Research Article

Neutrophilic Bronchial Asthma: Unraveling Clinical and Sociodemographic Features

Robin Bhati[1], Sonisha Gupta[1], Anshu Gupta Devra[2], Shubham Naswa[1], Syed Haider Rizvi[1]*

Background/Objectives: Neutrophilic bronchial asthma (NBA) is a distinct asthma phenotype characterized by neutrophilic airway inflammation, frequent exacerbations, and poor corticosteroid responsiveness. Data on the clinical, occupational, and environmental profile of NBA in the Indian population are limited. This study evaluated demographic characteristics, clinical features, occupational and environmental exposures, and inflammatory associations in NBA.

Methods: This cross-sectional observational study was conducted at a tertiary care hospital in India from May 2023 to November 2024. Of 562 patients with bronchial asthma screened, 150 were diagnosed with NBA based on sputum neutrophilia (>61%). Demographic details, body mass index, clinical symptoms, socioeconomic status, occupational history, and environmental exposures were recorded. Sputum cytology was analyzed, and statistical analyses assessed correlations between clinical variables and sputum neutrophil percentages.

Results: The mean age was 38.9 ± 13.5 years, with a slight female predominance (52%) and a mean body mass index of 25.3 kg/m². Dyspnea was the most common symptom (91.33%), followed by dry cough (33%) and nasal stuffiness (22.67%). Nearly half of the patients (48.6%) belonged to the upper-lower socioeconomic class. Occupational exposure was common among farmers (24%), painters (12.7%), and bakery workers (12.7%). Common environmental exposures included house dust (52%), smoke (39.33%), and air fresheners (24.67%). A moderate positive correlation was observed between age and sputum neutrophil percentage ($r = 0.449$, $p < 0.01$) and significant associations between socioeconomic class, occupation, and elevated neutrophilic inflammation.

Conclusion: Neutrophilic Bronchial Asthma is an under-recognized phenotype in India, linked to occupational and environmental exposures. Phenotypic identification and management may improve outcomes.

Access this article online

Website:
www.cijmr.com

DOI:
10.58999/cijmr.v5i02.405

Keywords: Neutrophilic bronchial asthma, Sputum neutrophilia, Occupational exposure, Corticosteroid resistance, Comorbidities, India.

Introduction

Neutrophilic bronchial asthma (NBA) represents a distinct asthma phenotype characterized by chronic neutrophilic airway inflammation, increased frequency of exacerbations, and poor response to corticosteroids.[1] Asthma is a heterogeneous chronic respiratory disease encompassing various phenotypes. Among these, neutrophilic bronchial asthma (NBA) is increasingly recognized as a refractory form associated with persistent airway inflammation predominantly driven by neutrophils.[2] Unlike eosinophilic asthma, NBA patients typically exhibit poor responsiveness to inhaled corticosteroids, often requiring alternative anti-inflammatory and bronchodilator therapies.[3,4] Recent evidence links the NBA to metabolic syndromes such as obesity, diabetes mellitus, and gastroesophageal reflux disease (GERD), all of which can exacerbate clinical severity and reduce treatment efficacy.[5,6] However, in the Indian context, the demographic and clinical characterization of NBA has not been thoroughly studied. This research aims to delineate the clinical presentation, comorbid profile, and sociodemographic variables of NBA to support individualized management and policymaking.

[1]Department of Respiratory Medicine, School of Medical Sciences and Research, Sharda Hospital, Greater Noida, Uttar Pradesh, 201310, India

[2]Department of Pathology, School of Medical Sciences and Research, Sharda Hospital, Greater Noida, Uttar Pradesh, 201310, India

Correspondence to: Sonisha Gupta, Department of Respiratory Medicine, SMS&R, Sharda Hospital, Greater Noida, Uttar Pradesh, 201310, India. E-mail: sonishagupta@gmail.com

Submitted: 27/04/2026 Revision: 05/05/2026
Accepted: 08/06/2026 Published: 15/08/2026

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

How to cite this article: Bhati R, Gupta S, Devra AG, Naswa S, Rizvi SH. Neutrophilic Bronchial Asthma: Unraveling Clinical and Sociodemographic Features. Central India Journal of Medical Research. 2026;5(2):124-129.

Table 1: Anthropometric Measurement

	height	*weight*	*BMI*
Mean	159	63.8	25.3
Median	158	62.0	25.2
Standard deviation	7.98	8.33	3.42
Minimum	142	46	18.1
Maximum	176	89	32.3

Mean BMI was 25.3 kg/m².

Materials And Methods

This cross-sectional observational study was conducted in the Department of Respiratory Medicine at our hospital in our city, India, over an 18-month period from May 2023 to November 2024. Among 562 asthma patients evaluated, 150 met the Neutrophilic Bronchial Asthma diagnostic criteria, shows 26.6% prevalence of neutrophilic bronchial asthma among bronchial asthma patients, which matches the 20 to 30% prevalence noted in the NOEUL KANG study.[7] Patients with >18 years of age presented with complaints/history suggestive of bronchial asthma were evaluated for PFT with BDR (Pulmonary Function Test with Bronchodilator Response), considering all pre procedure prerequisite. Post-bronchodilator FeV1>200 mL and >12% were labeled as bronchial asthma, further evaluated for sputum routine microscopy, those with sputum neutrophils >61%, sputum eosinophils <2%, FeNo <25 ppb, Absolute Eosinophil count <150/μL were labeled as neutrophilic bronchial asthma. Patients with active lung infections, active or history of smoking, chronic obstructive pulmonary disease, or other known respiratory pathologies were excluded. Detailed demographic data, including socioeconomic status using the Kuppuswamy scale, clinical history,

Table 2: Correlation of occupational exposure with AEC, sputum neutrophils, FeNO, Mmrc, ACQ

	Occupation	*Dyspnea as per mrc*	*FeNO(ppB)*	*Absolute eosinophil count*	*Asthma control questionaire*	*Sputum neutrophils (%)*
Mean	Farmer	1.42	17.1	122	3.36	91.7
	Housewife	1.45	17.7	123	3.50	72.5
	Bakery	1.42	17.7	123	3.39	91.0
	Tailor	1.25	17.1	117	3.19	74.8
	Electrician	1.33±	19.3	123	3.00	65.3
	Painter	1.37±	17.6	124	3.39	72.8
	Welder	1.67	18.3	118	4.08	74.3
	IT professional	1.50	18.3	124	3.52	72.0
	Carpenter	1.54	17.9	118	3.73	69.8
	Student	1.40	18.2	122	3.30	74.0
SD	Farmer	0.649	3.49	16.8	0.816	5.00
	Housewife	0.688	4.00	12.0	1.00	5.80
	Bakery	0.507	3.48	14.0	0.792	3.07
	Tailor	0.463	3.36	19.0	0.704	7.48
	Electrician	0.577	6.43	17.0	1.00	5.77
	Painter	0.597	3.56	10.7	0.891	6.81
	Welder	0.516	1.97	19.2	0.665	4.80
	IT professional	2	22	148	4.50	95
	Carpenter	2	23	142	4.50	78
	Student	2	22	148	4.50	98
F-value		0.354	0.298	0.388	0.972	43.860
p-value		0.947	0.969	0.931	0.483	<0.01

Sputum Neutrophils in Farmer and bakery confectioners were significantly higher than other occupation. (p<0.01).

Table 3: Correlation of sociodemographic, allergen exposure, occupation with AEC, sputum neutrophils, FeNO. Mmrc, ACQ

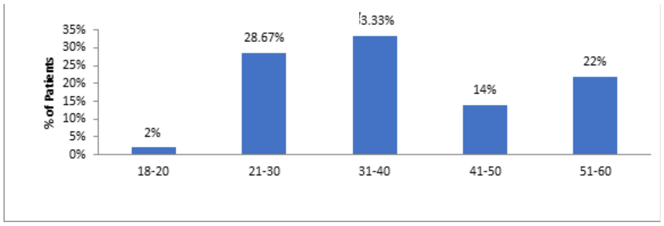
Cagegory	*Test value /p-value*	*Absolute eosinophil count*	*Sputum neutrophils*	*FeNO (ppB)*	*Dyspnea as per MRC*	*Asthma control questionnaire*
Age	r-value	-0.068	0.449	-0.122	0.013	-0.018
	p-value	0.408	0.754	0.138	0.873	831
Gender	T-value	1.722	0.795	0.808	1.52	0.336
	p-value	0.087	0.428	0.421	0.13	0.737
BMI	r-value	0.026	0.301	0.025	-0.073	-0.065
	p-value	0.75	<0.01*	0.374	0.378	0.428
SES	F-value	0.92	3.958	1.047	_	_
	p-value	0.404	0.025*	0.357	_	_
Allergen-biomass	F-value	_	277	_	_	_
	p-value		<0.001	_	_	_
Allergen-housedust	F-value	8.448	251.630	0.102	0.00462	0.121
	p-value	.400	<0.001	0.750	0.864	0.728
Allergen-sunlight	F-value	0.100	239.822	2.504	0.250	0.358
	p-value	0.756	<0.001	0.220	0.623	0.557
Occupation	F-value	0.388	43.86	0.298	0.354	0.972
	p-value	0.931	<0.01*	0.969	0.947	0.483

BMI showed an inverse relation with sputum neutrophils (r = -0.301, p<0.01). Significant l association l of l higher l sputum l neutrophils l in l patients l with l farmer l or l bakery l occupation l and l those l having l sunlight, house l dust l and l biomass l exposure (*p* <0.01). SES showed the statistical significance (p=0.025), particularly between the upper-lower and upper-middle strata (p=0.009).

and comorbidities, including BMI, diabetes, and GERD, were recorded. Occupational and environmental exposures were also assessed. Statistical analysis included descriptive statistics for baseline characteristics, Pearson correlation for continuous variables, chi-square for categorical comparisons, and multivariate logistic regression for significant predictors. A *p-value* <0.05 was considered statistically significant.

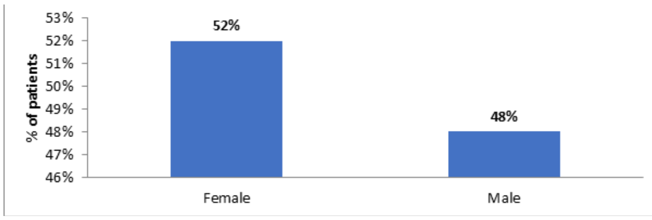
Results

Among 562 asthma patients evaluated, 150 met the NBA diagnostic criteria.[7] The average age was 38.9 ± 13.5 years, with female predominance (52%) (Figures 1 and 2). Mean BMI was 25.3 kg/m² (Table 1). Dyspnea was the most frequent symptom (91.33%), followed by dry cough (33%) and nasal congestion (22.67%). Socioeconomic distribution revealed that 48.6% of patients were from the upper-lower class (Figure 3), and occupational breakdown showed a higher prevalence among farmers (24%), painters (12.7%), and bakery workers (12.7%) (Figure 4). Environmental exposures such as house dust (52%), smoke (39.33%), and air fresheners (24.67%) were prevalent (Figure 5). Seasonal variability was absent in 60% of cases, and 28.66% had a history of similar respiratory illness. Inhalational corticosteroids had been used by 27.33% of patients prior to enrollment. Correlation analysis demonstrated a significant positive association between age and sputum neutrophil percentage (r = 0.449, *p* <0.01), but no significant correlation with eosinophil count, FeNO levels, or asthma control questionnaire (ACQ) scores. Gender-wise comparison revealed no significant differences in sputum neutrophilia or other inflammatory markers. BMI has **a** non-significant inverse correlation with sputum neutrophils and a direct correlation with absolute eosinophil count (AEC) and fractional exhaled nitric oxide (FeNO) measurement. Although BMI showed an inverse relation with sputum neutrophils (r = -0.301, *p* <0.01), its correlation with eosinophilic parameters and asthma control was weak and non-significant. Notably, socioeconomic status was significantly associated



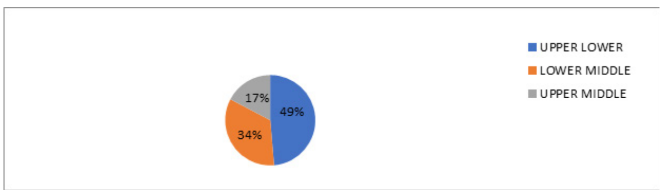
The average age was 38.9 ± 13.5 years.

Figure 1: Age category



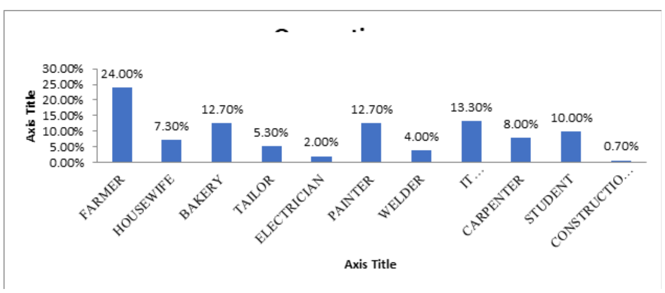
Female predominance (52%).

Figure 2: Gender



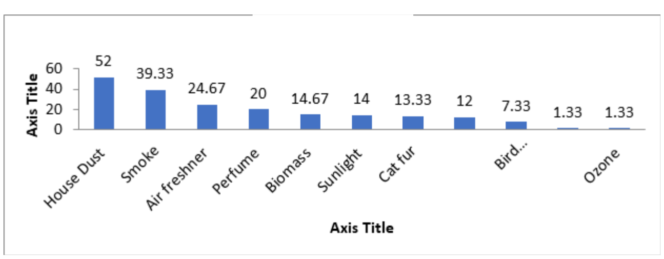
Socioeconomic distribution- 48.6% of patients were from the upper-lower class.

Figure 3: SES



Occupational breakdown showed a higher prevalence among farmers (24%), painters (12.7%), and bakery workers (12.7%).

Figure 4: Occupation



Environmental exposures such as house dust (52%), smoke (39.33%), and air fresheners (24.67%) were prevalent.

Figure 5: Allergen exposure

with sputum neutrophil levels, especially among the lower-middle and upper-lower classes. One-way Analysis of Variance (ANOVA) confirmed the statistical significance (p=0.025), particularly between the upper-lower and upper-middle strata ($p = 0.009$). Occupational exposure to bakery dust and farm-related allergens was significantly linked with higher neutrophilic counts ($p < 0.01$). Significant association of higher sputum neutrophils in patients with farmer or bakery occupation and those having sunlight, house dust and biomass exposure ($p < 0.01$) (Tables 2 and, 3). Hospital admissions were not significantly associated with asthma severity metrics such as dyspnea score, ACQ, or FeNO levels. However, a trend of poorer control was noted in patients with comorbid obesity, suggesting a link between metabolic inflammation and disease severity.

Discussion

Neutrophilic asthma (NBA) is a predominant adult-onset phenotype, often presenting after 12 years of age, with persistent symptoms, frequent exacerbations, and higher emergency visits compared to eosinophilic asthma.[5] Although exacerbations are less severe, NBA has been linked to sudden-onset fatal asthma (23%) and higher hospitalization rates.[8] It is also associated with nocturnal worsening, poor quality of life, and poor prognosis.[9]

In our study, the mean age of NBA patients was 38.9 ± 13.5 years, younger than reported in Western literature, possibly due to ethnic variations and sample size differences. Females were more commonly affected (52%), aligning with previous studies.[9-10]

In our study we observed a moderate positive correlation between advancing age and sputum neutrophil percentage ($p < 0.01$), suggesting increased neutrophilic inflammation with age. Neutrophils in NBA exhibit enhanced NET (Neutrophilic Extracellular Trap) formation, α-defensins, serine proteases, and proinflammatory markers, contributing to airway obstruction and disease progression.[11]

In our study, a significant correlation was found between higher BMI and neutrophilic inflammation ($p < 0.01$), supporting the role of obesity-related inflammatory cytokines (IL-6, IL-8, TNF-α, IL-1β, and IL-17) in airway neutrophilia.[12] Obesity is also linked to steroid resistance and increased airway remodeling, further worsening disease outcomes.[13]

It is possible that the high proportion with neutrophilia in lower-middle and upper-lower class could be due to environmental exposures (e.g. indoor air pollution, increased risk of infections, exposure to animals, endotoxi exposure).[14]

Our study identified a higher sputum neutrophil percentage in individuals with bakery or farming occupations, likely due to chronic exposure to flour dust, organic dust, and ammonia, which can trigger neutrophilic inflammation.[11,12] Similarly, exposure to biomass, house dust, and sunlight was significantly associated with higher neutrophil counts, emphasizing the role of environmental triggers in NBA.[9,10]

These findings highlight the importance of early recognition of demographic, occupational, and environmental risk factors in NBA to aid in better management and therapeutic strategies.

It can be observed that the age profile of patients in our study was younger than that reported in the literature. The disparity in findings could be attributed to ethnic differences in the study population observed previously. Also, the sample size of previous literature was comparatively smaller than in our study

Limitations

- Single-center study
- Lack of long-term follow-up
- Further multi-center trials needed

Conclusion

Patients with neutrophilic bronchial asthma, older age, higher BMI, upper middle and lower socioeconomic status have higher sputum neutrophil count. In occupation, Farmers and bakery confectioners have significantly higher sputum neutrophils. Patients with sunlight, biomass and household dust exposure tend to have higher sputum neutrophil count.

Acknowledgments

The author is responsible for all content of the manuscript. There are no Financial/nonfinancial disclosures. There is no role for any sponsors in the development of the research and manuscript.

I confirm the corresponding author has read the journal policies and submits this manuscript in accordance with those policies.

Author's Contribution

Robin Bhati- Drafting, Sonisha Gupta - Conception & Supervision, Anshu Gupta Devra - Critical Revision & Editing, Shubham Naswa - Data Acquisition, Syed Haider Rizvi - Writing Assistance.

Approval Number

Ref. No- SU/SMS&R/76-A/2023/127- approved from Institutional Ethic Committtee of SMS&R, Sharda Hospital, Sharda University.

Ethics Approval and Consent to Participate

The Title *Neutrophilic Bronchial Asthma: Unraveling Clinical and Sociodemographic Features* has been approved from Institutional Ethic Committtee of SMS&R, Sharda Hospital, Sharda University as for human ethics issues, in the meeting held under the chairmanship of Professor Chakra Dhar Tripathi. Approval number- Ref. No- SU/SMS&R/76-A/2023/127

Conflict of Interest

None of the Authors have any conflict of Interest. No conflicts exist for the specified authors.

Funding

This research did not receive funding.

References

1. Wenzel SE. Asthma phenotypes: the evolution from clinical to molecular approaches. Nat Med. 2012;18(5):716–25.
2. Shaw DE, Berry MA, Hargadon B, McKenna S, Shelley MJ, Green RH, et al. Association between neutrophilic airway inflammation and asthma severity. Thorax. 2007;62(1):56–61.
3. Simpson JL, Scott R, Boyle MJ, Gibson PG. Inflammatory subtypes in asthma: assessment and identification using induced sputum. Respirology. 2006;11(1):54–61.
4. Yamasaki A, Okazaki R, Harada T. Neutrophils and Asthma. Diagnostics. 2022; 12(5):1175
5. Kuruvilla ME, Lee FE, Lee GB. Understanding asthma phenotypes, endotypes, and mechanisms of disease. Clin Rev Allergy Immunol. 2019;56(2):219–33
6. Crisford H, Sapey E, Rogers GB, Taylor S, Nagakumar P, Lokwani R, Simpson JL. Neutrophils in asthma: the good, the bad and the bacteria. Thorax. 2021 Aug 1;76(8):835-44.
7. Kang N, Song WJ. Discovering Biomarkers of Neutrophilic Asthma: A Clinician's Perspective. Allergy Asthma Immunol Res. 2022;14(1):1–4
8. Singh S, Salvi S, Mangal DK, et al. Prevalence, time trends and treatment practices of asthma in India: the Global Asthma Network study. ERJ Open Res 2022;8:00528-202
9. Dasgupta A,Ade V,Dutta J,et al. Inflammatory phenotypes of severe asthma in India. Lung India 2019;36:267-8
10. Shin B, Kwon HS, Park SY, Kim TB, Moon HB, Cho YS. The transition of sputum inflammatory cell profiles is variable in stable asthma patients. Asia Pacific Allergy. 2017 Jan 1;7(1):19-28.
11. Wang F, He XY, Baines KJ, Gunawardhan LP, Simpson JL, et al.

(2011) Different phenotypes in adults and children with acute asthma. Eur Respir J 38: 567-574.

12. Wen Y, Reid DW, Zhang D, et al. Assessment of airway inflammation using sputum, BAL, and endobronchial biopsies in current and ex-smokers with established COPD. Int J Chron Obstruct Pulmon Dis 2010; 5: 327–334.
13. Pirogov AB, Prikhod'ko AG, Perelman YM, et al. Inflammatory pattern of the bronchial mucosa in patients with asthma with airway hyperresponsiveness to hypoosmotic stimulus. Bull Exp Biol Med 2016; 161: 550–553.
14. Pembrey L, Brooks C, Mpairwe H, Figueiredo CA, Oviedo AY, Chico M, Ali H, Nambuya I, Tumwesige P, Robertson S, Rutter CE, van Veldhoven K, Ring S, Barreto ML, Cooper PJ, Henderson J, Cruz AA, Douwes J, Pearce N; WASP Study Group. Asthma inflammatory phenotypes on four continents: most asthma is non-eosinophilic. Int J Epidemiol. 2023 Apr 19;52(2):611-623.