Original Article

# Association of Smoking, Obesity, and Psychological Stress with Asthma Severity Among Adult Patients: A Cross-Sectional Study

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## ABSTRACT

***Background:*** Asthma is a chronic inflammatory airway disease that causes breathing difficulties and affects approximately 12 million people in Indonesia. Smoking status, obesity, and psychological stress have been associated with increased asthma severity and poor outcomes. However, few studies have simultaneously examined the relative influence of these factors on asthma severity among adult patients with asthma in primary healthcare settings. Therefore, this study aimed to analyze the association of smoking status, obesity, and psychological stress with asthma severity.

***Methods:*** A quantitative cross-sectional study was conducted among 51 adult asthma patients who had experienced an asthma attack within the previous month and were recruited through purposive sampling. Smoking status was assessed using the Brinkman Index, obesity using Body Mass Index (BMI), psychological stress level using the Perceived Stress Scale (PSS), and asthma severity using clinical classification criteria. Data were analyzed using Spearman's rank correlation and multivariable ordinal logistic regression, with $p < 0.05$ considered statistically significant.

***Results:*** Among 51 participants, 45.1% had intermittent asthma. Smoking status ($r = 0.377$, $p = 0.006$), obesity ($r = 0.264$, $p = 0.041$), and psychological stress level ($r = 0.375$, $p = 0.007$) were significantly associated with asthma severity. Multivariable ordinal logistic regression revealed that smoking status (aOR = 5.23, 95% CI: 1.35–20.33, $p = 0.017$) and psychological stress level (aOR = 8.56, 95% CI: 1.64–44.79, $p = 0.011$) were independently associated with mild persistent asthma compared to those with intermittent asthma. Although obesity contributed significantly to the overall model, its adjusted effect estimates were imprecise and warrant cautious Interpretation.

***Conclusion:*** Smoking status and psychological stress were independently associated with asthma severity. Conversely, the association between obesity and asthma severity should be interpreted cautiously because of the imprecise effect estimate and limited statistical power. Of all factors, psychological stress demonstrated the strongest adjusted association with asthma severity.

***Keywords***: Asthma Severity; Smoking; Obesity; Psychological Stress; Adult; Cross-Sectional Studies.

## Implications for Practice:

- Clinical practice should incorporate routine assessment of smoking exposure, body weight status, and psychological stress to support comprehensive evaluation and individualized management of adults with asthma.
- Health policies should promote integrated asthma management strategies that combine pharmacological treatment with smoking cessation support, weight management, and psychosocial interventions to improve disease control and reduce severity.
- Midwifery and health professional education should strengthen competencies in lifestyle counseling and psychosocial assessment to enhance asthma care delivery in Low- and Middle-Income Countries and other resource-constrained healthcare settings.

## Introduction

Asthma is a chronic inflammatory airway disease characterized by dyspnea, wheezing, coughing, and chest tightness associated with variable expiratory airflow limitation (Tiotiu et al., 2021). The condition results from airway inflammation, increased airway resistance, and heterogeneous abnormalities within the intrapulmonary airways (Moral et al., 2019). Despite advances in diagnosis and treatment, asthma remains one of the most common chronic respiratory diseases and continues to impose a substantial burden on healthcare systems worldwide.

Globally, asthma affects more than 260 million people and contributes significantly to morbidity, healthcare utilization, and reduced quality of life (Global Initiative for Asthma, 2024). In the WHO South-East Asia Region, chronic respiratory diseases, including asthma, account for approximately 12% of all deaths (WHO, 2025). In Indonesia, asthma affects approximately 12 million people and remains a significant public health concern, particularly in primary healthcare settings where management often focuses on symptom control rather than comprehensive risk-factor assessment.

Several behavioral, physiological, and psychological factors have been associated with asthma severity. Smoking can aggravate airway inflammation and accelerate the decline in lung function, while approximately 20% of individuals with asthma continue to smoke despite its adverse effects on disease control (Arias et al., 2018; Tiotiu et al., 2021). Obesity is also a major comorbidity that contributes to systemic inflammation, impaired respiratory mechanics, airway remodeling, and poor asthma control (Hoo et al., 2024; Hudler et al., 2023; Listyoko et al., 2024). In addition, psychological stress may worsen asthma through neuroendocrine and immunological mechanisms, leading to increased airway inflammation, poorer self-management, and more frequent exacerbations (Frueh et al., 2024; Mohammad & Brough, 2019).

Although smoking, obesity, and psychological stress have each been associated with asthma outcomes, findings regarding their relative contribution to asthma severity remain inconsistent. Some studies have identified obesity as the strongest predictor of poor asthma control, whereas others have reported a greater influence of smoking behavior or psychological stress (Althoff et al., 2024; Hoo et al., 2024). Moreover, most studies have examined these factors separately rather than simultaneously. Consequently, evidence regarding the combined influence of behavioral, physiological, and psychological factors on asthma severity remains limited, particularly among adult asthma patients in Indonesian primary healthcare settings.

This study was guided by the biopsychosocial model, which proposes that health outcomes result from interactions among biological, psychological, and behavioral factors. Within this framework,

obesity, psychological stress, and smoking may collectively influence asthma severity through interconnected pathways involving inflammation, respiratory function, immune responses, and disease-management behaviors (Althoff et al., 2024; Listyoko et al., 2024). This perspective is particularly relevant in Indonesia, where variations in smoking prevalence, nutritional status, psychological well-being, socioeconomic conditions, and healthcare access may affect asthma outcomes differently from those observed in high-income countries.

From a nursing perspective, identifying modifiable factors associated with asthma severity is essential for developing holistic and patient-centered care. Nurses play a critical role in asthma assessment, smoking-cessation counseling, weight-management support, stress screening, health education, and long-term monitoring of asthma control. Therefore, this study aimed to analyze the association of smoking status, obesity, and psychological stress with asthma severity among adult asthma patients in a primary healthcare setting in South Kalimantan, Indonesia. It was hypothesized that smoking status, obesity, and psychological stress would be associated with asthma severity.

## Methods

### Study Design

This study employed a quantitative cross-sectional design to examine the association between smoking status, obesity, *psychological* stress, and asthma severity among adult asthma patients. The study was conducted at Sebamban II Community Health Center, South Kalimantan, Indonesia, from November 2023 to August 2024, with data collection carried out between April and June 2024. A cross-sectional design was selected because it enables the simultaneous assessment of multiple behavioral, physiological, and psychological factors associated with asthma severity within a relatively short period. Smoking status, obesity, and psychological stress were treated as exposure variables, while asthma severity was the outcome variable. All exposure and outcome variables were measured concurrently during a single assessment period; therefore, causal relationships could not be established. This study was reported in accordance with recognized reporting recommendations for observational cross-sectional studies. The overall research procedure is presented in **Figure 1.**

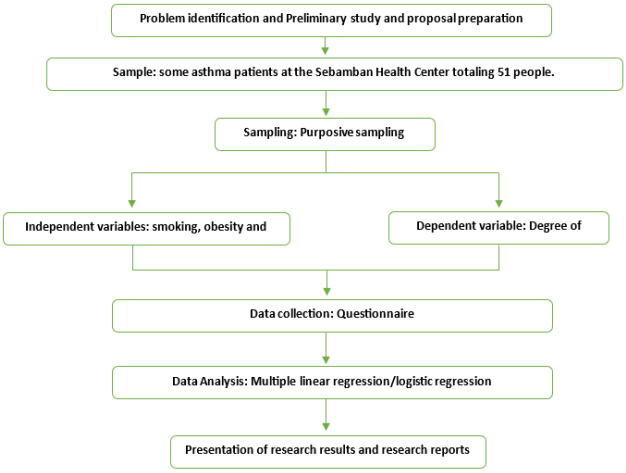


**Figure 1.** Flowchart of Research Procedure

### Participants

This study was conducted at Sebamban II Community Health Center, South Kalimantan, Indonesia. The target population consisted of 102 asthma patients who had experienced asthma attacks within the health center service area. The sample size was calculated using the Slovin formula with a 10% margin of error, resulting in a minimum sample of 51 participants.

Participants were recruited between April and June 2024 using a non-probability purposive sampling technique. Eligible participants were adults aged ≥18 years

who had been diagnosed with asthma, had experienced an asthma attack within the previous month, and provided informed consent to participate. Patients whose most recent asthma attack had occurred more than one month before data collection and those with cognitive or mental impairments that could interfere with participation were excluded.

A total of 51 participants met the eligibility criteria and were included in the final analysis. The participant selection process is presented in **Figure 2.**

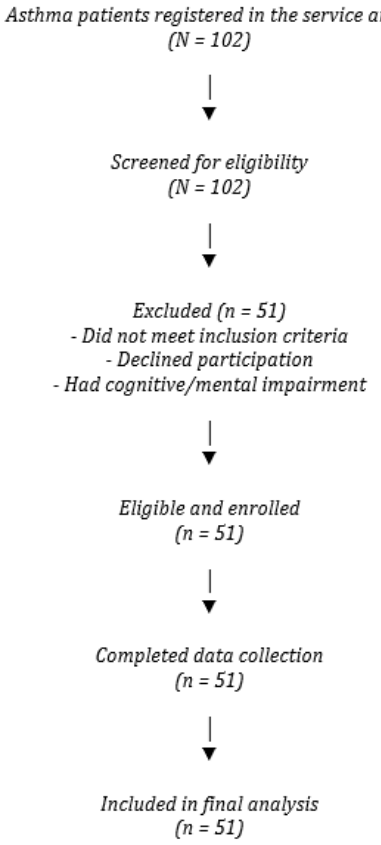


**Figure 2.** Participant Flow Diagram

## Instruments

This study employed four instruments to assess smoking status, obesity, stress level, and asthma severity. Data were collected through interviewer-administered questionnaires and direct anthropometric measurements.

*Brinkman Index*

Smoking status was assessed using the Brinkman Index (Taniguchi et al., 2019). The instrument includes questions regarding smoking history, duration of smoking (years), and the average number of cigarettes smoked per day. The Brinkman Index score was calculated by multiplying the number of cigarettes smoked per day by the duration of smoking in years. Based on the score, participants were classified as light, moderate, or heavy smokers.

*Body Mass Index (BMI)*

Obesity was assessed using Body Mass Index (BMI), calculated as body weight in kilograms divided by height in meters squared ($kg/m^2$). Body weight was measured using a calibrated digital weighing scale, and height was measured using a portable stadiometer following standard anthropometric procedures.

*Perceived Stress Scale (PSS-10)*

Psychological stress level was measured using the Indonesian version of the Perceived Stress Scale (PSS-10) (State of New Hampshire Employee Assistance Program, 2020). The instrument consists of 10 items rated on a five-point Likert scale ranging from 0 (never) to 4 (very often). Total scores range from 0 to 40 and are categorized as low stress (0–13), moderate stress (14–26), and high stress (27–40). The Indonesian version of the PSS-10 used in this study had previously undergone translation and cultural adaptation for use in Indonesian populations.

*Asthma Severity*

Asthma severity was assessed using a questionnaire adapted from the Ministry of Health of the Republic of Indonesia (2008) and the National Heart, Lung, and Blood Institute (2012) asthma classification guidelines. The instrument consists of 11

dichotomous items (Yes = 1; No = 0) assessing asthma symptoms and clinical manifestations. Based on the responses, participants were classified into four categories of asthma severity: intermittent, mild persistent, moderate persistent, and severe persistent asthma.

All questionnaires were administered through face-to-face interviews conducted by trained researchers to ensure completeness and consistency of responses. Copies of the Brinkman Index form, the Indonesian version of the PSS-10, and the asthma severity questionnaire are available in the supplementary materials.

**Data Collection**

After obtaining permission from the Sebamban II Community Health Center, eligible participants were identified and screened according to the inclusion and exclusion criteria. Data were collected at Sebamban II Community Health Center, South Kalimantan, Indonesia, from April to June 2024. Eligible participants were identified based on the inclusion and exclusion criteria and recruited through purposive sampling. Before participation, all respondents received an explanation of the study and provided written informed consent.

Data were collected directly by the principal researcher using standardized instruments, including the Brinkman Index for smoking status, the Perceived Stress Scale (PSS-10) for *psychological stress* level, Body Mass Index (BMI) measurements for obesity status, and asthma severity classification criteria. Exposure variables (smoking status, obesity, and stress level) and the outcome variable (asthma severity) were assessed during the same study visit.

To ensure data quality, all questionnaires were reviewed for completeness immediately after collection, and data were verified before entry into the database. Participant confidentiality was maintained by assigning identification codes and storing data in password-protected files accessible only to the research team. No substantial missing data were identified in the final dataset.

**Data Analysis**

Data were analyzed using IBM SPSS Statistics version 21. Descriptive statistics were used to summarize participant characteristics and study variables, including smoking status, obesity, *psychological stress*, and asthma severity. Bivariate analysis was performed using Spearman's rank correlation test to assess the association between the independent variables (smoking status, obesity, and *psychological stress*) and the dependent variable (asthma severity); the bivariate analysis was included in the multivariable analysis. Multivariable ordinal logistic regression was performed to identify independent predictors of asthma severity, with intermittent asthma used as the reference category. Model fit was evaluated using goodness-of-fit statistics, likelihood ratio tests, and pseudo R-square values. The results were reported as correlation coefficients (r), regression coefficients (β), adjusted odds ratios (aORs), and 95% confidence intervals (95% CIs). Statistical significance was set at $p < 0.05$. No missing data were identified; therefore, complete-case analysis was performed.

**Ethical Considerations**

This study was approved by the Ethics Committee of Universitas Muhammadiyah Banjarmasin (Approval No. 286/UMB/KE/V/2024) and was conducted in accordance with the principles of the Declaration of Helsinki. Written informed consent was obtained from all participants before data collection. To ensure anonymity, each participant was assigned a unique identification code, and no personally identifiable information was

included in the dataset. Participants were informed of their right to withdraw from the study at any time without consequences. All data were kept confidential and stored in password-protected electronic files and secured research records accessible only to the research team.

## Results

A total of 102 asthma patients were identified from the Sebamban II Community Health Center service area. After eligibility screening based on the inclusion and exclusion criteria, 51 participants met the study criteria, provided informed consent, and were enrolled in the study. All enrolled participants completed the questionnaires and anthropometric measurements, resulting in no missing data and no participant exclusions during the analysis phase. The majority of participants were aged 35–59 years (88.2%), while 11.8% were aged 20–34 years. All participants were male (100%). The demographic characteristics of the participants are presented in **Table 1.**

**Table 1.** Demographic Characteristics of Respondents (n=51)

| Characteristics | n (%) |
|---|---|
| Age | |
| 20–34 years | 6 (11,8) |
| 35–59 years | 45 (88,2) |
| Gender | |
| Male | 51 (100) |

*Notes: f = frequency; % = percentage,*

The results of Spearman's rank correlation analysis demonstrated significant associations between smoking status, obesity, *psychological stress*, and asthma severity. Regarding smoking status, most participants classified as light smokers had intermittent asthma (60.9%), whereas moderate smokers were predominantly classified as having mild persistent asthma (45.5%). Among heavy smokers, equal proportions were classified as having mild persistent and moderately persistent asthma (50.0% each). Smoking status was significantly associated with asthma severity (r = 0.377, p = 0.006) (**Table 2**).

**Table 2.** Bivariate analysis based on smoking habits and the degree of asthma

| Smoking Habits | Intermittent Asthma, n (%) | Mild Persistent Asthma, n (%) | Moderate Persistent Asthma, n (%) | Total, n (%) | *p*-value | Correlation Coefficient (*r*) |
|---|---|---|---|---|---|---|
| Mild smoker | 14 (60.9) | 7 (30.4) | 2 (8.7) | 23 (100) | 0.006 | 0.377 |
| Moderate smoker | 9 (40.9) | 10 (45.5) | 3 (13.6) | 22 (100) | | |
| Heavy smoker | 0 (0.0) | 3 (50.0) | 3 (50.0) | 6 (100) | | |
| Total | 23 (45.1) | 20 (39.2) | 8 (15.7) | 51 (100) | | |

For obesity status, participants with normal body weight were more likely to have intermittent asthma (73.7%), whereas overweight participants showed a higher proportion of persistent asthma. Body mass index was significantly associated with asthma severity (r = 0.264, p = 0.041) (**Table 3**).

**Table 3.** Bivariate analysis based on body weight and the degree of asthma

| Body Weight Status | Intermittent Asthma, n (%) | Mild Persistent Asthma, n (%) | Moderate Persistent Asthma, n (%) | Total, n (%) | *p*-value | Correlation Coefficient (*r*) |
|---|---|---|---|---|---|---|
| Underweight | 3 (30.0) | 7 (70.0) | 0 (0.0) | 10 (100) | 0.041 | 0.264 |
| Normal weight | 14 (73.7) | 3 (15.8) | 2 (10.5) | 19 (100) | | |
| Overweight | 6 (31.6) | 8 (42.1) | 5 (26.3) | 19 (100) | | |
| Obesity risk | 0 (0.0) | 2 (66.7) | 1 (33.3) | 3 (100) | | |
| Total | 23 (45.1) | 20 (39.2) | 8 (15.7) | 51 (100) | | |

With respect to psychological stress, most participants with low psychological stress levels had intermittent asthma (57.7%), while those with moderate psychological stress levels were predominantly classified as having mild persistent asthma (52.9%). Participants with high psychological stress levels were more likely to have moderately persistent asthma (62.5%). Psychological stress level was significantly associated with asthma severity (r = 0.375, p = 0.007) (**Table 4**).

**Table 4.** Results of bivariate analysis based on psychological stress and asthma degree

| Psychological Stress Level | Intermittent Asthma, n (%) | Mild Persistent Asthma, n (%) | Moderate Persistent Asthma, n (%) | Total, n (%) | *p*-value | Correlation Coefficient (*r*) |
|---|---|---|---|---|---|---|
| Mild stress | 15 (57.7) | 8 (30.8) | 3 (11.5) | 26 (100) | 0.007 | 0.375 |
| Moderate stress | 8 (47.1) | 9 (52.9) | 0 (0.0) | 17 (100) | | |
| Severe stress | 0 (0.0) | 3 (37.5) | 5 (62.5) | 8 (100) | | |
| Total | 23 (45.1) | 20 (39.2) | 8 (15.7) | 51 (100) | | |

Variables with p-values < 0.25 in the bivariate analysis were included in the multivariable model. An ordinal logistic regression analysis was performed to identify independent predictors of asthma severity. The goodness-of-fit statistics indicated that the model fit the data adequately (Pearson $\chi^2$ = 54.426, df = 80, p = 0.987; Deviance $\chi^2$ = 56.878, df = 80, p = 0.977). Model fitting information showed that the final model significantly improved prediction compared with the intercept-only model ($\chi^2$ = 41.290, df = 8, p < 0.001). The pseudo R-square values suggested that the independent variables explained a substantial proportion of the variation in asthma severity (Cox & Snell $R^2$ = 0.555; Nagelkerke $R^2$ = 0.639; McFadden $R^2$ = 0.398). The likelihood ratio test demonstrated that age (p = 0.009), smoking status (p < 0.001), obesity (p = 0.048), and psychological stress level (p < 0.001) significantly contributed to the model. (**Table 5)**

**Table 5.** Multivariable Ordinal Logistic Regression Analysis of Factors Associated with Asthma Severity

| Variable | β | aOR (Exp(B)) | 95% CI | p-value |
|---|---|---|---|---|
| Age | 0.321 | 1.38 | 1.03–1.85 | 0.032 |
| Smoking Status | 1.655 | 5.23 | 1.35–20.33 | 0.017 |
| Obesity | -0.043 | 0.96 | 0.37–2.45 | 0.928 |
| Psychological Stress | 2.147 | 8.56 | 1.64–44.79 | 0.011 |

*Notes: According to the likelihood ratio test, obesity contributed significantly to the overall model, although its individual coefficient was not statistically significant.*

**Table 6**. Model Fit Statistics

| Statistic | Value |
|---|---|
| Pearson Goodness-of-Fit (p) | 0.987 |
| Deviance Goodness-of-Fit (p) | 0.977 |
| Model Chi-square | 41.290 |
| Model p-value | <0.001 |
| Cox & Snell $R^2$ | 0.555 |
| Nagelkerke $R^2$ | 0.639 |
| McFadden $R^2$ | 0.398 |

As shown in **Table 5**, smoking status and psychological stress level demonstrated consistent associations with asthma severity. However, obesity contributed significantly to the overall model, based on the likelihood ratio test (p = 0.048). Its estimated odds ratios were accompanied by wide confidence intervals that included the null value, indicating substantial uncertainty regarding the magnitude and direction of this association. Higher smoking exposure was associated with increased odds of being in a higher asthma severity category (aOR = 5.23, 95% CI: 1.35–20.33, p = 0.017). The estimated effect of obesity on asthma severity was small (aOR = 0.96, 95% CI: 0.37–2.45). Because the confidence interval was wide and included the null value, the association should be interpreted with caution and cannot be considered conclusive. Psychological stress level demonstrated the strongest association with asthma severity (aOR = 8.56, 95% CI: 1.64–44.79, p = 0.011), indicating that participants with higher psychological stress were more likely to experience more severe asthma. Therefore, Psychological stress showed the largest adjusted effect estimate among the variables examined; however, the wide confidence intervals indicate considerable uncertainty, and the findings should be interpreted cautiously in this study.

## Discussion

This study examined the associations of smoking status, obesity, and psychological stress with asthma severity among adult patients. The findings demonstrated that smoking status and psychological stress were independently associated with asthma severity, whereas the association between obesity and asthma severity remained less certain after adjustment for potential confounders. Notably, Psychological stress demonstrated the largest estimated association with asthma severity in the multivariable model. However, given the wide confidence intervals and limited sample size, the magnitude of this association should be interpreted cautiously in the multivariable model. These findings support the biopsychosocial model of asthma, which proposes that disease outcomes are influenced by the complex interplay of psychological, behavioral, and biological factors (Frueh et al., 2024; Landeo-Gutierrez et al., 2020).

The association between smoking and asthma severity aligns with extensive evidence showing that tobacco exposure promotes airway inflammation, oxidative stress, accelerated decline in lung function, and poorer asthma control (Tiotiu et al., 2021). Smoking has also been linked to reduced responsiveness to inhaled

corticosteroids, thereby increasing the likelihood of persistent symptoms and exacerbations. In the present study, smoking remained independently associated with greater asthma severity after adjustment for other variables, reinforcing its role as an important modifiable risk factor in asthma management. Regarding obesity, the likelihood ratio test indicated that this variable contributed significantly to the overall regression model. However, the adjusted odds ratio for obesity (aOR = 0.96; 95% CI: 0.37–2.45) was accompanied by a wide confidence interval that crossed the null value, indicating considerable uncertainty regarding both the magnitude and direction of the association. Therefore, the independent contribution of obesity to asthma severity could not be established conclusively in the present study. Nevertheless, previous studies have consistently identified obesity as an important risk factor for poor asthma outcomes through mechanisms involving systemic inflammation, impaired respiratory mechanics, airway remodeling, and reduced pulmonary function (Hoo et al., 2024; Hudler et al., 2023). The imprecision observed in our findings may be attributable to the relatively small sample size and the limited distribution of participants across asthma severity categories. Consequently, the association between obesity and asthma severity should be interpreted cautiously and warrants confirmation in larger studies. Furthermore, the weaker effect observed in the adjusted model suggests that obesity may influence asthma severity indirectly or through interactions with behavioral and psychological factors rather than functioning as an independent determinant.

A key finding of this study is the strong independent association between psychological stress and asthma severity. This is consistent with a robust body of literature demonstrating that stress is associated with poorer asthma control, increased symptom burden, higher exacerbation rates, and reduced quality of life (Barnthouse & Jones, 2019; Frueh et al., 2024; Landeo-Gutierrez et al., 2020).

Similar patterns have been reported in Indonesian populations, where higher stress levels are associated with increased asthma recurrence and disease severity (Nurhalisa et al., 2022; Rahayu & Widaryati, 2023). The disproportionately stronger effect of psychological stress may be explained by its dual influence on neuroendocrine regulation and health behavior. Chronic stress activates the hypothalamic–pituitary–adrenal (HPA) axis and the sympathetic nervous system, resulting in sustained dysregulation of cortisol and catecholamine secretion. This neuroendocrine disruption may impair immune regulation, amplify airway inflammation, and increase bronchial hyperresponsiveness, thereby worsening asthma severity.

In addition to biological mechanisms, psychological stress significantly undermines self-management behaviors. Individuals under high stress are more likely to demonstrate poor medication adherence, sleep disturbance, reduced self-care capacity, and delayed healthcare utilization, all of which contribute to suboptimal disease control (Alqarni et al., 2024). Acute stress responses may also trigger hyperventilation and autonomic dysregulation, further exacerbating respiratory symptoms (Panek et al., 2017). Evidence also suggests that poor stress management significantly increases the risk of asthma relapse by 1.83-fold (Kalemci et al., 2021). While individuals with high stress levels may have up to a two-fold increased risk of asthma attacks (Akinsulore et al., 2020). In addition, prolonged or poorly timed stress exposure has been shown to induce immune suppression, increasing

vulnerability to asthma symptoms (Dowell et al., 2020). Collectively, these findings underscore stress as a critical driver of asthma instability.

Although psychological stress emerged as the most influential factor, smoking and obesity remain important contributors and should not be overlooked in comprehensive asthma management. Addressing these modifiable risk factors remains essential for reducing disease burden and preventing exacerbations through integrated lifestyle and psychosocial interventions.

These findings provide empirical support for the biopsychosocial model of asthma. Within this framework, smoking represents a behavioral determinant, obesity a biological determinant, and psychological stress a psychological determinant. These factors are not independent; rather, they interact through interconnected pathways influencing immune function, airway inflammation, and patient self-management. The prominent role of psychological stress observed in this study underscores the critical contribution of psychological determinants to asthma severity, particularly in primary care contexts where psychosocial stressors are frequently under-recognized. From a clinical nursing perspective, these findings underscore the importance of integrating psychosocial assessment into routine asthma care. Comprehensive management should extend beyond physiological evaluation to include systematic screening for psychological stress, smoking behavior, and obesity. Nurses are ideally positioned to deliver holistic, patient-centered interventions, including stress management education, psychological support, smoking cessation counseling, weight management strategies, and reinforcement of asthma self-management. Embedding these interventions into routine care pathways may improve asthma control, reduce exacerbation frequency, and enhance health-related quality of life. This study has several strengths, including the simultaneous examination of psychological, behavioral, and biological determinants using multivariable modeling, providing a comprehensive perspective on asthma severity. However, several limitations should be acknowledged. The cross-sectional design precludes causal inference, while self-reported measures of stress and smoking may introduce reporting bias. An important limitation of this study is the relatively small sample size and the uneven distribution of asthma severity categories. Only eight participants were classified as having moderate persistent asthma, and no participants were classified as having severe persistent asthma. Such sparse outcome data may have reduced the stability and precision of the ordinal logistic regression estimates, as reflected by the wide confidence intervals observed for several predictors, particularly obesity. Therefore, the findings should be interpreted cautiously and considered exploratory. Future longitudinal studies with larger and more diverse populations are warranted to confirm these associations and elucidate causal pathways.

This study contributes preliminary evidence suggesting that psychological stress may play a more prominent role in asthma severity than traditional behavioral and biological risk factors among adult asthma patients. However, given the relatively small sample size and the limited distribution of severe asthma categories, these findings should be considered preliminary and require confirmation in larger studies. While previous studies have largely examined these determinants separately, this study integrates them within a single multivariable biopsychosocial framework, providing a more comprehensive assessment of their relative contributions to asthma severity.

The findings highlight the dominant role of psychological stress compared with traditional clinical risk factors, suggesting that psychosocial determinants may exert a greater influence on asthma severity than previously recognized in routine clinical practice. This supports a shift in asthma management from a predominantly biomedical approach to an integrated biopsychosocial care model, particularly in primary care settings where psychological stressors are often under-recognized.

By quantifying the relative influence of stress, smoking, and obesity, this study provides clinical insight into priority targets for nursing-led interventions and supports the integration of structured stress assessment and psychosocial management into standard asthma care pathways.

### Implications and limitations

This study contributes to the growing body of evidence regarding the multidimensional determinants of asthma severity by simultaneously examining the roles of smoking status, obesity, and psychological stress within a single analytical framework among adult asthma patients in primary healthcare settings. The findings support the conceptual understanding that asthma severity is influenced not only by biological factors but also by behavioral and psychosocial dimensions, thereby reinforcing the importance of biopsychosocial perspectives in asthma research and theory development. Nevertheless, several limitations should be acknowledged. The cross-sectional design precludes causal inference; the relatively small sample size may have limited statistical power and contributed to imprecise effect estimates, particularly for obesity; and the use of purposive sampling may restrict the generalizability of the findings to broader populations. In addition, reliance on self-reported measures for smoking exposure and psychological stress may have introduced reporting bias.

## Relevance to Practice

Based on the research findings, smoking, obesity, and psychological stress are important factors associated with asthma severity. These results highlight the need for patients to have greater awareness of modifiable risk factors that may worsen asthma outcomes. Patient education should therefore emphasize smoking cessation, maintenance of an ideal body weight, and effective stress management strategies to support asthma control. From a clinical perspective, these findings support a holistic approach to asthma management. Nurses and healthcare providers should routinely assess smoking behavior, nutritional status, and psychological stress as part of comprehensive asthma care. Integrating behavioral and psychosocial interventions, such as smoking cessation counseling, weight management support, and stress management strategies, may contribute to improved disease control and reduced asthma severity.

## Conclusion

This study demonstrates that Smoking status and psychological stress were independently associated with asthma severity among adult asthma patients, whereas the independent contribution of obesity remained uncertain among adult asthma patients. Smoking status and psychological stress were independently associated with asthma severity. Psychological stress demonstrated the largest adjusted effect estimate, although the precision of the estimate was limited by the small sample size and wide confidence intervals. Obesity showed a positive association in the bivariate analysis; its independent contribution in the multivariable model remains uncertain because of the imprecision of the effect

estimate and the limited sample size. These findings should therefore be interpreted cautiously and confirmed in larger studies. These findings highlight the importance of a holistic, biopsychosocial approach to asthma management. Key message: Effective asthma control requires not only pharmacological treatment but also systematic attention to psychological stress and lifestyle-related risk factors. Future research should include multicenter studies with larger and more diverse populations and employ longitudinal designs to better establish causal relationships.

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## CrediT Authorship Contributions Statement

**Lukman Harun**: Conceptualization, Supervision, Writing - Original Draft

**Mira:** Software, Methodology, Validation, Formal Analysis - Review & Editing

**Alda Novendra**: Investigation, Project Administration, Original Draft

**Julianto:** Investigation, Data Curation, Resources

## Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this manuscript.

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