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Degree of Airway Obstruction and Contributing Factors, Exploring Potential Mismatches and Pitfalls

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ABSTRACT
BACKGROUND: The study investigates asthma, a chronic inflammatory respiratory condition that poses diagnostic challenges due to its variable symptoms, highlighting the importance of accurate documentation and interpretation. It aims to explore the demographic and clinical profiles of asthma patients, particularly focusing on the relationships among airway obstruction severity, spirometric measurements, atopic history, and family history to reveal the complex factors influencing asthma.
AIMS: Employing a retrospective descriptive-analytic design, the research analyzes medical records of 107 patients treated at the Outpatient Installation of the Lung Polyclinic at Wlingi General Hospital in Blitar Regency from 2021 to 2022. The analysis incorporates descriptive statistics for demographic and clinical variables alongside Spearman correlation tests.
METHOD: Results indicate a significant prevalence of smoking history among asthma patients, with 22.4% being active smokers and 52.3% passive smokers; however, no significant correlation with asthma control was found. Environmental risk factors such as dust and cold air were common but did not consistently correlate with asthma exacerbations. Spirometric analysis revealed a significant relationship between airway obstruction severity and parameters like FEV1, FVC, FEV1/FVC, PEF, FEF 25, FEF 50, and FEF 75, emphasizing the link between airflow obstruction and reduced lung function. Furthermore, no significant correlation was observed between stable asthma diagnosis and atopic or family history, suggesting that asthma control is influenced by various complex factors.
CONCLUSION: Our research reveals critical pitfalls in the current understanding of asthma, advocating for a comprehensive evaluation of all contributing factors to enhance diagnostic accuracy and treatment efficacy. Recognizing these complexities is essential for improving asthma management and ensuring better health outcomes for patients.

Keywords: Asthma, Atopy History, Degree of Obstruction, Environmental Risk Factors, Spirometric Parameters.

Introduction

Asthma is a chronic inflammatory condition affecting the airways, commonly presenting with symptoms such as wheezing, shortness of breath, chest tightness, and coughing (1,2). This inflammation results in recurring episodes of these symptoms, which include wheezing, breathlessness, chest heaviness, and coughing (3). These symptoms tend to fluctuate, but often involve wheezing, coughing, difficulty breathing, and a sensation of tightness in the chest (1). Mismanagement can occur when all abnormal breath sounds are incorrectly interpreted as wheezing, leading to a mistaken diagnosis of asthma (4). Proper identification of wheezing and consistent symptoms is essential to avoid misdiagnosis and inappropriate treatment (5,6).

Diagnosing asthma requires a comprehensive medical history, physical examination, and diagnostic tests. Medical history includes questions about respiratory complaints like wheezing, shortness of breath, chest pain, and coughing, as well as any family history of allergic conditions. Physical examination focuses on detecting expiratory wheezing through auscultation and observing for signs such as tachypnea, tachycardia, or the tripod sitting position. Identifying trigger factors like cold air, physical exercise, and pollution is also important (7).

Spirometry is the primary diagnostic tool used to measure forced expiratory volume in one second (FEV1). In asthma patients, reversible airway obstruction is indicated by FEV1 values less than 0.8 and an FEV1/FVC ratio below 0.70. Severity correlates with lower FEV1 and FEV1/FVC values. An increase in FEV1 by more than 12% and greater than 200 ml after administering salbutamol confirms airway reversibility (1,8).

Several factors contribute to asthma or airway hyperreactivity, including environmental allergens like dust mites, pet dander, cockroaches, and molds, which can trigger allergic reactions in susceptible individuals (7). Viral respiratory infections, such as the common cold or flu, may exacerbate asthma by further narrowing the airways (8). In addition, exercise-induced hyperventilation often causes bronchoconstriction, particularly in people with asthma (1). Conditions such as gastroesophageal reflux disease (GERD), chronic sinusitis, and rhinitis can also worsen asthma symptoms (7). Certain medications like aspirin, NSAIDs, and beta-blockers may induce asthma in some patients (8). Other risk factors include obesity, air pollution, tobacco smoke, occupational irritants, stress, and perinatal factors like premature birth (6,7,9–18).

A number of related studies have been conducted. For example, research by (19) used an analytical observational design with a cross-sectional approach, gathering data from 100 pediatric asthma patients at Dr. Soetomo Hospital in Surabaya. The ISAAC questionnaire was used to identify atopy history, and asthma severity was categorized according to GINA 2019 guidelines. A Chi-Square test was used to analyze the data. The study found a significant correlation between atopy history and asthma severity in pediatric patients ($p < 0.05$). Children with atopy history were found to have a 2.5 times higher risk of developing severe asthma compared to those without atopy.

Another study by Cetemen included 90 children aged 6-18 years, 60 of whom were obese and 30 served as healthy controls. Obesity was defined as a BMI ≥ the 95th percentile for age. The study involved physical examinations and lung function tests (FEV1, FVC, PEF, FEF25-75) (20). Questionnaires were administered to investigate obesity, allergic diseases, and asthma, and blood samples were collected for total IgE and specific allergen measurements. The findings showed that asthma attacks in the past 12 months were significantly more prevalent among obese children compared to the control group (p = 0.049), and obesity was more common in family members (p = 0.001). While specific IgE levels for food and inhalant allergens were higher in the obese group, these increases were not statistically significant (p = 0.136 and p = 0.392, respectively). No significant differences were found in lung function tests (p > 0.05) or total IgE levels (p = 0.619) between the two groups.

A similar study by London focused on children with asthmatic parents compared to those without a family history of asthma (21). The prevalence ratio (PR) for early-onset persistent asthma was 12.1 [95% confidence interval (CI) 7.91-18.7], compared to 7.51 (95% CI 2.62-21.5) for early-onset transient asthma and 5.38 (95% CI 3.40-8.50) for late-onset asthma. The study found that maternal smoking during pregnancy, combined with a parental history of asthma and allergies, significantly increased the risk of early-onset persistent asthma (interaction contrast ratio = 3.10, 95% CI 1.45-4.75). This supports previous evidence that parental history is strongly linked to early-onset persistent asthma, especially when early-life environmental factors, such as maternal smoking, are involved. Similar studies have been conducted by (22–26).

Based on the issues presented, the goals of this research are to examine the demographic and clinical characteristics of asthma patients and to analyze the correlation between the degree of airway obstruction (based on spirometry) and a history of atopy or family history of asthma/allergies. This research aims to provide further insight into the factors influencing asthma in the studied population.

Method

This study employs a descriptive-analytic design with a retrospective approach, utilizing patient medical records to gather data. The information is sourced from the medical records of patients treated at the Lung Polyclinic Outpatient Unit of Wlingi General Hospital, Blitar Regency, covering the period from 2021 to 2022, with a total sample size of 107 patients.

Data analysis is conducted in two stages. First, a descriptive analysis is performed, where the frequency and percentage distribution of demographic variables such as age, gender, occupation, and education are examined. Clinical variables, including the degree of airway obstruction, spirometry results, atopy history, and family history of asthma or atopy, are also analyzed using frequency and percentage distributions. For numerical variables such as FEV1, FVC, and FEV1/FVC, the mean and standard deviation distributions are calculated.

The second stage involves a correlation analysis using the Spearman correlation test. This test assesses the relationship between the degree of airway obstruction, spirometry results, atopy history, and family history of asthma or atopy. The degree of obstruction is classified based on FEV1/FVC values into normal, mild, moderate, and severe categories. Spirometry results are evaluated through FEV1, FVC, and the FEV1/FVC ratio. Atopy history and family history are documented based on patient information recorded in the medical records.

Result

Table 1 Characteristics of Observed Parameters

	Frequency	**Percentage (%)**
Smoking history		
NA	18	16.8%

	Frequency	Percentage (%)
Active	24	22.4%
Passive	56	52.3%
Former	9	8.4%
Stable Asthma Diagnosis		
Well-Controlled	15	14.0%
Partially Controlled	68	63.6%
Uncontrolled	24	22.4%
Comorbid		
CHF (Congestive Heart Failure)	1	0.9%
DM (Diabetes Mellitus)	1	0.9%
GERD (Gastroesophageal Reflux Disease)	3	2.8%
HF (Heart Failure)	4	3.7%
HT (Hypertension)	28	26.2%
Lung Tumor	1	0.9%
Obesity	3	2.8%
Rhinitis	6	5.6%
TB (Tuberculosis)	2	1.9%
Patient's ATOPY History		
No	61	57.0%
Yes	46	43.0%
Type of Atopy: Dust Allergy	4	3.7%
Type of Atopy: Cold Allergy	5	4.7%
Type of Atopy: Food Allergy	1	0.9%
Type of Atopy: Weather-Related Allergy	1	0.9%
Type of Atopy: Dermatitis	6	5.6%
Type of Atopy: Eczema	6	5.6%
Type of Atopy: Rhinitis	28	26.2%
Type of Atopy: Hypertension (HT)	1	0.9%
Family History of ASTHMA/Atopy		
No	71	66.4%
Yes	36	33.6%
Asthma (family atopy)	27	25.2%
Rhinitis (family atopy)	5	4.7%
Dermatitis (family atopy)	1	0.9%
ASTHMA RISK ASSESSMENT		
Type of risk factor: Dust	42	39.3%
Type of risk factor: Cold air	47	43.9%
Type of risk factor: History of allergies	11	10.3%
Type of risk factor: Stress	8	7.5%
Type of risk factor: Dry air	1	0.9%
Diagnosis of Exacerbated Asthma		

	Frequency	Percentage (%)
NA	68	63.6%
Mild-Moderate	34	31.8%
Severe	4	3.7%
Life-threatening	1	0.9%
RESTRICTION/OBSTRUCTION/MIXED		
Normal	15	14.0%
Obstruction	12	11.2%
Restriction	44	41.1%
Mixed	36	33.6%
Degree of Obstruction		
Mild	31	64.6%
Moderate	17	35.4%

Source: Researcher's data analysis (2023)

An analysis of smoking history characteristics among 107 research participants reveals significant insights into their health profiles. Notably, 22.4% of patients are active smokers, while a substantial 52.3% are exposed to passive smoking. Additionally, 8.4% are former smokers, and 16.8% have an unknown smoking status. In terms of asthma diagnoses, the data indicates that 14.0% of patients are classified as having Fully Controlled Stable Asthma, 63.6% as Partially Controlled, and 22.4% as Uncontrolled.

The study also explores comorbidities present in the sample. It is found that 0.9% suffer from Congestive Heart Failure (CHF), 0.9% from Diabetes Mellitus (DM), 2.8% from Gastroesophageal Reflux Disease (GERD), and 3.7% from Heart Failure (HF). A significant portion, 26.2%, is affected by Hypertension (HT), with varying percentages noted for conditions such as lung tumors, obesity, rhinitis, and tuberculosis (TB). Regarding atopy history, 57.0% of patients have no history of atopy, while 43.0% report various allergic conditions, including dust allergy, food allergy, dermatitis, and eczema.

Furthermore, the assessment of asthma risk factors reveals that 39.3% of patients are at risk due to dust exposure, while 43.9% are exposed to cold air. Additional contributors include allergy history (10.3%), stress (7.5%), and dry air exposure (0.9%). The data on asthma exacerbation shows that 31.8% of patients experience mild to moderate exacerbations, 3.7% have severe exacerbations, and 0.9% face life-threatening exacerbations, with 63.6% of patients having an unknown exacerbation level. Finally, the distribution of patients regarding respiratory patterns is noted, with 14.0% having restrictive patterns, 11.2% obstructive, and 41.1% mixed patterns. In terms of obstruction degree, 64.6% of patients present with mild obstruction, while 35.4% exhibit moderate obstruction among the 48 participants assessed.

Table 2 Characteristics of Spirometry Results

	Mean±Std. Deviation
FEV1 (%)	51.41±20.13
FVC (%)	67.13±20.73
FEV1/FVC (%)	61.65±10.47
PEF (%)	28.74±13.58
FEF 25 (%)	26.52±16.23
FEF 50 (%)	20.02±12.30

FEF 75 (%)	17.81±11.71

Source: Researcher's data analysis (2023)

The spirometric results from the analysis of 107 research samples reveal critical insights into lung function among the participants. The average Forced Expiratory Volume in one second (FEV1) is recorded at 51.41%, indicating a significant reduction in airway function. Similarly, the average Forced Vital Capacity (FVC) stands at 67.13%, suggesting compromised lung capacity. The FEV1/FVC ratio, also at 51.41%, further underscores the impaired respiratory function, as a normal ratio typically ranges higher. Additionally, the Peak Expiratory Flow (PEF) is measured at 28.74%, while the Forced Expiratory Flow at 25%, 50%, and 75% (FEF 25, FEF 50, and FEF 75) average 26.52%, 20.02%, and 17.81%, respectively. These values collectively indicate notable airway obstruction and highlight the need for ongoing monitoring and intervention in this patient population.

Table 3 Correlation Test Results Between Stable Asthma Diagnosis and Spirometric Results, Atopic History, and Family History of Asthma/Atopy in the Family

	r	p
The relationship between Stable Asthma Diagnosis and FEV1 (%)	-0.165	0.089
The relationship between Stable Asthma Diagnosis and FVC (%)	-0.098	0.317
The relationship between Stable Asthma Diagnosis and FEV1/FVC (%)	-0.179	0.065
The relationship between Stable Asthma Diagnosis and PEF (%)	-0.186	0.055
The relationship between Stable Asthma Diagnosis and FEF 25 (%)	-0.144	0.140
The relationship between Stable Asthma Diagnosis and FEF 50 (%)	-0.145	0.137
The relationship between Stable Asthma Diagnosis and FEF 75 (%)	-0.213	0.028
The relationship between Stable Asthma Diagnosis and Patient's Atopy History	-0.159	0.103
The relationship between Stable Asthma Diagnosis and Family History of Asthma/Atopy in the family	-0.063	0.517

Source: Researcher's data analysis (2023)

The correlation test results examining the relationship between stable asthma diagnosis and various spirometric outcomes—namely FEV1, FVC, FEV1/FVC, PEF, FEF 25, and FEF 50—indicated p-values greater than 0.05 ($p > 0.05$), leading to the acceptance of the null hypothesis. Consequently, it can be concluded that there is no significant relationship between stable asthma diagnosis and these spirometric measures, nor is there an association with the patient's atopy history or family history of asthma/atopy. This finding suggests that whether patients are categorized as having Well-Controlled, Partially Controlled, or Uncontrolled asthma, their spirometric outcomes remain unaffected by these classifications or their atopy backgrounds.

Conversely, the correlation test for the spirometric outcome FEF 75 yielded a correlation coefficient of -0.213 and a p-value of 0.028 ($p < 0.05$), indicating a significant relationship. This moderately strong negative correlation suggests that as asthma control decreases, the spirometric outcome for FEF 75 declines. In other words, patients with more stable asthma exhibit higher values for FEF 75, highlighting the importance of asthma management in maintaining lung function.

Table 4 Results of Correlation Test Between Restriction/Obstruction/Mixed with Spirometric Outcomes, Atopic History, and Family History of Asthma/Atopy

	r	p
The relationship between Restriction/Obstruction/Mixed and FEV1 (%)	-0.614	0.000
The relationship between Restriction/Obstruction/Mixed and FVC (%)	-0.546	0.000
The relationship between Restriction/Obstruction/Mixed and FEV1/FVC (%)	-0.556	0.000
The relationship between Restriction/Obstruction/Mixed and PEF (%)	-0.413	0.000
The relationship between Restriction/Obstruction/Mixed and FEF 25 (%)	-0.574	0.000
The relationship between Restriction/Obstruction/Mixed and FEF 50 (%)	-0.669	0.000
The relationship between Restriction/Obstruction/Mixed and FEF 75 (%)	-0.530	0.000
The relationship between Restriction/Obstruction/Mixed and Patient's Atopy History	0.017	0.863
The relationship between Restriction/Obstruction/Mixed and Family History of Asthma/Atopy Family History	-0.029	0.770

Source: Researcher's data analysis (2023)

The correlation test results reveal a significant relationship between the Restriction/Obstruction/Mixed pattern and various spirometric parameters, including FEV1, FVC, FEV1/FVC, PEF, FEF 25, FEF 50, and FEF 75. The strong negative correlation coefficients across these parameters indicate that patients exhibiting an obstructive or mixed pattern tend to demonstrate lower spirometric values, whereas those with a restrictive pattern tend to have relatively higher values. This conclusion is further substantiated by significant p-values ($p < 0.05$) obtained in all tests, allowing for the rejection of the null hypothesis.

The analysis clearly indicates that the Restriction/Obstruction/Mixed pattern is significantly associated with a decline in lung function, as evidenced by the consistently lower spirometric values among affected patients. However, despite this significant correlation with spirometric parameters, the relationship between the Restriction/Obstruction/Mixed pattern and both the patient's and family's atopy history is not statistically significant. The p-values exceeding 0.05 ($p > 0.05$) in these correlation tests suggest that there is no substantial connection between the Restriction/Obstruction/Mixed pattern and the presence or absence of atopy history in either patients or their families.

Table 5 Correlation Test Results Between Degree of Obstruction and Spirometric Outcomes, Patient Atopy History, and Family History of Asthma/Atopy

	r	p
Relationship between Degree of Obstruction and FEV1 (%)	-0.489	0.000
Relationship between Degree of Obstruction and FVC (%)	-0.300	0.038
Relationship between Degree of Obstruction and FEV1/FVC (%)	-0.829	0.000
Relationship between Degree of Obstruction and PEF (%)	-0.428	0.002
Relationship between Degree of Obstruction and FEF 25 (%)	-0.514	0.000
Relationship between Degree of Obstruction and FEF 50 (%)	-0.508	0.000
Relationship between Degree of Obstruction and FEF 75 (%)	-0.308	0.033
Relationship between Degree of Obstruction and Patient's Atopy History	0.074	0.615
Relationship between Degree of Obstruction and Family History of Asthma/Atopy	0.039	0.793

Source: Researcher's data analysis (2023)

The results of the correlation tests reveal a significant relationship between the Degree of Obstruction and the spirometric parameter FEV1. Specifically, a strong negative correlation coefficient indicates that patients with moderate obstruction tend to exhibit lower FEV1 values, while those with mild obstruction demonstrate relatively higher values. Similarly, the correlation test between the Degree of Obstruction and Forced Vital Capacity (FVC) reveals a significant relationship, characterized by a moderately strong negative correlation coefficient. This suggests that patients with moderate obstruction have lower FVC spirometric values compared to their counterparts with mild obstruction.
Moreover, the correlation test assessing the relationship between the Degree of Obstruction and the FEV1/FVC ratio shows a highly significant association, indicated by a very strong negative correlation coefficient. Patients with moderate obstruction again present lower FEV1/FVC values in comparison to those with mild obstruction. This trend is consistent across additional spirometric parameters, including Peak Expiratory Flow (PEF), FEF 25, FEF 50, and FEF 75, all of which reveal strong negative correlation coefficients. Collectively, these findings underscore that patients experiencing moderate obstruction consistently demonstrate diminished spirometric values, while those with mild obstruction show relatively higher values, emphasizing the impact of obstruction severity on lung function.

Table 6 Results of Correlation Tests Between Degree of Obstruction and Atopy Types, Family Atopy Types, and Risk Factor Types (Asthma Risk Assessment)

	r	p
The relationship between the Degree of Obstruction and the Type of Dust Allergy	0.197	0.180
The relationship between the Degree of Obstruction and the Type of Cold Allergy	0.064	0.668
The relationship between the Degree of Obstruction and the Type of Food Allergy	.	.
The relationship between the Degree of Obstruction and the Type of Weather Allergy	-0.108	0.465
The relationship between the Degree of Obstruction and the Type of Dermatitis Allergy	0.197	0.180
The relationship between the Degree of Obstruction and the Type of Eczema Allergy	-0.154	0.295
The relationship between the Degree of Obstruction and the Type of Rhinitis Allergy	0.031	0.835
The relationship between the Degree of Obstruction and the Type of Hypertension Allergy	-0.108	0.465
The relationship between the Degree of Obstruction and Asthma (family atopy)	-0.110	0.457
The relationship between the Degree of Obstruction and Rhinitis (family atopy)	0.175	0.233
The relationship between the Degree of Obstruction and Dermatitis (family atopy)	-0.108	0.465
The relationship between the Degree of Obstruction and ACT SCORE	-0.011	0.940
The relationship between the Degree of Obstruction and GINA SYMPTOMS CONTROL	-0.084	0.571
The relationship between the Degree of Obstruction and the Type of Dust Risk Factor	-0.074	0.615
The relationship between the Degree of Obstruction and the Type of Cold Air Risk Factor	0.113	0.444

	r	p
The relationship between the Degree of Obstruction and the Type of Allergy History Risk Factor	0.019	0.895
The relationship between the Degree of Obstruction and the Type of Stress Risk Factor	0.169	0.252
The relationship between the Degree of Obstruction and the Type of Dry Air Risk Factor	.	.
The relationship between the Degree of Obstruction and the Diagnosis of Asthma Exacerbation	0.075	0.610
The relationship between the Degree of Obstruction and RESTRICTION/OBSTRUCTION/MIXED	0.226	0.122

Source: Researcher's data analysis (2023)

The correlation test results reveal no significant relationship between the Degree of Obstruction and various Allergy Types, including Dust, Cold, Food, Weather, Dermatitis, Eczema, Rhinitis, and Hypertension (HT). The p-values obtained were greater than 0.05 (p>0.05, accept Ho), indicating that both mild and moderate obstruction do not significantly correlate with the presence or types of allergic atopy. Similarly, the correlation test with Family Atopy Types, such as Asthma, Rhinitis, and Dermatitis, confirms that there is no significant association between the Degree of Obstruction and familial atopy history, as evidenced by p-values exceeding 0.05 (p>0.05, accept Ho).

Additionally, the assessment of the Asthma Control Test (ACT) Score and the Gina Symptoms Control suggests no significant relationship between the Degree of Obstruction and the ACT scores, whether high or low. The p-value greater than 0.05 (p>0.05, accept Ho) indicates that the level of asthma control in patients is not influenced by the Degree of Obstruction. Furthermore, correlation tests focused on Asthma Risk Assessment—including factors such as Dust, Cold Air, Allergy History, Stress, and Dry Air—also showed no significant correlation with the Degree of Obstruction, reaffirmed by p-values greater than 0.05 (p>0.05, accept Ho).

Finally, the correlation tests regarding the Diagnosis of Asthma Exacerbation and the Restriction/Obstruction/Mixed category further support the absence of a significant relationship with the Degree of Obstruction. Again, the p-value greater than 0.05 (p>0.05, accept Ho) indicates that neither mild nor moderate obstruction significantly correlates with the diagnosis of asthma exacerbation or the classification of Restriction/Obstruction/Mixed in patients.

Table 7 Results of Correlation Test Between the Degree of Obstruction and Types of Patient Comorbidities

	r	p
Relationship between Degree of Obstruction and CHF (Congestive Heart Failure)	-0.108	0.465
Relationship between Degree of Obstruction and DM (Diabetes Mellitus)	.	.
Relationship between Degree of Obstruction and GERD (Gastroesophageal Reflux Disease)	-0.011	0.940
Relationship between Degree of Obstruction and HF (Heart Failure)	.	.
Relationship between Degree of Obstruction and HT (Hypertension)	-0.092	0.535
Relationship between Degree of Obstruction and Lung Tumor	.	.

Relationship between Degree of Obstruction and Obesity	0.064	0.668
Relationship between Degree of Obstruction and Rhinitis	0.092	0.534
Relationship between Degree of Obstruction and TB (Tuberculosis)	.	.

Source: Researcher's data analysis (2023)

The results of the correlation test examining the relationship between the Degree of Obstruction and various comorbidities—including Congestive Heart Failure (CHF), Diabetes Mellitus (DM), Gastroesophageal Reflux Disease (GERD), Heart Failure (HF), Hypertension (HT), lung tumors, obesity, rhinitis, and tuberculosis (TB)—indicate that all p-values were greater than 0.05 (p>0.05, accept Ho). This finding allows for the conclusion that there is no significant relationship between the Degree of Obstruction and these specific comorbidities. In essence, patients classified with mild or moderate obstruction do not demonstrate a meaningful association with the presence or absence of these health conditions.

Table 8 Results of Correlation Test Between Stable Asthma Diagnosis and Types of Patient Comorbidities

	r	p
Relationship between Stable Asthma Diagnosis and CHF	0.153	0.116
Relationship between Stable Asthma Diagnosis and DM	0.153	0.116
Relationship between Stable Asthma Diagnosis and GERD	0.070	0.475
Relationship between Stable Asthma Diagnosis and HF	0.138	0.156
Relationship between Stable Asthma Diagnosis and HT	0.054	0.581
Relationship between Stable Asthma Diagnosis and Lung Tumor	0.153	0.116
Relationship between Stable Asthma Diagnosis and Obesity	-0.019	0.843
Relationship between Stable Asthma Diagnosis and Rhinitis	-0.042	0.671
Relationship between Stable Asthma Diagnosis and TB	0.097	0.321

Source: Researcher's data analysis (2023)

The results of the correlation test examining the relationship between Stable Asthma Diagnosis and various comorbidities—including Congestive Heart Failure (CHF), Diabetes Mellitus (DM), Gastroesophageal Reflux Disease (GERD), Heart Failure (HF), Hypertension (HT), lung tumors, obesity, rhinitis, and tuberculosis (TB)—indicated a p-value greater than 0.05 (p>0.05, accept Ho). Consequently, it can be concluded that there is no significant relationship between Stable Asthma Diagnosis and these comorbidities. Specifically, patients diagnosed with stable asthma, whether classified as Fully Controlled, Partially Controlled, or Uncontrolled, do not exhibit a significant correlation with the presence or absence of these associated health conditions.

Table 9 Results of Correlation Test Between Restriction/Obstruction/Mixture and Types of Patient Comorbidities

	r	p
Relationship between Restriction/Obstruction/Mixture and CHF	0.118	0.224
Relationship between Restriction/Obstruction/Mixture and DM	-0.015	0.878
Relationship between Restriction/Obstruction/Mixture and GERD	0.075	0.443
Relationship between Restriction/Obstruction/Mixture and HF	-0.101	0.302

Relationship between Restriction/Obstruction/Mixture and HT	0.146	0.133
Relationship between Restriction/Obstruction/Mixture and Lung Tumor	-0.015	0.878
Relationship between Restriction/Obstruction/Mixture and Obesity	0.129	0.184
Relationship between Restriction/Obstruction/Mixture and Rhinitis	-0.062	0.525
Relationship between Restriction/Obstruction/Mixture and TB	-0.021	0.827

Source: Researcher's data analysis (2023)

The results of the correlation test examining the relationship between Restriction/Obstruction/Mixed patterns and various comorbidities—including Congestive Heart Failure (CHF), Diabetes Mellitus (DM), Gastroesophageal Reflux Disease (GERD), Heart Failure (HF), Hypertension (HT), lung tumors, obesity, rhinitis, and tuberculosis (TB)—revealed p-values greater than 0.05 ($p>0.05$, accept Ho). This finding indicates that there is no significant relationship between these respiratory patterns and the aforementioned comorbidities. In essence, patients exhibiting Restriction, Obstruction, or Mixed patterns do not show a significant association with the presence or absence of these specific health conditions.

Discussion

The study offers a comprehensive examination of asthma patient characteristics in relation to spirometric parameters, atopic history, family history, and various risk factors. The findings reveal that a considerable number of patients have a smoking history, with 22.4% being active smokers and 52.3% passive smokers. Although smoking can negatively impact lung health, this research did not establish a significant link between smoking history and asthma control levels. This indicates the complexity of factors that influence asthma management, suggesting that active and passive smokers may experience different levels of control. These results are consistent with Soraya's research (19), which found a significant correlation between atopic history and asthma severity in pediatric patients. Understanding atopic history in children is vital for effective management strategies. Furthermore, Cetemen's findings indicate that obese children are more likely to experience asthma attacks (20). While this study did not find a notable correlation between smoking history—both active and passive—and asthma control, the relevance of obesity as a risk factor in assessing asthma causation remains significant. Additionally, the study supports previous work by London (21), highlighting that a family history of asthma and allergies contributes to early-onset asthma in children. It also emphasizes the impact of maternal smoking during pregnancy, underlining how early-life environmental exposures can significantly influence the development of asthma in young children.

This study identifies that risk factors such as dust and cold air are frequently encountered; however, not all of these factors correlate with the severity of asthma exacerbations. It underscores the significance of managing specific risk factors and enhancing understanding of their influence on asthma exacerbation. These findings are consistent with previous research, including Soraya's study, which also highlighted the intricate relationship between risk factors and asthma severity (19). While this research emphasizes environmental risk factors, it also confirms a strong correlation between atopic history and asthma severity in children. Although there are inconsistencies with some earlier studies that indicated a link between certain risk factors and asthma exacerbation—such as Yavuzyilmaz's investigation into the prevalence of asthma attacks in obese children—these findings further illustrate the complexity of understanding how risk factors contribute to asthma exacerbation (22).

The results from the spirometry analysis indicate that most patients exhibit low spirometry values, which suggest the presence of either obstruction or restriction in lung function. Typically, individuals with asthma show reduced spirometry values. These findings are consistent with existing literature that establishes a connection between asthma and compromised lung function. The spirometry results, which reveal that the majority of patients have low values, corroborate earlier studies, including those by Soraya and Yavuzyilmaz (19,22). Soraya identified a link between low spirometry values and the severity of asthma in children, while Yavuzyilmaz reported a higher incidence of asthma attacks among obese children, which may also indicate impaired lung function (19,22).

There is a significant correlation between the degree of airway obstruction and spirometric parameters, including FEV1, FVC, FEV1/FVC, PEF, FEF 25, FEF 50, and FEF 75. This aligns with expectations, as airway obstruction typically correlates with a decline in lung function. The particularly strong relationship with FEV1/FVC indicates relevant airway obstruction within the study population. The correlation results between the degree of obstruction and spirometric parameters such as FEV1, FVC, and FEV1/FVC consistently align with previous research, especially studies conducted by Soraya and Yavuzyilmaz (19,22). They found that asthma severity correlates with variations in spirometric values. This further confirms the relationship between airway obstruction and lung function in asthma patients. The notable relationship with FEV1/FVC underscores the effectiveness of using spirometry as the primary diagnostic tool for assessing airway obstruction. These findings are consistent with the GINA diagnostic guidelines (2021), which stress the importance of measuring FEV1/FVC for confirming an asthma diagnosis.

This study found no significant correlation between a stable asthma diagnosis and the patient's atopic or family history. This suggests that asthma control levels are not directly linked to atopic history, possibly due to other factors influencing asthma management beyond atopy. The study also revealed no significant relationship between the degree of obstruction or stable asthma diagnosis and comorbidities such as congestive heart failure (CHF), diabetes mellitus (DM), gastroesophageal reflux disease (GERD), heart failure (HF), hypertension (HT), lung tumors, obesity, rhinitis, and tuberculosis (TB). This indicates the complexity involved in managing asthma patients with comorbid conditions, where these factors may necessitate distinct management strategies.

Conclusion

The study highlights significant pitfalls in asthma diagnostics, particularly regarding the interpretation of spirometry results and the reliance on traditional risk factors. A key challenge is the nonspecific nature of asthma symptoms, which can overlap with other respiratory conditions, complicating accurate diagnosis. While spirometry is the primary tool for assessing airflow obstruction, it primarily evaluates larger airways and may not adequately capture small airway dysfunction, leading to potential misdiagnosis or underestimation of disease severity.

Moreover, the findings indicate that many patients with asthma have a history of smoking; however, this does not correlate significantly with asthma control levels. This disconnect illustrates a pitfall in assuming that smoking history is a definitive indicator of asthma severity or management needs. Similarly, while environmental risk factors like dust and cold air are prevalent among patients, their inconsistent relationship with exacerbations further complicates the diagnostic landscape.

Additionally, the lack of correlation between stable asthma diagnoses and atopic or family histories suggests that relying solely on these factors may lead to oversimplified conclusions about patient profiles. This complexity necessitates a more holistic approach to asthma management, where individual characteristics and comorbidities are considered comprehensively.

In summary, the pitfalls in asthma diagnostics stem from an overreliance on spirometry measures and traditional risk factors without acknowledging the multifactorial nature of the disease. A nuanced understanding of these complexities is essential for improving diagnostic accuracy and developing effective management strategies tailored to individual patient needs.

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