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Original Research Article

CLINICAL OUTCOMES OF MEPOLIZUMAB IN BIOMARKER-SELECTED SEVERE EOSINOPHILIC ASTHMA: A PROSPECTIVE COHORT STUDY FROM A SOUTH INDIAN TERTIARY CENTRE

Harigovind P[1], Manaal Shamsudeen[2], Jesbin BS[3]

[1]Junior Resident, Department of Respiratory Medicine, Sri Siddhartha Medical College, Tumkur, Agalakote, Karnataka, India
[2]MBBS Intern, Department of Respiratory Medicine, Kasturba Medical College, Mangalore, Karnataka, India
[3]Consultant, Department of Pulmonology, Sree Ayyappa Hospital and Research Foundation, Kumpalathamon, Vadasserikkara, Kerala, India

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Corresponding Author:
Dr. Harigovind P,
Junior Resident, Department of Respiratory Medicine, Sri Siddhartha Medical College, Tumkur, Agalakote, Karnataka 572107, India.
Email: harigovindp6@gmail.com

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ABSTRACT

Background: Severe asthma is a heterogeneous chronic inflammatory airway disease. Eosinophilic inflammation is a major endotype associated with frequent exacerbations and corticosteroid dependence. Biomarkers such as absolute eosinophil count (AEC) and fractional exhaled nitric oxide (FeNO) guide targeted biologic therapy. Mepolizumab, an anti-IL-5 monoclonal antibody, reduces eosinophilic inflammation. Real-world evidence from Indian tertiary care settings remains limited. The objective is to evaluate clinical outcomes of mepolizumab therapy in adult patients with severe eosinophilic asthma selected using AEC and FeNO biomarkers.

Materials and Methods: This prospective observational cohort study was conducted in the Department of Pulmonary Medicine, Sri Siddhartha Medical College, Tumkur from February 2024 to February 2026 Adults (>18 years) with GINA-defined severe asthma, AEC ≥300 cells/µL, and elevated FeNO (≥25 ppb) were enrolled. Of 40 patients initially screened with severe eosinophilic asthma, only 19 could receive mepolizumab 100 mg subcutaneously every 4 weeks plus optimised inhaled therapy. The remaining 21 were excluded due to financial constraints (n=14), loss of follow-up before initiation (n=4), or other personal reasons (n=3). Follow-up assessments were performed at 3, 6, and 12 months. Outcomes included Asthma Control Test (ACT) score, exacerbation frequency, hospitalisation rate, oral corticosteroid (OCS) use, spirometry, AEC, FeNO, and adverse events.

Results: Mean ACT score improved from 13.6±3.4 at baseline to 18.9±3.1 at 12 months ($p<0.01$). Annual exacerbation frequency reduced from 3.8±1.4 to 2.1±1.1 episodes/year ($p<0.05$). OCS dependence decreased from 63.2% to 36.8% ($p<0.05$). AEC fell from 498±152 to 210±89 cells/µL ($p<0.001$); FeNO from 46.2±13.1 to 31.5±10.2 ppb ($p<0.01$). FEV1% improved from 59.1±10.2% to 65.8±9.4% ($p<0.05$). Response was heterogeneous: 52.6% good responders, 31.6% partial, 15.8% non-responders. Injection site reactions occurred in 15.8%; no serious adverse events.

Conclusion: Mepolizumab therapy in biomarker-selected severe eosinophilic asthma was associated with modest but significant improvements in asthma control, exacerbation burden, and eosinophilic inflammation in this South Indian cohort. Response variability highlights the need for careful patient selection.

Keywords: Severe eosinophilic asthma, mepolizumab, eosinophils, FeNO, biologic therapy, personalised medicine.

INTRODUCTION

Asthma is a chronic inflammatory disorder of the airways characterised by airway hyperresponsiveness, reversible airflow limitation, and recurrent respiratory symptoms including wheezing, cough, chest tightness, and dyspnoea.[1,2] It affects nearly 300 million individuals worldwide and is associated with a significant public health burden owing to its morbidity, mortality, and healthcare costs.[2] Severe asthma constitutes about 5–10% of all cases of asthma but accounts for a disproportionate share of the disease burden due to frequent exacerbations, recurrent hospitalisations, poor quality of life, and increased exposure to oral corticosteroids.[2,3] Despite advances in conventional asthma management, a large percentage of patients remain uncontrolled despite treatment with high-dose inhaled corticosteroids (ICS) and long-acting beta-agonists (LABA).[2,3] The heterogeneity of severe asthma has led to increased understanding of different inflammatory phenotypes and endotypes.[1] One of the most critical and well-characterised endotypes associated with persistent airway inflammation, frequent exacerbations, and corticosteroid responsiveness is type-2 eosinophilic inflammation.[1,2] The growing emphasis on personalised therapeutic approaches has highlighted the critical role of biomarkers in diagnosing eosinophilic airway inflammation and guiding targeted therapies.[4,5] Widely employed biomarkers including absolute eosinophil count (AEC) and fractional exhaled nitric oxide (FeNO) are valuable in detecting type-2 inflammation in severe asthma.[4] High blood eosinophil counts have been associated with increased risk of exacerbations and better response to anti-interleukin-5 (IL-5) therapy,[5,6] while elevated FeNO levels reflect eosinophilic airway inflammation and may predict response to corticosteroids and biologic therapy.[4,7]

Mepolizumab, a monoclonal antibody against IL-5, is an effective biologic treatment for eosinophilic severe asthma.[6,8] Mepolizumab-associated suppression of eosinophilic inflammation has been associated with reductions in exacerbation frequency, hospitalisation, and oral corticosteroid dependence, along with improvements in asthma control and pulmonary function.[6,8,9] Other biologic therapies including benralizumab, dupilumab, and tezepelumab have also demonstrated efficacy in severe asthma management,[10–12] however, the present study specifically focused on mepolizumab therapy in patients selected using AEC and FeNO biomarkers.

Although several international studies have demonstrated the benefits of biomarker-based biologic selection, real-world evidence from Indian tertiary care settings remains limited.[13] Data regarding the clinical utility of AEC and FeNO for identifying Indian severe asthma patients likely to benefit from mepolizumab therapy are sparse. Therefore, this prospective observational cohort study aimed to evaluate the clinical outcomes of mepolizumab therapy in eosinophilic severe asthma patients selected using AEC and FeNO biomarkers attending Sri Siddhartha Medical College, Tumkur. In low- and middle-income countries like India, access to biologic therapy remains limited because of high treatment costs, inadequate insurance coverage, and lack of publicly funded access programmes. Consequently, many clinically eligible patients remain untreated despite biomarker-confirmed severe eosinophilic asthma. Real-world Indian data evaluating both clinical outcomes and economic barriers to biologic access remain limited.

MATERIALS AND METHODS

Study Design: This was a prospective observational cohort study conducted in a single tertiary care centre.
Study Setting: The study was carried out in the Department of Pulmonary Medicine at Sri Siddhartha Medical College and Hospital, Tumkur, Karnataka, India.
Study Duration: The study was conducted over 24 months from February 2024 to February 2026
Study Population: Adult patients diagnosed with eosinophilic severe asthma attending the outpatient and inpatient services of the Department of Pulmonary Medicine were included.
Sample Size: A total of 40 patients met the clinical inclusion criteria for severe eosinophilic asthma (AEC ≥300 cells/µL, FeNO ≥25 ppb) during the study period. However, only 19 patients could ultimately receive mepolizumab and be enrolled in the study. The primary reasons for non-enrolment among the remaining 21 patients were: financial inability to afford mepolizumab despite eligibility (n=14), loss to follow-up before treatment initiation (n=4), and other personal or family reasons (n=3). Thus, the final analytical sample comprised 19 patients who received at least one dose of mepolizumab. Recruitment occurred during the first 12 months of the study period, allowing enrolled participants to complete longitudinal follow-up assessments. Financial inaccessibility accounted for two-thirds of all non-enrolments among clinically eligible patients and represented 35% of the total initially eligible severe eosinophilic asthma cohort.
As this was an exploratory single-centre real-world cohort study, no formal a priori sample size calculation was performed. Recruitment was determined pragmatically by the number of eligible patients who initiated mepolizumab during the study period, particularly given substantial financial barriers to biologic access.

Inclusion Criteria

1. Adults aged ≥18 years.
2. Diagnosis of severe asthma according to Global Initiative for Asthma (GINA) 2024 guidelines [2].
3. Absolute eosinophil count (AEC) ≥300 cells/µL.

4. Elevated fractional exhaled nitric oxide (FeNO) ≥25 parts per billion (ppb), suggestive of type-2 eosinophilic airway inflammation.
5. Receiving mepolizumab as add-on therapy.

Exclusion Criteria

1. Chronic obstructive pulmonary disease (COPD) or asthma–COPD overlap syndrome (ACOS).
2. Active pulmonary tuberculosis or any other active respiratory infection.
3. Pregnant or lactating women.
4. Significant cardiac, hepatic, renal, neurological, rheumatological, or other systemic illnesses that could influence study outcomes.
5. Known hypersensitivity or contraindication to mepolizumab therapy.
6. Alternative respiratory diagnoses contributing to airway obstruction.
7. Active smokers or former smokers with a smoking history ≥10 pack-years.
8. History of parasitic infection within the previous 6 months.

Methodology: Patients attending the outpatient and inpatient services who fulfilled the inclusion criteria were enrolled after obtaining written informed consent. A total of 19 adult patients with eosinophilic severe asthma receiving mepolizumab were included over the 24-month study period.

Detailed clinical history including duration of asthma, symptom severity, smoking history, previous exacerbations, hospitalisation history, medication use, and associated comorbidities was recorded. General physical examination and systemic respiratory examination were performed in all patients.

Baseline investigations included:

1. Complete blood count with absolute eosinophil count (AEC).
2. Fractional exhaled nitric oxide (FeNO) measurement using the NIOX VERO analyser following ATS/ERS recommendations (exhalation at 50 mL/s) [4].
3. Spirometry using the COSMED Pony FX spirometer measuring forced expiratory volume in one second (FEV1), forced vital capacity (FVC), and FEV1/FVC ratio according to ATS/ERS guidelines.
4. Chest radiography (posteroanterior view).
5. Baseline Asthma Control Test (ACT) score assessment.

Treatment: All 19 enrolled patients received mepolizumab 100 mg subcutaneously every 4 weeks in addition to optimised background therapy. Optimised background therapy included high-dose ICS (≥500 µg fluticasone propionate equivalent daily) plus LABA, with or without tiotropium, as per GINA 2024 guidelines [2]. No patient received mepolizumab alone without inhaled therapy. Patients were instructed on proper inhaler technique at each visit.

Follow-up schedule: Patients were assessed at baseline and at 3 months, 6 months, and 12 months after treatment initiation. Seventeen patients completed 12 months of follow-up, while two patients were lost to follow-up after the 6-month visit.

At each follow-up visit, the following were recorded:

- Asthma Control Test (ACT) score (range 5–25; higher scores indicate better control)
- Number of severe exacerbations since the last visit (defined as need for systemic corticosteroids for ≥3 days or emergency department visit/hospitalisation for asthma)
- Hospitalisation episodes for asthma
- Maintenance oral corticosteroid use (yes/no; daily dose in prednisolone equivalents)
- Spirometry (FEV1, FVC, FEV1/FVC)
- Absolute eosinophil count (AEC)
- FeNO level
- Adverse drug reactions

Outcome Measures

Primary outcomes:

- Change in ACT score from baseline to 12 months.
- Reduction in annualised severe exacerbation frequency.

Secondary outcomes:

- Reduction in hospitalisation rate.
- Reduction in oral corticosteroid requirement.
- Improvement in FEV1% predicted.
- Decrease in AEC and FeNO levels.
- Adverse event profile.

Statistical Analysis: Data were entered into Microsoft Excel and analysed using Statistical Package for Social Sciences (SPSS) version 25 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD) for normally distributed data and median with interquartile range for non-normal data. Categorical variables were expressed as frequencies and percentages. Normality was assessed using the Shapiro–Wilk test. Pre- and post-treatment comparisons were performed using paired t-test for normally distributed continuous variables and Wilcoxon signed-rank test for non-normal data. Categorical variables were compared using McNemar's test for paired proportions. A two-sided p-value <0.05 was considered statistically significant. Given the small sample size (n=19), 95% confidence intervals were reported for key outcomes where appropriate, and results were interpreted conservatively.

Ethical Considerations: The study was conducted after obtaining approval from the Institutional Ethics Committee of Sri Siddhartha Medical College and Hospital. Written informed consent was obtained from all participants prior to enrolment. Confidentiality and anonymity of patient information were strictly maintained throughout the study period, and all collected data were used solely for research purposes. Participation was voluntary, and participants were free to withdraw at any stage without affecting their clinical care. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki (2013 revision), Good

Clinical Practice guidelines, and STROBE recommendations for observational studies.

RESULTS

Baseline Characteristics: A total of 19 patients with eosinophilic severe asthma receiving mepolizumab were enrolled. The mean age was 45.2 ± 12.4 years, with females accounting for 57.9% (11/19). Mean duration of asthma was 8.7 ± 5.1 years. Most patients had poorly controlled asthma at baseline: mean ACT score was 13.6 ± 3.4, mean FEV1% predicted was 59.1 ± 10.2%, and 68.4% (13/19) had experienced at least one severe exacerbation requiring oral corticosteroids or hospitalisation in the preceding 12 months. Maintenance oral corticosteroids were used by 63.2% (12/19) at a median daily dose of 10 mg prednisolone (IQR: 7.5–15). Baseline demographic and clinical characteristics are summarised in [Table 1].

Table 1: Baseline Demographic and Clinical Characteristics (n=19)

Variable	Value
Mean age (years)	45.2 ± 12.4
Male, n (%)	8 (42.1%)
Female, n (%)	11 (57.9%)
Mean duration of asthma (years)	8.7 ± 5.1
Never-smokers, n (%)	14 (73.7%)
Ex-smokers, n (%)	5 (26.3%)
Baseline ACT score	13.6 ± 3.4
AEC (cells/µL)	498 ± 152
FeNO (ppb)	46.2 ± 13.1
Baseline FEV1% predicted	59.1 ± 10.2
Maintenance oral corticosteroid use, n (%)	12 (63.2%)
≥1 severe exacerbation in prior year, n (%)	13 (68.4%)
≥1 asthma-related hospitalisation in prior year, n (%)	8 (42.1%)

Data expressed as mean ± SD or n (%). ACT: Asthma Control Test; AEC: absolute eosinophil count; FeNO: fractional exhaled nitric oxide; FEV1: forced expiratory volume in one second.

Follow-up and Attrition: Although 40 patients were initially eligible based on clinical criteria, only 19 could be enrolled primarily due to financial barriers. Of these 19 enrolled patients, 17 (89.5%) completed 12 months of follow-up. Two patients were lost to follow-up after the 6-month visit (one relocated to another city; one withdrew consent, citing travel difficulties). All available data were included in the analysis; for the two patients with incomplete follow-up, the last observation carried forward method was used for the 12-month time point. Participant enrolment, follow-up, and analysis are summarised in [Figure 1].

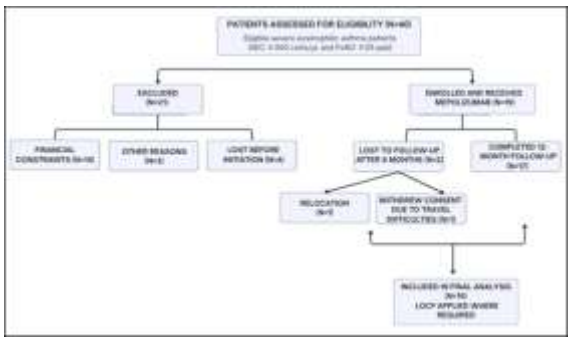

Figure 1: STROBE flow diagram showing patient selection, enrolment, follow-up, and inclusion in final analysis.

Primary Outcomes: Asthma Control Test (ACT) Score: Mean ACT score improved progressively from baseline (13.6 ± 3.4) to 3 months (16.2 ± 3.2, p<0.05), 6 months (17.8 ± 3.0, p<0.01), and 12 months (18.9 ± 3.1, p<0.01). The mean change from baseline to 12 months was +5.3 points (95% CI: 3.1 to 7.5). The proportion of patients achieving well-controlled asthma (ACT ≥20) increased from 0% at baseline to 31.6% (6/19) at 12 months.

Exacerbation Frequency: The annualised severe exacerbation rate decreased from 3.8 ± 1.4 episodes per year at baseline to 2.5 ± 1.2 at 3 months, 2.2 ± 1.1 at 6 months, and 2.1 ± 1.1 at 12 months (p<0.05 for baseline vs. 12 months). The reduction was more pronounced in the subgroup with baseline AEC ≥500 cells/µL (n=9), from 4.2 ± 1.3 to 2.0 ± 1.0 episodes/year (p<0.01).

Secondary Outcomes

Hospitalisation Rate: The proportion of patients requiring at least one asthma-related hospitalisation decreased from 42.1% (8/19) at baseline to 21.1% (4/19) at 12 months; this difference did not reach statistical significance (p=0.07, McNemar's test).

Oral Corticosteroid Requirement: Maintenance oral corticosteroid use decreased from 63.2% (12/19) at baseline to 36.8% (7/19) at 12 months (p<0.05). Among those continuing oral corticosteroids, the median daily prednisolone dose reduced from 10 mg (IQR: 7.5–15) to 5 mg (IQR: 5–7.5).

Pulmonary Function: Mean FEV1% predicted improved from 59.1 ± 10.2% at baseline to 62.5 ± 9.8% at 3 months, 64.2 ± 9.6% at 6 months, and 65.8 ± 9.4% at 12 months (p<0.05 for baseline vs. 12 months). An increase of ≥5 percentage points was observed in 8 patients (42.1%), while 5 patients (26.3%) showed no improvement or a decline.

Eosinophilic Biomarkers: Mean AEC decreased from 498 ± 152 cells/µL at baseline to 245 ± 95 at 3 months (p<0.001), 220 ± 85 at 6 months (p<0.001), and 210 ± 89 at 12 months (p<0.001). Mean FeNO

decreased from 46.2 ± 13.1 ppb to 36.5 ± 11.8 at 3 months ($p<0.05$), 33.2 ± 10.9 at 6 months ($p<0.01$), and 31.5 ± 10.2 at 12 months ($p<0.01$). Longitudinal changes are summarized in [Table 2].

Table 2: Longitudinal Changes in Clinical and Biomarker Parameters (n=19)

Parameter	Baseline	3 months	6 months	12 months	p-value
ACT score	13.6 ± 3.4	16.2 ± 3.2	17.8 ± 3.0	18.9 ± 3.1	<0.01
Annual exacerbations	3.8 ± 1.4	2.5 ± 1.2	2.2 ± 1.1	2.1 ± 1.1	<0.05
FEV1% predicted	59.1 ± 10.2	62.5 ± 9.8	64.2 ± 9.6	65.8 ± 9.4	<0.05
AEC (cells/µL)	498 ± 152	245 ± 95	220 ± 85	210 ± 89	<0.001
FeNO (ppb)	46.2 ± 13.1	36.5 ± 11.8	33.2 ± 10.9	31.5 ± 10.2	<0.01

Data: mean ± SD. p-values represent baseline versus 12-month comparisons using paired t-test for normally distributed variables and Wilcoxon signed-rank test for non-normally distributed variables.

Table 3: Categorical Outcomes at Baseline and 12 Months

Outcome	Baseline (n=19)	12 months (n=19)	p-value
ACT ≥20 (well-controlled)	0 (0%)	6 (31.6%)	<0.01
Any asthma hospitalisation	8 (42.1%)	4 (21.1%)	0.07
Maintenance OCS use	12 (63.2%)	7 (36.8%)	<0.05
Any severe exacerbation in prior 12 months	13 (68.4%)	8 (42.1%)	<0.05

Data: n (%). McNemar's test. Exacerbations during the 12-month follow-up period. OCS: oral corticosteroids.

Variability in Response and Adverse Events: Clinical response was heterogeneous. Based on ACT improvement of ≥3 points and ≥50% reduction in exacerbations, 10 patients (52.6%) were classified as good responders, 6 (31.6%) as partial responders, and 3 (15.8%) as non-responders. Non-responders had numerically higher baseline FeNO (mean 54.2 vs. 44.1 ppb) and longer asthma duration (12.3 vs. 7.8 years), though these differences were not statistically significant.

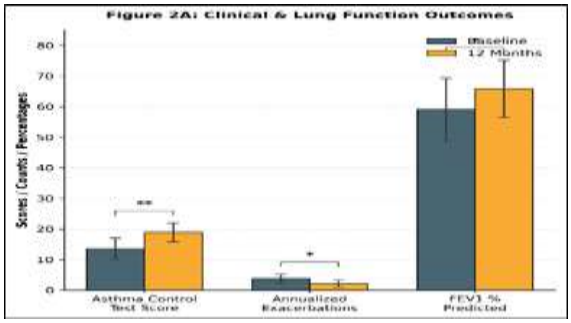

Figure 2A: Baseline and 12-month clinical and lung function outcomes following mepolizumab therapy in biomarker-selected severe eosinophilic asthma. Data are presented as mean ± SD. *p<0.05, **p<0.01.

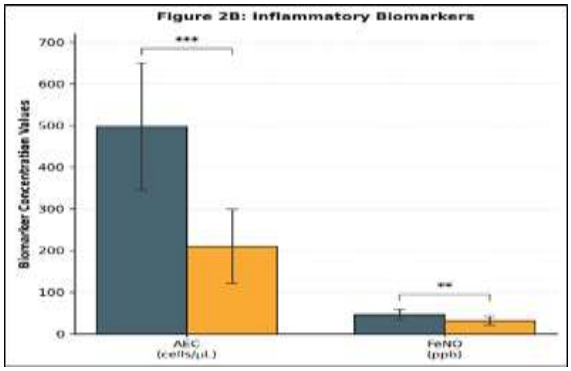

Figure 2B: Baseline and 12-month inflammatory biomarker outcomes following mepolizumab therapy in biomarker-selected severe eosinophilic asthma. Data are presented as mean ± SD. **p<0.01, ***p<0.001.

Mepolizumab was generally well tolerated. Injection site reactions (mild erythema or pain) occurred in 3 patients (15.8%). Headache was reported by 2 patients (10.5%), and one patient (5.3%) developed a mild upper respiratory tract infection that resolved without sequelae. No serious adverse events, anaphylaxis, or treatment discontinuations due to adverse effects were recorded.

DISCUSSION

Severe asthma is a complex and heterogeneous airway disease associated with recurrent exacerbations, poor symptom control, frequent hospitalisation, impaired quality of life, and increased healthcare burden.[1–3] Recent advances in personalised medicine have transformed severe asthma management by identifying distinct inflammatory endotypes and enabling targeted biologic therapy.[1,3] Among these, type-2 eosinophilic inflammation is strongly linked to increased exacerbation risk, corticosteroid responsiveness, and persistent airway inflammation.[1,6] Biomarkers such as absolute eosinophil count (AEC) and fractional exhaled nitric oxide (FeNO) have emerged as reliable indicators of eosinophilic airway inflammation and play an important role in guiding biologic therapy.[4,5,7] According to GINA 2024 recommendations, biologic therapy should be considered in patients with severe asthma who remain uncontrolled despite optimised high-dose inhaled corticosteroid–long-acting beta-agonist (ICS-LABA) therapy and appropriate management of contributory factors such as poor inhaler technique, medication non-adherence, smoking exposure, and comorbidities.[2] Anti-IL-5 therapy such as mepolizumab is particularly recommended in patients with evidence of type-2 eosinophilic inflammation, recurrent severe exacerbations, elevated blood eosinophil counts, and/or dependence on maintenance oral

corticosteroids.[2,6] Biomarkers including AEC and FeNO are useful in identifying patients most likely to benefit from biologic therapy and in supporting personalised treatment strategies.

In this prospective real-world cohort of 19 South Indian patients with severe eosinophilic asthma, mepolizumab therapy in patients selected using AEC and FeNO biomarkers was associated with improvements in asthma control, exacerbation frequency, oral corticosteroid dependence, lung function, and eosinophilic airway inflammation over 12 months of follow-up. These findings are consistent with the established efficacy of anti-IL-5 therapy in eosinophilic severe asthma and support the clinical utility of biomarker-guided biologic selection in routine pulmonary practice.[4,6,8]

Comparison with previous studies

The magnitude of improvement in ACT scores (+5.3 points) and FEV1 (+6.7 percentage points) in our study was somewhat lower than the improvements in lung function and symptom-control outcomes reported in the pivotal DREAM and MENSA trials.[6,8] This discrepancy is expected and likely reflects real-world constraints including delayed initiation of biologic therapy, suboptimal adherence to inhaled background therapy, comorbid conditions such as allergic rhinitis and obesity, and incomplete optimisation of high-dose ICS before biologic initiation. Our findings are more comparable to recent real-world cohorts, where ACT improvements of approximately +4 to +6 points have been reported.[13] The relatively modest improvement in FEV1 may also reflect fixed airflow limitation due to long-standing disease (mean asthma duration 8.7 years) and partial irreversibility of airway remodelling.

Biomarker response: The marked reduction in AEC from 498 to 210 cells/µL (approximately 58% suppression) is consistent with the known mechanism of action of mepolizumab and comparable to previous clinical trials and real-world studies.[6,8,9] Similarly, FeNO levels declined from 46.2 to 31.5 ppb over 12 months. Although FeNO is primarily associated with IL-4 and IL-13 mediated inflammation rather than IL-5 activity, the observed reduction may reflect improved adherence to inhaled corticosteroid therapy during regular follow-up and overall reduction in airway inflammation. These findings support the combined utility of AEC and FeNO as complementary biomarkers for identifying and monitoring patients with eosinophilic severe asthma.

Heterogeneity of response: A notable observation in our study was the variability in treatment response. Despite adequate eosinophil suppression, 15.8% of patients showed minimal or no clinical improvement. Similar findings have been reported in previous real-world cohorts,[13] highlighting that eosinophilic inflammation is not the sole determinant of disease severity in all patients with severe asthma. Factors such as airway remodelling, obesity-related asthma, persistent environmental exposures, poor inhaler technique, non-eosinophilic inflammation, and psychosocial factors may contribute to persistent symptoms despite biologic therapy. Current guidelines therefore recommend reassessment of response after 4–6 months of biologic therapy, with consideration of switching to alternative biologics targeting IL-4/IL-13 or thymic stromal lymphopoietin (TSLP) pathways in non-responders.[2]

Strengths and limitations: The strengths of this study include its prospective observational design, structured longitudinal follow-up at 3, 6, and 12 months, and use of both AEC and FeNO as complementary biomarkers in a real-world South Indian population. However, several limitations must be acknowledged. The study was conducted at a single centre with a relatively small sample size (n=19), limiting statistical power and generalisability. The absence of a control group and lack of blinding limit causal inference. Two patients were lost to follow-up, and the use of the last observation carried forward method may have introduced bias in estimating 12-month outcomes. Additionally, adherence to inhaled corticosteroid therapy was not objectively assessed.

Another important limitation was the influence of financial accessibility on patient selection. Although 40 patients fulfilled clinical eligibility criteria for mepolizumab therapy, only 19 could receive treatment, primarily due to cost constraints. This reflects a major real-world challenge in low- and middle-income countries such as India, where biologic therapy remains prohibitively expensive for many patients despite clinical eligibility. Consequently, selection bias related to socioeconomic status cannot be excluded.

Indian context and clinical implications: Access to biologic therapy in India remains limited because of high treatment costs, inadequate insurance coverage, and restricted availability of public funding programmes. In our centre, mepolizumab therapy was accessed through a combination of patient self-payment and limited compassionate access support. Despite these barriers, the observed clinical improvements support the expanding role of biologic therapy in appropriately selected patients with severe eosinophilic asthma in resource-limited settings. Wider implementation of biomarker-guided treatment approaches, along with improved affordability and access programmes, may substantially reduce disease burden and corticosteroid exposure in Indian severe asthma populations.

CONCLUSION

In this prospective observational cohort of 19 South Indian patients with severe eosinophilic asthma, mepolizumab therapy in patients selected using absolute eosinophil count (AEC) and fractional exhaled nitric oxide (FeNO) biomarkers was

associated with modest but statistically significant improvements in asthma control, exacerbation frequency, oral corticosteroid dependence, and eosinophilic airway inflammation over 12 months of follow-up. The mean ACT score increased by 5.3 points, annual exacerbations decreased from 3.8 to 2.1 episodes, and maintenance oral corticosteroid use fell from 63.2% to 36.8%. Response was heterogeneous, with 52.6% of patients classified as good responders and 15.8% as non-responders, highlighting that eosinophilic inflammation is not the sole driver of disease in all patients. Mepolizumab was well tolerated, with no serious adverse events.

These findings support the clinical utility of AEC and FeNO as accessible biomarkers for identifying patients with type-2 eosinophilic inflammation who may benefit from targeted biologic therapy in routine pulmonary practice in India. However, the observational design, small sample size, absence of a comparator group, and incomplete follow-up limit causal inference. Further multicentre studies with larger Indian cohorts, longer follow-up (≥24 months), standardised responder definitions, and objective adherence monitoring are required to better define the long-term effectiveness, cost-effectiveness, and biomarker predictors of response to biologic therapy in severe asthma. Importantly, the high proportion of clinically eligible patients who could not afford mepolizumab (14 of 40, 35%) highlights an urgent need for subsidised access programmes and cost-effectiveness research in low- and middle-income settings.

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