid administration.⁵ Several studies have investigated the efficacy of corticosteroid nebulization in chronic cough, with varying degrees of success. Some trials have shown significant improvement in cough severity, frequency, and quality of life in patients treated with nebulized corticosteroids. These positive outcomes suggest the potential of corticosteroid nebulization as a targeted and effective therapeutic option for chronic cough patients who are refractory to conventional treatments.

However, it is important to note that the evidence supporting the use of corticosteroid nebulization in chronic cough is still evolving, and more research is needed to establish its optimal role and identify patient subgroups that may benefit the most from this treatment modality. Additionally, the long-term safety and potential side effects of corticosteroid nebulization require further investigation. Corticosteroid nebulization offers a rational approach to managing chronic cough by directly targeting the underlying airway inflammation.⁶ The localized delivery of corticosteroids through nebulization aims to alleviate cough symptoms and improve quality of life in patients who have failed to respond to conventional therapies. However, more research is needed to further validate its efficacy, define appropriate patient selection criteria, and assess long-term safety considerations.⁷

MATERIALS AND METHODS

The study was conducted at Niazi Medical and Dental College in Sargodha, Pakistan. The medical college provided the necessary infrastructure and facilities to carry out the research effectively. This study utilized a prospective observational design. The study duration spanned over 8 months, from August 2022 to March 2023. This timeframe allowed for adequate recruitment of participants, data collection, and analysis. A total of 175 patients with chronic cough were enrolled in the study.

Inclusion Criteria:

- Patients aged 18 years or older.
- Presence of chronic cough, defined as a cough lasting for more than eight weeks.
- Failure to respond to appropriate treatment for underlying causes of chronic cough, such as postnasal drip, asthma, GERD, or upper airway cough syndrome.

Exclusion Criteria:

- Patients with significant comorbidities that may interfere with the study outcomes or pose a risk during corticosteroid nebulization.

- Patients with contraindications to corticosteroid nebulization, such as known hypersensitivity or adverse reactions to corticosteroids.
- Patients who had received corticosteroid treatment in the past four weeks prior to the study initiation.
- Pregnancy or breastfeeding women, as the safety of corticosteroid nebulization during pregnancy or lactation is not well-established.
- Patients with a history of respiratory infections or exacerbations within the previous four weeks.
- Patients with known active pulmonary tuberculosis or other active respiratory infections.
- Patients with a history of psychiatric disorders or uncontrolled systemic diseases that may confound the study outcomes.
- Patients who were unable to provide informed consent or comply with study procedures.

Study Procedure: Patient Recruitment: Patients visiting the respiratory medicine department at Niazi Medical and Dental College were screened for eligibility. Those meeting the inclusion criteria were approached for participation in the study. The purpose, procedures, and potential risks and benefits of the study were explained to the patients, and written informed consent was obtained.

Baseline Assessment: All enrolled patients underwent a comprehensive baseline assessment, including detailed medical history, physical examination, and relevant investigations such as spirometry, chest X-ray, and sputum culture. Baseline cough severity, frequency, and quality of life were also evaluated using standardized questionnaires.

Corticosteroid Nebulization Intervention: The eligible patients received nebulized corticosteroid treatment as per the study protocol. The specific corticosteroid agent, dosage, and frequency were determined based on the standard clinical practice at Niazi Medical and Dental College. Nebulization sessions were conducted under the supervision of healthcare professionals to ensure proper technique and adherence.

Follow-up Visits: Patients were scheduled for regular follow-up visits at specified intervals throughout the study period. During these visits, cough symptoms, medication adherence, and any adverse events were assessed. Any necessary adjustments to the corticosteroid nebulization regimen were made based on individual patient response and tolerability.

Data Collection and Analysis: Relevant data, including demographic information, clinical characteristics, cough severity scores, and treatment outcomes, were recorded for each participant. Statistical analysis was performed using appropriate methods to evaluate the effectiveness of corticosteroid nebulization in managing chronic cough.

Ethical Considerations: This study was conducted in compliance with ethical guidelines and regulations. Ethical approval was obtained from the institutional

review board of Niazi Medical and Dental College before the initiation of the study. Patient confidentiality was ensured throughout the study, and data were anonymized and securely stored.

RESULTS

A total of 175 patients with chronic cough were included in the study. The mean age of the participants was 45 years, with a range from 25 to 65 years. Out of the total participants, 62% were female and 38% were male.

Table No. 1: Demographic values of patients

Characteristic	Number of Patients
Total number	175
Age (years)	Mean: 45, Range: 25-65
Gender	Female: 62%, Male: 38%

The primary outcome measure in this study was the change in cough severity scores following corticosteroid nebulization. Cough severity scores were assessed using a standardized questionnaire at baseline and at regular follow-up visits. The results showed a statistically significant improvement in cough severity scores after the administration of corticosteroid nebulization. The mean baseline cough severity score was 7.2 (SD = 1.5), and after 8 weeks of treatment, the mean cough severity score decreased to 3.8 (SD = 1.2). This reduction in cough severity was highly significant ($p < 0.001$).

Table No. 2: Primary and secondary outcomes

Outcome Measure	Baseline	After 8 Weeks	p-value
Cough Severity Score	7.2 (SD=1.5)	3.8 (SD=1.2)	<0.001
Cough Frequency	25/day (SD=5)	12/day (SD=3)	<0.001
Quality of Life	45 (SD=10)	75 (SD=8)	<0.001

Secondary outcome measures, including cough frequency and quality of life, were also evaluated. The mean baseline cough frequency was 25 cough episodes per day (SD = 5), which decreased to 12 cough episodes per day (SD = 3) after 8 weeks of corticosteroid nebulization. This reduction in cough frequency was statistically significant ($p < 0.001$). Assessment of quality of life using a validated questionnaire revealed a significant improvement in the overall quality of life scores following corticosteroid nebulization. The mean baseline quality of life score was 45 (SD = 10), which increased to 75 (SD = 8) after 8 weeks of treatment ($p < 0.001$). Subgroup analysis based on age, gender, and underlying causes of chronic cough did not show any significant differences in treatment response.

Regarding safety, corticosteroid nebulization was well-tolerated by the participants, with no reports of serious

adverse events. A few participants experienced mild throat irritation or hoarseness, but these symptoms resolved spontaneously without any intervention.

Table No. 3: Rationales of corticosteroids

Rationale	Description
Anti-inflammatory	Corticosteroids have potent anti-inflammatory properties that can help reduce airway inflammation.
Suppression of cough reflex	Corticosteroids can suppress the hypersensitive cough reflex, reducing cough frequency.
Reduction of airway edema and mucosal swelling	Corticosteroids can alleviate airway edema and mucosal swelling, improving airflow and cough.
Immunomodulatory effect	Corticosteroids can modulate immune responses, reducing chronic inflammation in the airways.

Table No. 4: Effect of Corticosteroid Nebulization in Chronic Cough Patients

Outcome Measure	Baseline Mean (SD)	Post-Treatment Mean (SD)	p-value
Cough Severity Score	7.2 (1.5)	3.8 (1.2)	<0.001
Cough Frequency (per day)	25 (5)	12 (3)	<0.001
Quality of Life Score	45 (10)	75 (8)	<0.001
Satisfaction with Treatment (%)	-	82%	-

DISCUSSION

The present study aimed to evaluate the rationale of corticosteroid nebulization in the management of chronic cough. The results demonstrated significant improvements in cough severity, cough frequency, and quality of life following corticosteroid nebulization. These findings support the hypothesis that corticosteroid nebulization is an effective treatment option for chronic cough.⁸ The primary outcome measures showed a notable reduction in cough severity scores after eight weeks of corticosteroid nebulization. This indicates the ability of corticosteroids to alleviate the symptoms associated with chronic cough. The observed decrease in cough severity aligns with the known anti-inflammatory properties of corticosteroids, which can help reduce airway inflammation and irritation.⁹

Furthermore, the study revealed a significant decrease in cough frequency among the participants. Corticosteroids have been shown to suppress the hypersensitive cough reflex, which may explain the observed reduction in cough frequency. By modulating the cough reflex, corticosteroids contribute to the overall improvement in cough-related symptoms.¹⁰ Another key finding of this study was the improvement in the participants' quality of life following

corticosteroid nebulization. Chronic cough can have a detrimental impact on the physical, psychological, and social well-being of individuals. The observed increase in quality-of-life scores suggests that corticosteroid nebulization effectively alleviates the burden of chronic cough and improves overall well-being.

The rationale behind corticosteroid nebulization in chronic cough is further supported by its ability to reduce airway edema and mucosal swelling. Corticosteroids possess potent anti-inflammatory properties that can mitigate airway inflammation, leading to a reduction in edema and improved airflow.¹¹⁻¹³ By targeting these underlying mechanisms, corticosteroids provide relief from chronic cough symptoms. It is important to acknowledge the limitations of this study. Firstly, the study design was observational, lacking a control group for comparison. A randomized controlled trial with a placebo control group would provide more robust evidence of the efficacy of corticosteroid nebulization in chronic cough. Additionally, the follow-up period was limited to eight weeks, and long-term outcomes were not evaluated. Further studies with longer follow-up durations are needed to assess the sustainability of the observed benefits.^{14,15}.

CONCLUSION

In conclusion, the results of this study suggest that corticosteroid nebulization is a rational and effective approach for the management of chronic cough. The observed improvements in cough severity, cough frequency, and quality of life provide evidence of the potential benefits of corticosteroid nebulization in alleviating the burden of chronic cough. Future research should focus on conducting controlled trials with longer follow-up periods to confirm these findings and optimize the treatment approach for chronic cough patients..

Author's Contribution:

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Conflict of Interest: The study has no conflict of interest to declare by any author.

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