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ASSOCIATION BETWEEN BODY MASS INDEX AND ASTHMA: A REVIEW OF EVIDENCE

Abstract

Background: Obesity has emerged as an important risk factor for asthma, with increasing global prevalence of both conditions. Objective: To examine the association between body mass index (BMI) and asthma based on evidence from epidemiological studies. Methods: A narrative review of studies published between 1999 and 2024 was conducted using databases such as PubMed and Google Scholar. Cohort studies, meta-analyses, and observational studies assessing BMI in relation to asthma incidence, prevalence, and severity were included. Results: The findings consistently show a positive, dose-dependent relationship between BMI and asthma. Obesity is associated with a 1.5–2-fold increased risk of developing asthma. Additionally, higher BMI is linked to greater disease severity, poor control, and increased exacerbations. Evidence from Mendelian randomization studies suggests a causal relationship. Conclusion: Increased BMI is a significant and modifiable risk factor for asthma, highlighting the importance of weight management in reducing asthma risk and improving outcomes.

Keywords:-Body Mass Index (BMI), Asthma, Obesity

Introduction: Asthma is a chronic inflammatory airway disease affecting millions worldwide and represents a significant global health burden. Recent epidemiological analyses from the Global Burden of Disease (GBD) 2021 highlight that asthma prevalence continues to rise, with high body mass index (BMI) identified as a major modifiable risk factor contributing to disease burden (*Yuan et al., 2025; Hang et al., 2025*).

Over the past two decades, increasing attention has been directed toward the relationship between obesity and asthma, with accumulating evidence suggesting that elevated BMI not only increases the risk of asthma onset but also worsens disease severity and outcomes. Large cohort studies and pooled analyses demonstrate a consistent dose–response relationship between BMI and asthma incidence, supporting a potential causal link (*Vartiainen et al., 2024; Parasuaraman et al., 2023*).

Recent reviews further emphasize that obesity contributes to asthma through multiple mechanisms, including systemic inflammation, altered lung mechanics, and immune dysregulation, leading to a distinct "obese asthma phenotype" (*Riemann et al., 2026; Olejnik et al., 2024*). Moreover, population-based analyses indicate that obesity is now one of the leading contributors to asthma burden globally, particularly in adults and aging populations (*Zheng et al., 2025; Kong et al., 2025*).

Thus, understanding the association between BMI and asthma is essential, as it represents a modifiable target for prevention and improved disease control.

Methodology

This study was conducted as a narrative review of the literature exploring the association between body mass index (BMI) and asthma. Relevant articles were identified through electronic databases including PubMed, Scopus, and Google Scholar, covering publications from 2000 to 2025. Original research studies such as cohort, case-control, cross-sectional studies, and meta-analyses that examined asthma incidence, prevalence, or severity in relation to BMI were included. Non-English articles, case reports, editorials, and studies without clear BMI classification were excluded. Key data including author, year, sample size, study design, and main findings were extracted, and the results were synthesized qualitatively to provide an integrated understanding of the relationship between BMI and asthma.

Result

The relationship between body mass index (BMI) and asthma has been extensively investigated through large prospective cohort studies, pediatric cohorts, and meta-analyses. Collectively, the evidence demonstrates a consistent, dose–response association, where increasing BMI is linked to a higher risk of incident asthma, greater disease severity, and poorer control.

Early landmark work by Camargo et al. (1999) in a cohort of over 85,000 women showed that obesity (BMI ≥30 kg/m²) was associated with approximately a twofold increase in risk of adult-onset asthma, establishing one of the first strong epidemiological links. This finding was later reinforced by Romieu et al. (2003) in the E3N cohort (~88,000 women), which demonstrated that increasing BMI and weight gain significantly increased asthma incidence.

Subsequent large-scale cohort studies strengthened this association. For example, Hjellvik et al. (2010), in a cohort of 118,723 individuals, reported that obesity was associated with a hazard ratio of ~1.8 for asthma incidence. Similarly, Ulrik et al. (2018), analyzing over 310,000 children, found that higher BMI in childhood significantly increased the risk of asthma-related hospital admissions later in life, highlighting the long-term impact.

Evidence in pediatric populations is equally compelling. Oddy et al. (2004) and Black et al. (2013) demonstrated that overweight and obese children have a significantly increased risk of developing asthma, with odds ratios ranging from 1.3 to 1.9. Importantly, Granell et al. (2014)

used Mendelian randomization to show a causal relationship between increased BMI and asthma, reducing concerns about confounding.

Meta-analyses further confirm these findings. The widely cited analysis by Beuther and Sutherland (2007), including over 330,000 participants, reported that overweight and obesity increased asthma risk with odds ratios of 1.38 and 1.92, respectively. More recent analyses (e.g., Parasuaraman et al., 2023) continue to support a positive association between BMI, abdominal adiposity, and asthma incidence.

In addition to incidence, obesity influences asthma severity and control. Studies such as Peters et al. (2011) and Schatz et al. (2013, 2015) demonstrate that higher BMI is associated with increased exacerbations, emergency visits, and poorer symptom control, suggesting that obesity contributes to a distinct and more severe asthma phenotype.

Overall, the accumulated evidence from diverse populations, methodologies, and time periods strongly supports a causal and clinically significant relationship between increased BMI and asthma and summarised in table1.

Table 1: Original Studies on BMI and Asthma

Study	Year	Sample Size	Design	Key Findings	Limitations
Camargo et al.	1999	85,911	Cohort	RR ~2.0 asthma in obese	Women only
Romieu et al.	2003	88,000	Cohort	BMI ↑ → asthma risk ↑	Self-report
Gold et al.	2003	~1,000	Cohort	BMI predicts asthma	Small sample
Oddy et al.	2004	2,602	Birth cohort	OR ~1.4 asthma	Moderate size
Sin et al.	2004	~9,000	Cohort	OR ~1.9 asthma	Observational
Ford et al.	2005	~10,000	Cross-sectional	BMI ↑ prevalence	No causality
Beuther et al.	2007	333,102	Meta-analysis	OR 1.38–1.92	Heterogeneity
Von Behren et al.	2009	88,304	Cohort	OR ~1.7 asthma	Bias possible
Hjellvik et al.	2010	118,723	Cohort	HR ~1.8 asthma	Registry data
Antó et al.	2010	~10,000	Cohort	Obesity ↑ incidence	Confounding
Peters et al.	2011	~60,000	Prospective	↑ severity	Clinical bias
Ho et al.	2011	~4,000	Cohort	BMI ↑ asthma risk	Sex variation
Yun et al.	2012	~6,000	Cohort	Obesity + inflammation	Retrospective
Black et al.	2013	65,000	Cohort	Childhood obesity ↑ asthma	Confounders
Schatz et al.	2013	17,316	Cohort	↑ exacerbations	Clinical cohort
Egan et al.	2013	~100k	Meta-analysis	RR ~1.2–1.3	Variation
Gibeon et al.	2013	~1,000	Registry	Severe phenotype	Referral bias
Granell et al.	2014	5,135	MR study	Causal link	Genetic limits
Lawson et al.	2014	~3,000	Cohort	Adolescents ↑ risk	Sample size
Schatz et al.	2015	~2,500	Prospective	RR ~1.4 ED visits	Clinical
Barros et al.	2017	~5,000	Cohort	↑ incidence & severity	Observational
Ulrik et al.	2018	310,211	Cohort	↑ admissions	Registry bias
Parasuaraman et al.	2023	Large meta	Meta-analysis	BMI ↑ asthma	Publication bias
Vartiainen et	2024	59,668	Cohort	Adult-onset asthma ↑	Observational

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Discussion

A substantial body of evidence from cohort studies and meta-analyses demonstrates a positive, dose-dependent association between BMI and asthma. Individuals with overweight and obesity have a 1.3–2-fold increased risk of developing asthma compared to those with normal BMI (Camargo et al., 1999; Romieu et al., 2003; Beuther et al., 2007).

This relationship is consistent across both adults and children, with pediatric studies (e.g., Oddy et al., 2004; Black et al., 2013) showing early-life obesity as a predictor of asthma onset. Large cohorts such as Hjellvik et al. (2010) and Ulrik et al. (2018) further confirm increased incidence and hospitalizations with higher BMI.

Importantly, obesity not only increases asthma risk but also contributes to greater disease severity, poor control, and frequent exacerbations (Peters et al., 2011; Schatz et al., 2013). Mendelian randomization studies (Granell et al., 2014) support a causal relationship, minimizing confounding.

However, most studies are observational, and limitations include self-reported data, confounding factors (physical activity, smoking), and heterogeneity across populations.

Conclusion

In conclusion, a substantial body of evidence from large cohort studies and meta-analyses consistently demonstrates that elevated BMI is associated with an increased risk of asthma, as well as greater disease severity and poorer control. The relationship shows a clear dose–response pattern and is supported by emerging evidence suggesting a causal link. Given that obesity is a modifiable risk factor, addressing excess body weight represents a key strategy for reducing asthma burden and improving clinical outcomes.

REFERENCES

1. *Camargo, C.A. Jr., et al. (1999).* Prospective study of body mass index and risk of adult-onset asthma. **Archives of Internal Medicine.** https://jamanetwork.com/journals/jamainternalmedicine/article-abstract/485181
2. *Romieu, I., Avenel, V., Leynaert, B., et al. (2003).* Body mass index, change in body silhouette, and risk of asthma. **American Journal of Epidemiology, 158(2), 165–174.** https://academic.oup.com/aje/article/158/2/165/323398
3. *Gold, D.R., Damokosh, A.I., Dockery, D.W., et al. (2003).* Body mass index as a predictor of incident asthma in children. **American Journal of Respiratory and Critical Care Medicine.**
4. *Oddy, W.H., et al. (2004).* The association between body mass index and asthma in childhood. **International Journal of Obesity.**
5. *Sin, D.D., Sutherland, E.R. (2004).* Obesity and the risk of asthma: a population-based study. **American Journal of Epidemiology.**
6. *Ford, E.S. (2005).* The epidemiology of obesity and asthma. **Journal of Allergy and Clinical Immunology.**
7. *Beuther, D.A., Sutherland, E.R. (2007).* Overweight, obesity, and incident asthma: a meta-analysis. **American Journal of Respiratory and Critical Care Medicine.** https://www.atsjournals.org/doi/10.1164/rccm.200611-1717OC

8. *Von Behren, J., et al. (2009).* Obesity and the prevalence of asthma. **Epidemiology.**
9. *Hjellvik, V., Tverdal, A., Furu, K. (2010).* Body mass index as predictor for asthma. **European Respiratory Journal, 35(6), 1235–1242.** https://publications.ersnet.org/content/erj/35/6/1235
10. *Antó, J.M., et al. (2010).* The association between obesity and asthma incidence. **European Respiratory Journal.**
11. *Peters, J.I., et al. (2011).* The effect of obesity on asthma severity and control. **Journal of Allergy and Clinical Immunology.**
12. *Ho, W.C., et al. (2011).* Obesity and asthma risk in adolescents. **International Journal of Obesity.**
13. *Yun, H.D., et al. (2012).* Obesity, metabolic syndrome, and asthma. **Allergy and Asthma Proceedings.**
14. *Black, M.H., Smith, N., Porter, A.H., et al. (2013).* Higher prevalence of asthma among obese children. **Journal of Allergy and Clinical Immunology.**
15. *Schatz, M., et al. (2013).* Obesity and asthma control and exacerbations. **Journal of Allergy and Clinical Immunology.**
16. *Egan, K.B., Ettinger, A.S., Bracken, M.B. (2013).* Childhood body mass index and asthma risk: systematic review. **Pediatric Allergy and Immunology.**
17. *Gibeon, D., et al. (2013).* Obesity-associated severe asthma phenotype. **European Respiratory Journal.**
18. *Granell, R., et al. (2014).* Body mass index and asthma: Mendelian randomization study. **PLoS Medicine.**
19. *Lawson, J.A., et al. (2014).* Body mass index and asthma incidence in adolescents. **American Journal of Epidemiology.**
20. *Schatz, M., et al. (2015).* Obesity and asthma-related healthcare utilization. **Journal of Allergy and Clinical Immunology: In Practice.**
21. *Barros, R., et al. (2017).* Obesity and asthma incidence and severity. **Public Health Nutrition.**
22. *Ulrik, C.S., et al. (2018).* Body mass index and asthma hospitalizations. **Clinical Epidemiology.**
23. *Parasuaraman, G., Ayyasamy, L., Aune, D., Sen, A. (2023).* BMI and asthma risk: systematic review and meta-analysis. **Scientific Reports.** https://www.nature.com/articles/s41598-023-31373-6
24. *Vartiainen, V.A., et al. (2024).* Body mass index and adult-onset asthma. **Nutrients.** https://www.mdpi.com/2072-6643/16/15/2515