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# Cannabis consumption and risk of asthma: a systematic review and meta-analysis

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## Abstract

**Background** Cannabis is the third most widely used psychoactive substance globally, and its consumption has been increasing, particularly with the growing trend of legalization for medicinal and recreational use. Recent studies have raised concerns about the potential impact of cannabis on respiratory health, specifically the risk of asthma, a significant public health concern. This systematic review aimed to consolidate research on the association between cannabis use and the risk of asthma.

**Methods** A comprehensive search was conducted across PubMed, Embase, and Web of Science, covering studies published up to September 30, 2024. We included peer-reviewed observational studies evaluating the link between cannabis consumption and the risk of asthma diagnosis. Data synthesis employed a random-effects meta-analysis to account for heterogeneity. R statistical software (version 4.4) was used for statistical analyses.

**Results** The search yielded 8 relevant studies after screening 1,887 records. The pooled odds ratio (OR) for the association between cannabis consumption and the risk of asthma diagnosis was 1.31, 95% confidence interval (CI): 1.19–1.44, indicating greater odds of having asthma compared to non-users. Moderate heterogeneity was observed ($I^2 = 46\%$), and sensitivity analysis confirmed the robustness of the findings.

**Conclusion** This systematic review and meta-analysis identifies a significant association between cannabis use and greater odds of having asthma. These findings emphasize the importance of raising awareness about the potential respiratory risks associated with cannabis use. Future research should prioritize identifying moderating factors, such as the frequency and mode of cannabis consumption, to enhance understanding of this association and provide a stronger evidence base for potential public health interventions.

**Clinical trial number** Not applicable.

**Keywords** Cannabis, Asthma, Respiratory health, Systematic review, Meta-analysis

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## Introduction

Cannabis is the third most widely used psychoactive substances globally [1], and its consumption has been steadily increasing, particularly with the growing trend of legalization for medicinal and recreational purposes in several regions [2]. This has prompted a surge in research exploring the potential health effects and risks associated with cannabis use. Among these concerns is the potential link between cannabis consumption and respiratory health, specifically the risk of asthma. Asthma, a chronic respiratory condition characterized by inflammation and hyper-reactivity of the airways [3], affects approximately 300 million people globally each year and poses a significant burden on individuals' quality of life and healthcare systems worldwide [4]. Given the rising rates of cannabis use and the need to understand its health implications, examining its association with asthma is of paramount importance.

In recent years, research has focused on investigating the impact of cannabis use on respiratory health, as smoking remains the most common mode of cannabis consumption [5]. Studies suggest that cannabis vaping may still pose risks to respiratory function, including irritation of airways and lung inflammation [6, 7]. A study reports that asthma is more prevalent among individuals who use cannabis (9.8%) in the United States [8]. Inhalation of combusted plant material, whether tobacco or cannabis, has been linked to adverse respiratory outcomes due to the presence of harmful chemicals, such as tar and carbon monoxide, which can trigger or exacerbate respiratory conditions [9]. While the harmful effects of tobacco smoking on respiratory health are well-established, the relationship between cannabis consumption and the risk of asthma remains controversial and less understood. Some studies suggest that cannabis use might lead to bronchial hyper-responsiveness, airway inflammation, and respiratory symptoms, all of which could increase the risk of risk of asthma diagnosis [9]. Conversely, other studies propose a null or protective effect [10], adding to the complexity of this association.

Various possible mechanisms have been suggested to clarify the connection between cannabis use and the risk of asthma. First, the presence of irritants and toxic substances in cannabis smoke can cause direct damage to the respiratory epithelium, leading to increased airway reactivity and susceptibility to asthma [11]. Second, cannabis may have immunomodulatory effects, potentially altering the balance of pro-inflammatory and anti-inflammatory cytokines [12], which could contribute to airway inflammation and hyper-reactivity. Furthermore, the co-use of tobacco and cannabis, a common pattern among users, could confound the observed associations, making it difficult to delineate the specific role of cannabis in respiratory health.

The link between cannabis use and the risk of asthma has been examined in multiple observational studies [13, 14]. However, the findings have been varied. Some research suggests that cannabis consumption is linked to a higher risk of asthma, while others have found no significant correlation. These mixed results emphasize the necessity for a more thorough evaluation to consolidate the existing evidence. Although there have been systematic reviews on various aspects of respiratory-related issues and cannabis use, none have specifically explored the association between cannabis use and greater odds of having asthma [15]. As a result, there remains a gap in the literature regarding the precise nature of the relationship between cannabis use and asthma. With the growing prevalence of cannabis use and its potential impact on respiratory health, a systematic review and meta-analysis are essential to clarify the extent of this association and provide definitive insights.

This systematic review and meta-analysis aimed to address these gaps by comprehensively evaluating the association between cannabis consumption and greater odds of having asthma. By consolidating findings from observational studies, this review seeks to elucidate the potential impact of cannabis use on respiratory health, inform clinical practice, and guide public health policies related to cannabis consumption and respiratory disease prevention.

## Methods

### Study design

This systematic review and meta-analysis was conducted to compile and analyze existing research on the association between cannabis consumption and greater odds of having asthma. This study adhered to the guidelines outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [16] (Table S1). Additionally, the study was formally registered in the International Prospective Register of Systematic Reviews (PROSPERO) (CRD42024597633).

### Data sources and search strategy

A comprehensive search was performed across three electronic databases such as Embase, Web of Science, and PubMed to identify relevant studies published up to September 30, 2024. These databases were chosen for their extensive coverage of biomedical and health-related literature, and their ability to index a wide range of journals relevant to respiratory health and cannabis research. The search strategy incorporated a combination of free text keywords terms to ensure thorough retrieval of relevant studies. The specific terms included were ("cannabis" OR "marijuana" OR "weed" OR "Ganja" OR "Hashish" OR "tetrahydrocannabivarin" OR "Cannabidiol" OR "Cannabinol" OR "Cannabinoid" OR

"Cannabigerol" OR "Cannabichromene" OR "Dronabinol") AND ("Asthma"). Boolean operators (AND, OR) were used to combine the search terms. No restrictions were applied regarding language or article type during the search, ensuring a comprehensive identification of studies. The detailed search strategy, including all keywords, MeSH terms, and Boolean operators, is outlined in Table S2.

### Eligibility criteria

Studies were chosen according to pre-defined inclusion and exclusion criteria. Inclusion criteria were: 1) observational studies (cohort, case-control, or cross-sectional) that evaluated the association between cannabis consumption and clinically diagnosed or self-reported asthma; (2) studies providing quantitative risk estimates such as odds ratios (OR), risk ratios (RR), hazard ratios (HR), or sufficient data to calculate these metrics; (3) and they were published in peer-reviewed journals. The primary exposure considered was cannabis consumption, with the outcome being the occurrence of asthma. Asthma can be clinically diagnosed or self-reported. No restriction was applied to mode of cannabis consumption. Studies that evaluated any form of cannabis consumption including smoking, vaping, or oral ingestion were deemed eligible for inclusion. The exclusion criteria consisted of case studies, conference summaries, opinion pieces, and review articles.

### Study selection

The titles and abstracts of all identified studies were independently screened by two reviewers to assess eligibility. The full texts of potentially relevant articles were subsequently obtained and assessed by the same two reviewers for final inclusion. Any discrepancies between the reviewers were resolved through discussion, and if necessary, a third reviewer was consulted. To enhance the efficiency and accuracy of the study selection process, semi-automated software (e.g., Nested-Knowledge, MN, USA) was used to remove duplicate records and streamline the initial screening phase [17, 18].

### Data extraction and quality assessment

Data was obtained through a standardized extraction form, which encompassed details such as study characteristics (including year of publication, author, and location), sample size, research design, and participant demographics (e.g., age and sex), along with effect sizes and their corresponding 95% confidence intervals (CIs). Two reviewers conducted the data extraction independently, and any discrepancies were resolved by consensus or through adjudication by a third reviewer. The "tagging" feature of the Nested-Knowledge platform was utilized to facilitate and streamline the data extraction process.

The quality of the included studies was assessed independently by two reviewers using the ROBINS-E tool. Each study was evaluated according to criteria covering various domains, including risk of bias due to confounding, risk of bias arising from measurement of the exposure, risk of bias in selection of participants, risk of bias due to post-exposure interventions, risk of bias due to missing data, risk of bias arising from measurement of the outcome, and risk of bias in selection of the reported result. Most studies showed "some concerns" across these domains, while none were classified as having a "high" or "very high" risk of bias. The results of the quality assessment are presented in (Fig. 2).

### Data synthesis and statistical analysis

A narrative qualitative synthesis approach was employed to analyze and integrate the findings from the included studies. This approach allowed for a comprehensive examination of relationships within and between studies, emphasizing the similarities, differences, and contextual factors influencing the observed associations. Through a textual description, we explored the patterns, methodological variations, and potential reasons for heterogeneity in study outcomes, providing an overall assessment of the robustness of the evidence.

Meta-analysis was performed using R software version 4.4. We used "Meta" and "Metafor" packages for the statistical analyses. Combined risk estimates for the association between cannabis use and odds of having asthma were computed using a random-effects meta-analysis model to account for possible variability across studies. No conversion of p values was made since studies provided effect and CI. Summary estimates were reported as pooled OR with corresponding 95% CIs. Heterogeneity between studies was assessed using the $I^2$ statistic. Subgroup analysis was performed on the basis of study design (retrospective cohort and cross-sectional). A leave-one-out approach was applied for sensitivity analysis to assess the stability of the results. Publication bias was assessed using funnel plot and Egger test. In all analyses, a p-value below 0.05 was regarded as statistically significant.

## Results

### Literature search

Database searches identified a total of 1,887 records across Embase (798 records), PubMed (511 records), and Web of Science (578 records). After eliminating 719 duplicate records, 1168 unique records persisted for screening. During the screening process, 1116 records were excluded based on titles and abstracts that did not meet the inclusion criteria, leaving 52 full-text articles to be assessed for eligibility. Upon full-text review, 44 articles were excluded for the following reasons: 24 did

not focus on the outcomes of interest, 6 was deemed irrelevant, 7 were case reports, 3 were case series and 4 were reviews. This resulted in a total of 8 studies [8, 13, 14, 19–23] being included in the systematic review and meta-analysis (Fig. 1).

### Characteristics of included studies

The included studies comprised eight investigations primarily conducted in the USA, focusing on various population groups such as adolescents, adults, and specific subgroups like high school students and African Americans. Of the eight studies, six utilized a cross-sectional design, while two employed a retrospective cohort design. The sample sizes varied significantly, ranging from 2,611 to 160,209 participants, reflecting a broad range of study scopes and statistical power. The age groups explored included adolescents and adults aged 18 years and above, with the proportion of female participants also varying widely across studies, highlighting the diverse demographic compositions. The mode of cannabis consumption in all studies was inhalation, with cannabis use defined in various ways, including past 30-day use, current use, and frequent use. Adjusted factors included age, sex, race/ethnicity, tobacco use, body mass index (BMI), and psychosocial factors such as depression, smoking, and stress. These additional details, along with the effect sizes, are detailed in Table 1. The quality assessment of the studies, based on the ROBINS-E tool, is presented in Fig. 2.

### Quality assessment

For the quality assessment, we used the ROBINS-E tool. In the domain of "bias due to confounding," most of the studies raised some concerns. All studies were based on self-reported data, which introduced potential biases in exposure measurement (Domain D2). Additionally, none of the studies identified any post-exposure interventions, which also contributed to concerns. Some studies showed concerns in Domains 5 and 6, related to the classification of exposure and outcomes. Overall, while all studies presented some concerns, none were classified as having a high risk of bias. The results of the quality assessment are presented in Fig. 2.

### Narrative synthesis of evidence on cannabis consumption and risk of asthma

The association between cannabis use and asthma reveals a range of outcomes, with most studies suggesting a significant and dose-dependent relationship. For instance, Bruzesse et al. (2020) found that both ever use of marijuana (OR = 1.25, 95% CI: 1.14–1.36) and current use (OR = 1.33, 95% CI: 1.20–1.47) were associated with

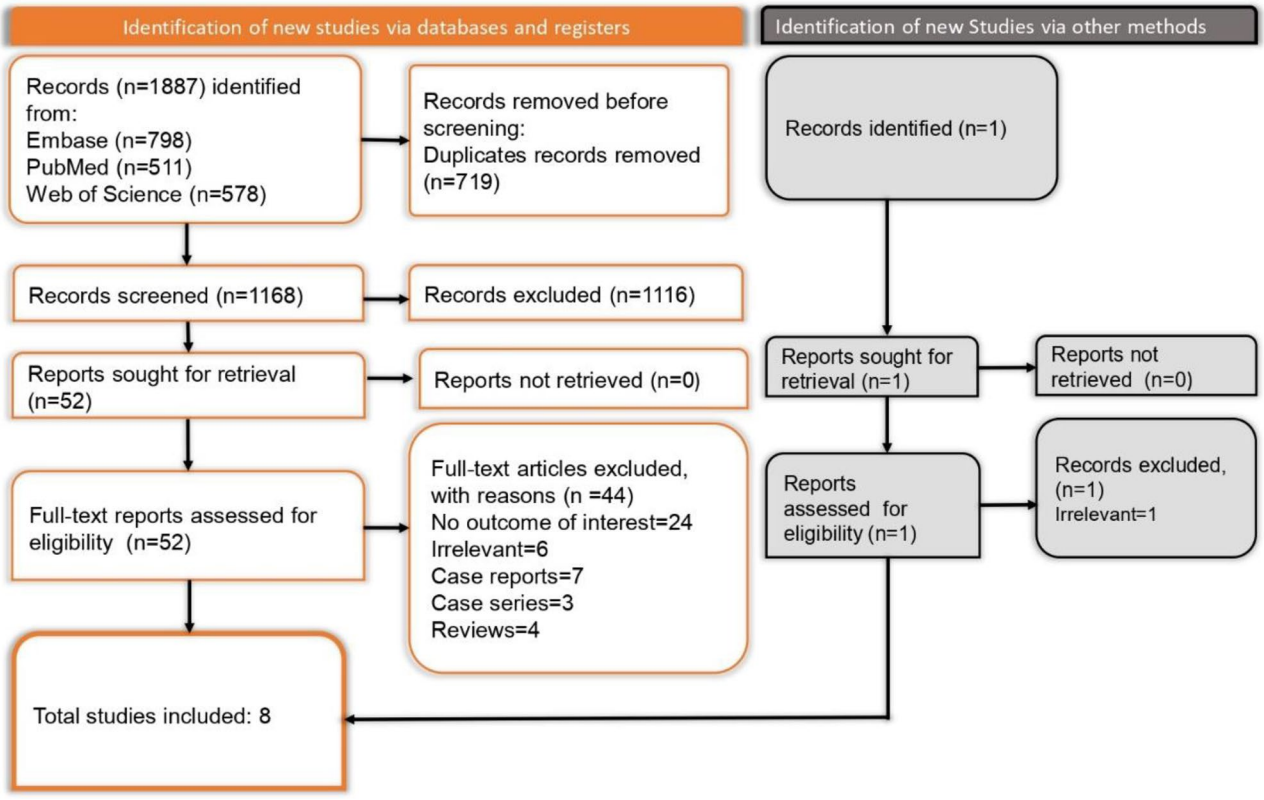


**Fig. 1** PRISMA flowchart depicting article selection and screening process

**Table 1** Characteristics of included studies

| Study | Country | Study design | Population characteristics | Age | Female | Sample size | Modes of Cannabis Consumption | Definition of Cannabis Use | OR (95% CI) for Asthma | Adjusted Factors |
|---|---|---|---|---|---|---|---|---|---|---|
| Boakye 2021 [19] | USA | Cross - sectional | U.S. adults (≥ 18 years), data from BRFSS | 18 years or above | 52% | 160,209 | Inhalation | Past 30-day cannabis use: Use at least once in the past 30 days. | OR = 1.03 (0.64–1.64) | Age, Sex, Race/Ethnicity, Marital Status, Education, Poverty Level, Depression, Combustible Cigarette Use, BMI, Nicotine Vaping |
| Bruzzese 2019 [20] | USA | Cross - sectional | Adolescents, U.S. high school students, data from the 2015 and 2017 CDC YRBS | NA | 51% | 28,811 | Inhalation | Past 30-day and ever use of marijuana or synthetic marijuana | OR = 1.33 (1.20–1.47) | Sex, sexual identity, age, race/ethnicity, use of cigarettes, cigars/cigarillos, vaping |
| Goodwin 2024 [8] | USA | Cross - sectional | US population, aged 12 and older from the NSDUH | 12 years or above | 67% | 2,611 | Inhalation | Past 30-day cannabis use: Use at least once in the past 30 days. | OR = 1.43 (1.16–1.78) | Sociodemographic Variables (Sex, Age, Marital Status, Income, Race/Ethnicity, Education), Cigarette Use (Current) |
| Han 2019 [21] | USA | Cross - sectional | US adolescents, aged 9th–12th grade, YRBS | Mean = 15.9 (SD = 0.03) | NA | 24,612 | NA | Past 30-day cannabis use: Use at least once in the past 30 days. | OR = 1.14 (1.01–1.28) | Sex, Age, Race/Ethnicity, Body Mass Index (BMI), Sleep Duration, Fruit/Vegetable Consumption, Soda Consumption, Smoking, Psychosocial Stressors (e.g., violent behavior, victimization, suicidal behavior) |
| Han 2020 [14] | USA | Cross - sectional | U.S. adolescents, YRBS (9th-12th grade students, public and private schools) | NA | NA | 21,532 | Inhalation | **Current Use**: Using marijuana at least once in the past 30 days; **Frequent Use**: Using marijuana 10 or more times in the past 30 days. | OR = 1.55 (1.29–1.87) | Age, Sex, Race/Ethnicity, Overweight/Obesity (BMI > 85th percentile), Dental visit in the previous year |

**Table 1** (continued)

| Study | Country | Study design | Population characteristics | Age | Female | Sample size | Modes of Cannabis Consumption | Definition of Cannabis Use | OR (95% CI) for Asthma | Adjusted Factors |
|---|---|---|---|---|---|---|---|---|---|---|
| Kaplan 2023 [13] | USA | Retrospective cohort | Adults (18 + years, non-pregnant) across the U.S. from the PATH Study | 18 years or above | NA | 3,536 | Inhalation | **Current Use**: Marijuana use ≥ 1/week or replacing tobacco with marijuana. **Exclusive Marijuana Use**: Marijuana use only, no tobacco us | OR = 1.78 (1.22–2.59) | Age, sex, race/ethnicity, education, body mass index, sexual orientation, cocaine use, physical activity, asthma medication use |
| Silverman 2024 [22] | USA | Cross - sectional | Adolescents (9th – 12th graders) across the U.S. from YRBSS, 2019 | NA | 49.61% | 130,136 | NA | Past 30-day cannabis use: Use at least once in the past 30 days. | OR = 1.25 (1.20–1.30) | Age, sex, race/ethnicity, grade, past 30-day cigarette use |
| Winhusen 2019 [23] | USA | Retrospective cohort | Adult patients (age ≥ 18) in the Metro-Health System, Northeast Ohio, 1999–2018. | Mean = 42 years | 43% | 17,864 | NA | Regular cannabis use: At least one CUD diagnosis or two positive UDS for cannabinoids. | OR = 2.13 (1.75–2.59) | Age, sex, race, ethnicity, BMI, status TUD status, opioid use, alcohol use, cocaine use, |

Abbreviations: USA: United States of America, NA: Not Available, SD: Standard Deviation, OR: Odds Ratio, CI: Confidence Interval, BRFSS: Behavioral Risk Factor Surveillance System, CDC: Centers for Disease Control and Prevention, YRBS: Youth Risk Behavior Survey, NSDUH: National Survey on Drug Use and Health, YRBSS: Youth Risk Behavior Surveillance System, PATH: Population Assessment of Tobacco and Health, BMI: Body Mass Index, CUD: Cannabis Use Disorder, UDS: Urine Drug Screen

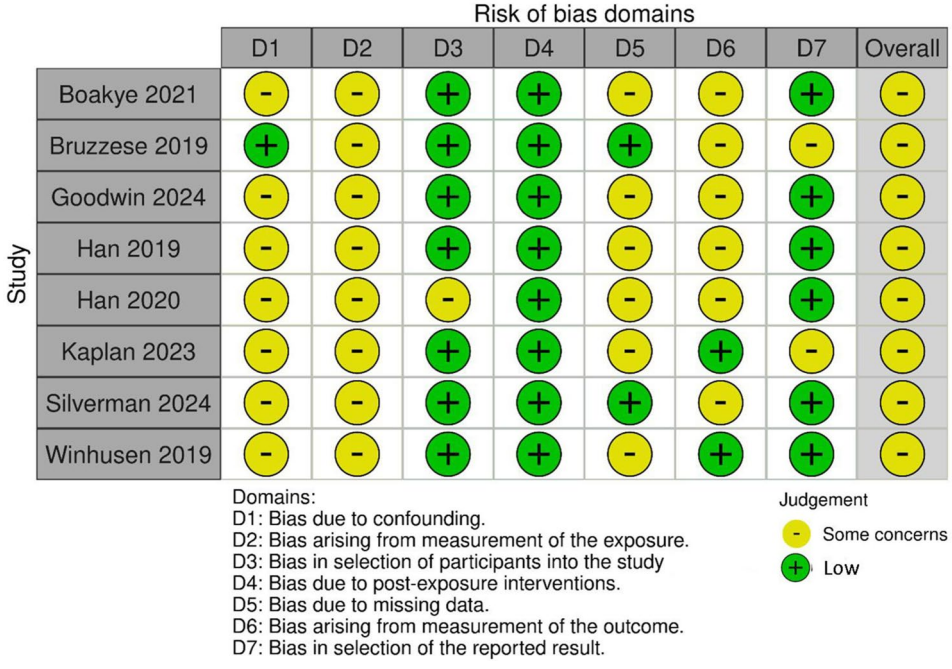


**Fig. 2** Quality assessment of studies with ROBINS-E

increased odds of asthma diagnosis. This study also highlighted subgroup differences, showing that lesbian girls and bisexual boys using synthetic marijuana had even higher odds of asthma compared to heterosexual counterparts. Similarly, Goodwin et al. (2020) identified higher odds of asthma among cannabis users in the past 30 days (OR = 1.43, 95% CI: 1.16–1.78), with a dose-response relationship evident; individuals reporting 20–30 days of cannabis use had even higher odds (OR = 1.73, 95% CI: 1.29–2.31). Han et al. (2020) corroborated these findings, reporting that participants using cannabis ≥ 10 times had an OR of 1.33 (95% CI: 1.10–1.62) for asthma, compared to a weaker association among those using cannabis fewer than 10 times (OR = 1.14, 95% CI: 0.98–1.32). This dose-dependent pattern was also evident in Han et al. (2019), which found that adolescents using cannabis at least once weekly had higher odds of asthma (OR = 1.14, 95% CI: 1.01–1.28).

Further supporting these trends, Kaplan (2023) found that exclusive marijuana users had higher odds of experiencing persistent asthma (OR = 1.78, 95% CI: 1.22–2.59) compared to non-users, with evidence suggesting more severe asthma outcomes among frequent users. Similarly, Winhusen et al. (2023) observed a higher asthma prevalence in cannabis users (10.2%) compared to non-users (7.3%) (OR = 1.44, 95% CI: 1.29–1.61), a finding consistent across both tobacco users and non-users. Silverman (2024) also highlighted a higher prevalence of asthma among youth reporting any cannabis use (29.07% vs. 23.62%; AOR = 1.25, 95% CI: 1.20–1.30). Moreover, youth using cannabis more frequently—40 or more times per month—had greater odds of asthma (AOR = 1.35, 95% CI: 1.25–1.45), further illustrating the dose-dependent relationship. In contrast, Boakye et al. (2020) found no significant association between cannabis vaping and asthma diagnosis (OR = 1.03, 95% CI: 0.64–1.64), even after adjusting for sociodemographic variables and BMI. This study, based on a large sample of 160,209 participants, suggested that cannabis vaping may not pose the same respiratory risks as combustible cannabis use. These contrasting findings might be attributed to differences in cannabis consumption methods, with inhalation of combusted cannabis exposing users to harmful irritants like tar and carbon monoxide, which are absent in vaping. Despite this, the overall body of evidence supports a consistent dose-dependent relationship, where heavier and more frequent cannabis use correlates with higher asthma prevalence and severity, particularly among adolescents and frequent users.

### Meta-analysis

The meta-analysis of eight studies revealed a link between cannabis use and greater odds of having asthma, showing a pooled OR of 1.31 (95% CI: 1.19–1.44). The analysis indicated moderate heterogeneity ($I^2$ = 46%), suggesting some differences in effect sizes among the studies. OR estimates varied among studies, with some studies reporting values as low as 1.03 and others reaching as high as 2.13 (Fig. 3). We performed subgroup analysis based on the study design (retrospective cohort and cross-sectional). Results from 6 cross-sectional studies showed a pooled OR of 1.25 (95% CI: 1.20–1.30) for asthma, with $I^2$ of 17%. Two retrospective cohort studies showed a pooled OR of 2.02 (95% CI: 1.41–2.90), with $I^2$ = 0% (Fig. 4).

### Sensitivity analysis

A leave-one-out sensitivity analysis was conducted to evaluate the stability of the combined OR estimates. In the sensitivity analysis, removing individual studies did not significantly impact the pooled effect size, with ORs spanning from 1.25 (95% CI: 1.20–1.31) to 1.37 (95% CI:

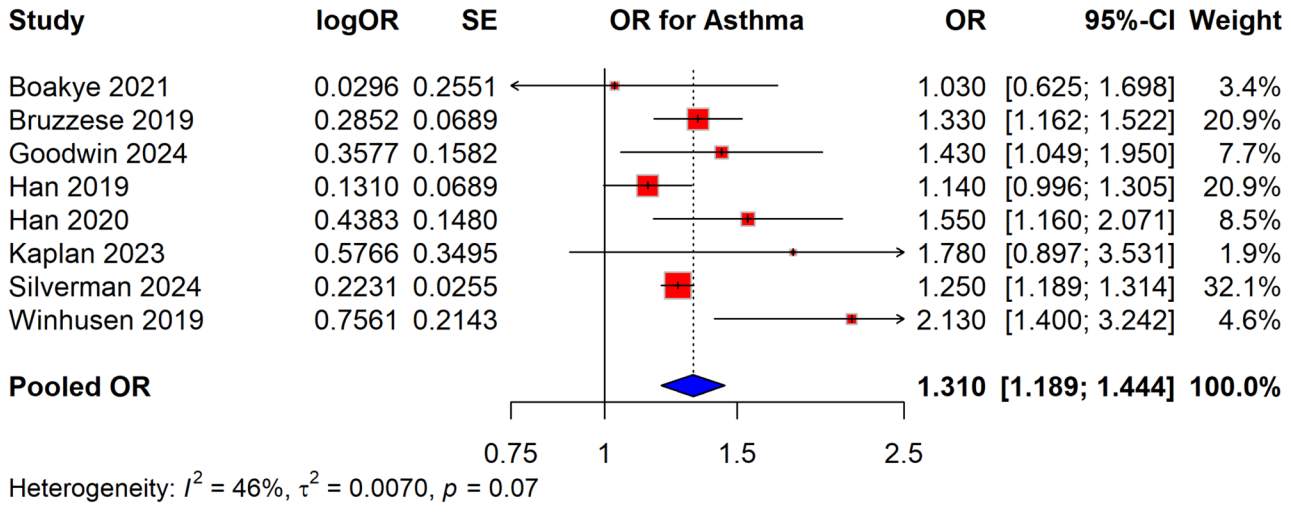


**Fig. 3** Pooled odds ratio for greater odds of having asthma among cannabis users

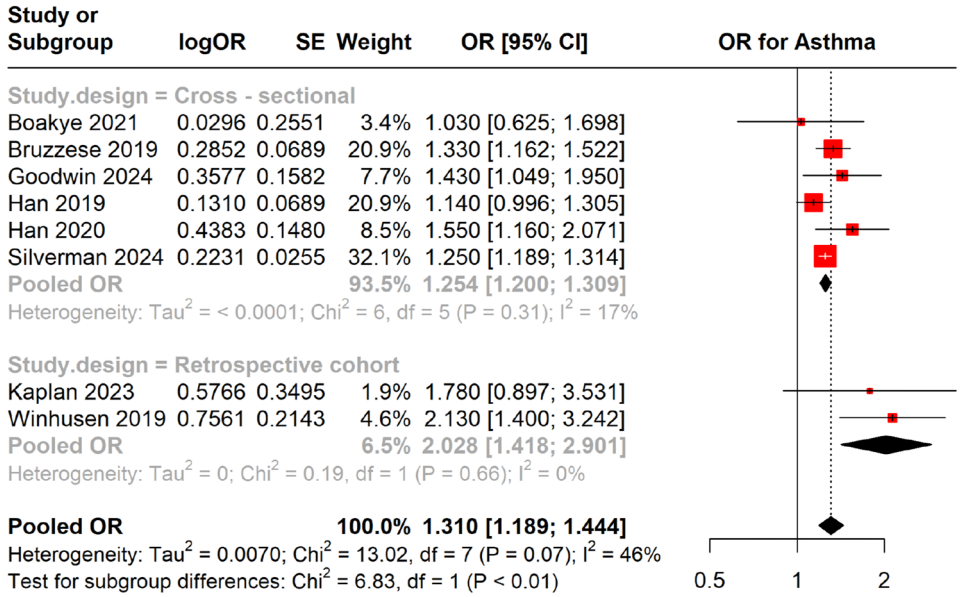


**Fig. 4** Subgroup analysis showing the odds ratio for greater odds of having asthma among cannabis users based on study design

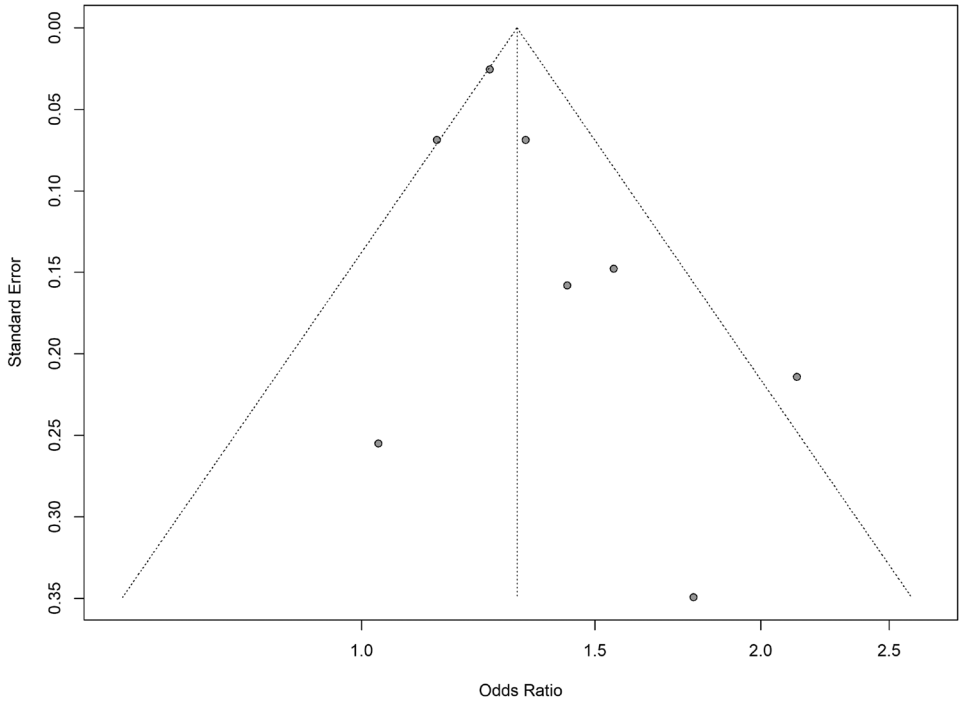


**Fig. 5** Funnel plot assessing publication bias

1.18–1.56). This indicates that the association between cannabis consumption and greater odds of having asthma is robust and not driven by any single study (Figure S1).

### Publication bias

Publication bias was assessed using a funnel plot and Egger's test. Slight asymmetry was observed in the funnel plot upon visual inspection (Fig. 5). However, Egger's test showed no significant presence of publication bias ($p = 0.18$).

## Discussion

The findings from this systematic review and meta-analysis provide compelling evidence that indicates a significant association between cannabis use and greater odds of having asthma. The pooled OR of 1.31 (95% CI: 1.19–1.44) suggests that individuals who use cannabis are

at 31% greater odds of having asthma compared to non-users. These results indicate a concerning public health issue, as cannabis use continues to rise globally, and highlight the potential respiratory complications associated with its consumption. The finding is consistent with prior research that links cannabis uses to respiratory inflammation. Inhalation of cannabis smoke, much like tobacco smoke, is thought to contribute to an increased risk of asthma diagnosis [24]. The OR across studies ranged from 1.03 to 2.13, showing a consistent pattern of elevated odds of having asthma among cannabis users. The studies included in this analysis adjusted for these potential confounders such as smoking. Our subgroup analysis based on study design resolved the source of heterogeneity. Both cross-sectional studies and cohort studies showed a significant association between cannabis use and asthma.

In comparison to previous meta-analyses, our study provides focused insights into the association between cannabis use and greater odds of having asthma. While earlier studies primarily examined respiratory symptoms like cough, sputum production, wheezing, and dyspnea [15], our research specifically investigates asthma as a clinical outcome. Previous analyses linked cannabis use to these symptoms but did not address asthma development or asthma risk. Our findings build on this by linking cannabis use directly to asthma prevalence, offering more detailed data on its long-term impact. Unlike earlier studies, which focused on general symptoms, our study clarifies the risks of cannabis use for asthma patients, providing a more specific understanding of its potential effects on respiratory health.

Sensitivity analyses using the leave-one-out approach demonstrated that the pooled OR remained robust, ranging from 1.25 (95% CI: 1.20–1.31) to 1.37 (95% CI: 1.18–1.56), even after systematically excluding each study. This indicates that the overall findings are stable and not driven by any individual study. The variation in heterogeneity, ranging from 14 to 52%, suggests that the association between cannabis use and asthma diagnosis is consistent, despite minor fluctuations depending on the inclusion or exclusion of specific studies. Thus, the results of this meta-analysis are reliable and illustrated a robust link between cannabis consumption and greater odds of having asthma.

The substantial heterogeneity ($I^2$ = 46%) observed across the included studies reflects the wide variability in study populations, methodologies, and geographic contexts. The ORs for asthma diagnosis varied from as low as 1.03 to as high as 2.13, suggesting that the correlation between cannabis use and asthma diagnosis is influenced by various factors such as age, gender, and environmental exposures. This variability may also be attributed to differences in the assessment of cannabis use, including frequency, mode of consumption, and the presence of co-exposures like tobacco. Moreover, the presence of comorbid conditions, such as allergies or chronic respiratory diseases, may further modify the observed risk of asthma diagnosis, making it challenging to isolate the specific impact of cannabis use on respiratory outcomes.

Although many studies accounted for smoking as a factor and adjusted for it, not all have adequately controlled for smoking as a confounder. This oversight can lead to residual confounding, affecting the accuracy of the conclusions drawn about the impacts of cannabis vaping on respiratory health. Since smoking is a well-known risk factor for various respiratory conditions, including asthma [25], its influence must be thoroughly considered. Ignoring or inadequately adjusting for cigarette smoking may distort the association between cannabis vaping and respiratory symptoms or disease. Therefore, more studies are necessary to explicitly account for smoking behaviors. This will enhance the reliability of research findings by providing a clearer distinction between the effects attributable to cannabis vaping alone and those influenced by concurrent tobacco use.

The results of this meta-analysis carry several critical clinical implications. They emphasized the need for clinicians to be vigilant in assessing respiratory health among cannabis users, particularly those with a history of asthma or other respiratory conditions. Given the association between cannabis use and greater odds of having asthma, clinicians may consider evaluating respiratory symptoms among cannabis users, particularly those with a history of asthma or other respiratory conditions. Although this meta-analysis offers valuable insights into the relationship between cannabis use and greater odds of having asthma, it is crucial to recognize several limitations. First, the majority of the included studies employed cross-sectional designs, limiting the ability to establish temporal relationships and causality. Second, most studies relied on self-reported cannabis use, which may be subject to recall bias and underreporting. Third the USA centric nature of existing research on cannabis consumption and asthma poses significant limitations for generalizability. Variations in cannabis products, consumption patterns, and healthcare systems across countries mean that findings from USA based studies may not accurately reflect the risks encountered in other countries. Differences in product potency, consumption methods, regulation, and healthcare infrastructure can influence how asthma diagnosis related to cannabis are identified and managed. This highlights the need for more inclusive, global research to improve the applicability of findings and guide effective public health strategies worldwide. Future research should focus on longitudinal studies to better elucidate the temporal relationship between cannabis use and asthma and to identify potential causal

pathways. Additionally, studies exploring the influence of different modes of cannabis consumption (e.g., vaping vs. smoking) and their relative contributions to asthma diagnosis are warranted. Understanding the differential effects of cannabinoids and other compounds in cannabis smoke on respiratory health will be essential in developing targeted public health interventions and clinical guidelines.

## Conclusion

This meta-analysis highlights a significant association between cannabis use and an greater odds of having asthma. These findings emphasize the need for clinicians to monitor respiratory health in individuals who use cannabis, especially those with a prior history of asthma or other respiratory conditions. Future research could benefit from examining moderating factors such as the frequency, method of cannabis use, and demographic variables to further clarify the relationship between cannabis consumption and asthma diagnosis. In addition, public health strategies aimed at raising awareness about the potential respiratory risks of cannabis use and promoting safer consumption practices may be beneficial for reducing the associated health burden.

## Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12890-025-03516-0.

Supplementary Material 1

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**Data availability**
The data is with the authors and available upon request. The data can be obtained by contacting the corresponding author, Afukonyo Shidoiku Daniel. Email: afukonyoshidoiku@tsuniversity.edu.ng.

## Declarations

**Ethical approval**
Not applicable.

**Consent to participate**
Not applicable since this is a review and not involved any human.

**Competing interests**
The authors declare no competing interests.

**Human ethics and consent to participate**
Not applicable.

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