



Sinus migraine: A systematic review and meta-analysis

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Introduction

Sinus headache is frequently misdiagnosed, with growing evidence suggesting that many cases may actually be migraine with sinus-like features.

Objective

To evaluate the prevalence of migraine among patients initially diagnosed with sinus headache and assess how often migraine is mistaken for sinus-related conditions.

Methods

This systematic review and meta-analysis adhered to PRISMA guidelines. Literature searches were performed in Scopus, Medline, PubMed, and Google Scholar using terms such as "sinus headache" and "sinus migraine." Studies were screened based on predefined inclusion and exclusion criteria. A proportional meta-analysis was performed using conducted in R (version 4.3.2), and study quality was assessed using the JBI checklist.

Results

Twelve studies involving 4,392 patients were included. Eight studies (Group 1) assessed patients with sinus headache, finding a pooled migraine prevalence of 55% (95% CI: 0.42-0.68), increasing to 59% when probable migraine was included, and 65% when tension-type headache cases were considered. Four studies (Group 2) examined patients with confirmed migraine previously misdiagnosed as sinus headache, with misdiagnosis rates up to 81.5% and diagnosis delays up to 38 years. Female predominance was noted in both groups: 65% (95% CI: 53-77%) in Group 1 and 75% (95% CI: 71-80%) in Group 2.

Conclusions

A significant proportion of patients diagnosed with sinus headache were ultimately found to have migraine, with consistently high female predominance-particularly in cases of confirmed migraine misdiagnosis. Enhanced diagnostic vigilance and awareness are needed to reduce misclassification and promote appropriate treatment.

Keywords:

Sinus headache
Sinus migraine
Migraine
Misdiagnosis
Otorhinolaryngology
Systematic review

Submitted: April 23, 2025
Accepted: June 27, 2025
Published online: June 30, 2025



Introduction

Headache disorders are among the most prevalent and disabling neurological conditions worldwide, with migraine representing a major contributor to the global disease burden (1).

Beyond its core symptoms, migraine has been associated with several systemic and neurological conditions, including hypertension, diabetes, and even intracranial tumors (2–4).

Despite increased awareness, migraine is frequently misclassified, especially when presenting with sinus-related symptoms. Many patients report nasal congestion, facial pressure, or rhinorrhea, leading to an initial diagnosis of sinus headache. However, accumulating evidence suggests that a significant proportion of these cases actually fulfill the criteria for migraine (5,6).

The overlapping symptomatology has led to the use of terms such as “sinus migraine” to describe cases where migraine patients presents with sinus-like features.

Such diagnostic confusion has critical clinical implications. Patients may receive inappropriate treatments such as antibiotics or undergo unnecessary surgical interventions, while the underlying primary headache disorder remains unaddressed (7). In several studies, participants without sinus infection or structural abnormalities on imaging showed significant improvement with migraine-specific treatments such as triptans (8).

Misdiagnosis with sinusitis, can also lead to significant delay in appropriate treatment. In one study, over 80% of migraine patients were initially misdiagnosed, with an average delay of nearly 8 years- some as long as 38 years. This delay was associated with higher rates of chronic migraine and medication overuse headache. Despite receiving medical or even surgical treatment for presumed sinus issues, most patients experienced little relief until a correct migraine diagnosis was made, after which nearly 70% reported improvement (9).

Some cases, radiologic signs of sinus changes in migraine patients, likely reflecting true comorbidity rather than causation. In Therefore, ENT assessments remain important to rule out concurrent pathology (10).

This review aims to assess the reported prevalence of migraine among individuals diagnosed with sinus headache and to shed light on the persistent challenges of delayed recognition and incorrect classification in clinical practice.

Methods

This review followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure a transparent and structured approach (11).

Data sources and searches

A thorough literature search was carried out on March 10, 2025, across Scopus, Medline, PubMed, and Google Scholar using the search terms “sinus headache” OR “sinus migraine”.

Inclusion and exclusion criteria

This review included original studies that assessed individuals diagnosed with sinus headache or those presenting with sinus-related symptoms within the clinical context of migraine. Eligible studies were required to report either the prevalence or proportion of migraine among these patients and to utilize established diagnostic criteria for migraine. Only full-text articles written in English were considered. Excluded from the review were case reports, editorials, narrative reviews, and conference proceedings. Studies were also excluded if they did not provide specific data on migraine diagnosis and prevalence, or involved participants with secondary causes of headache.

Study selection

The selection process for eligible studies involved two stages: an initial review of titles and abstracts, followed by a detailed examination of the full-text articles.

Data extraction and quality assessment

The extracted data included the first author's name, publication year, country where the study was conducted, journal of publication, study design, study period/ follow-up duration, mean age and percentage of females in the sinus headache or sinus migraine group, study setting (monocenter or multicenter), methods used to diagnose headache or migraine, reported symptoms and headache characteristics, total number of patients with sinus headache and of how many were confirmed to have migraine, any reported medication use, inclusion and exclusion criteria, and the study's conclusion.

Study quality was assessed using the JBI Critical Appraisal Checklist for Prevalence Studies (12) (Table 1). High quality studies are those that meet most JBI criteria (✓ in at least 8 out of 9 domains).



Table 1. Quality assessment of included studies using JBI Checklist

Study ID	Appropriate sample frame	Proper recruitment	Adequate sample size	Detailed description	Sufficient data coverage	Valid diagnostic criteria	Standardized measurement	Proper statistical analysis	Response rate adequate	Overall quality
Group 1										
Study 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	9
Study 2	✓	✓	X	✓	✓	✓	✓	✓	✓	8
Study 3	✓	✓	X	✓	✓	✓	✓	✓	✓	8
Study 4	✓	✓	X	✓	✓	✓	✓	✓	✓	8
Study 5	✓	✓	X	✓	✓	✓	✓	✓	✓	8
Study 6	✓	✓	✓	✓	✓	✓	✓	✓	✓	9
Study 7	✓	✓	X	✓	✓	✓	✓	✓	✓	8
Study 8	✓	✓	✓	✓	✓	✓	✓	✓	✓	9
Group 2										
Study 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	9
Study 2	✓	✓	X	✓	✓	✓	✓	✓	✓	8
Study 3	✓	✓	✓	✓	✓	✓	✓	✓	✓	9
Study 4	✓	✓	✓	✓	✓	✓	✓	✓	✓	9



Data synthesis and analysis

Proportional meta-analysis was performed using R-4.3.2.

Results

Literature search

A systematic search was conducted across: Medline (n= 86), Scopus (n= 402), PubMed (n= 115), and Google Scholar (manual search, n= 2), identifying a total of 605 records. Prior to screening, 180 duplicate records and a 9 non- English studies were removed, leaving 416 records for initial review.

Title and abstract screening excluded 150 records that were not relevant to the research question or were review or case report articles. The full texts of 198 records were sought for retrieval. However, 68 were not accessible in the full text, and 185 were excluded during full-text screening for not meeting the inclusion criteria.

A total of 13 records were assessed for eligibility. Among these, 1 was excluded for being unrelated to the outcome of interest, resulting in 12 studies that were included in the final analysis.

The complete selection process is summarized in the PRISMA flow diagram (Figure 1).

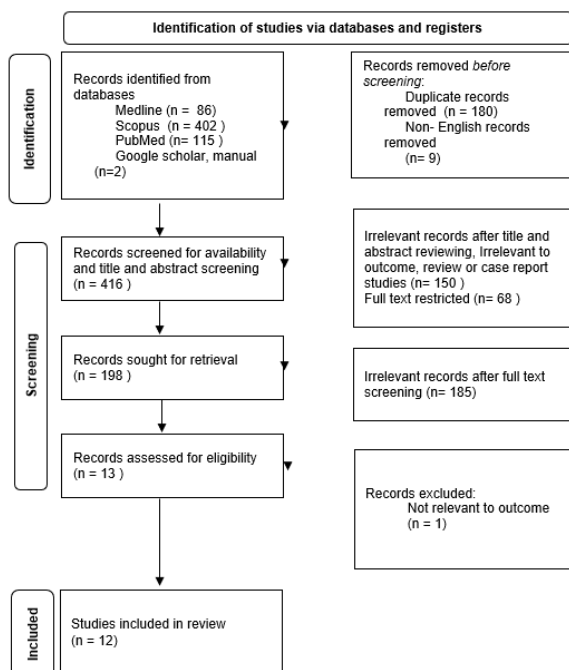


Figure 1. PRISMA Flow Diagram.

The twelve studies included in this review were categorized into two distinct groups based on their research focus. Group 1 consisted of eight studies that involved patients initially diagnosed with sinus headache. These patients were later assessed to determine whether they met the diagnostic criteria for migraine, and the prevalence of migraine among them was reported. Group 2 included four studies in which all participants had a confirmed diagnosis of migraine, but their condition had previously been misdiagnosed as sinus headache or had been associated with sinus related symptoms.

Group 1 Studies

This group included eight studies (5–8,10,13–15) that assessed patients initially with sinus headache to determine the proportion of migraine among them. The studies were conducted in various countries, including Sudan, Turkey, Iran, and the United States, and were published in reputable journals such as The Egyptian Journal of Otolaryngology, Eastern Journal of Medicine, European Archives of Otorhinolaryngology, The Laryngoscope, Headache, Otolaryngology-Head and Neck Surgery, and Archives of Internal Medicine. The designs included cross-sectional, prospective, and descriptive clinical studies, with most being monocentric.

The publication years of these studies ranged from 2004 to 2025. The reported study duration ranged from a few months of follow-up to several years of data collection. The participants' mean ages generally ranged between 33 and 51. The proportion of female participants varied across studies, with percentages reported between 30.7% and 78% where available.

All studies employed standardized diagnostic criteria to evaluate headache disorders. The majority relied on the International Headache Society (HIS) criteria, including versions based on the ICHD-II classification. In one study (study 7), the 20 - item Sino-Nasal Outcome Test (SNOT-20) was also used as a complementary diagnostic tool.

Across the studies, a wide array of sinus-like symptoms were reported by participants. Nasal congestion was among the most common complaints. Other frequently observed symptoms included facial pain, sinus pressure, nasal discharge, postnasal drip, rhinorrhea, and allergic features such as sneezing or nasal itching. In one study (study 1), autonomic symptoms such as lacrimation, conjunctival injection, and eyelid edema were reported in some cases. Many patients also had a history of allergic rhinitis or prior acute rhinosinusitis, contributing to the diagnostic complexity. In several cases, these symptoms were misleading and led to misclassification of the headache type as sinus-related when the underlying cause was, in fact, a primary headache disorder such as migraine.



Headache characteristics described by participants often matched those typical of migraine. A significant proportion of patients reported throbbing or pulsating pain. Many participants noted that their pain worsened with physical activity. Aura symptoms- including visual disturbances, tingling or numbness, and slow speech- were also reported. Photophobia and phonophobia were frequently encountered, as well as accompanying symptoms such as nausea and vomiting. In terms of severity and duration, several studies documented moderate to severe pain lasting from few hours to over a day, with some patients experiencing recurrent episodes for months or even years prior to receiving an accurate diagnosis.

Common exclusion criteria across the studies involved the presence of secondary causes of headache, such as malignancies, granulomatous conditions (e.g., nasal tuberculosis, syphilis), or atypical infections. Patients exhibiting signs of active infection-such as recent radiological evidence of sinusitis (within six months), fever, or purulent nasal/postnasal discharge- were also excluded. Additional reasons for exclusion included acute rhinosinusitis exacerbation, ciliary dysmotility, prior diagnosis of migraine or tension-type headache, pregnancy, a history of facial trauma or autoimmune disorders affecting the head and neck.

Treatment data further reflected the initial misclassification of migraine as sinus headache. Nonsteroidal anti-inflammatory drugs (NSAIDs) were the most commonly used medications, utilized by more than 70% of patients in some cohorts. Despite the high proportion of participants eligible for migraine-specific therapies such as triptans, these medications were used in less than 10% of cases. When used, triptans received the highest efficacy rating. In contrast, many patients was prescribed treatments aimed at managing sinus disease, including decongestants, antihistamines, and even repeated courses of antibiotics. One study (study 3) found that 96% of participants had received antibiotics at least once prior to the study, and a substantial proportion had undergone surgical interventions such as nasal septoplasty- despite ultimately receiving diagnosis of migraine or tension-type headache (Supplementary Table 1).

A total of 3427 patients with sinus headache were included across six studies, of whom 2791 were females (Table 2).

Table 2. Female cases among sinus headache patients

Study ID	Number of patients with sinus headache	Of whom females
Study 1	197	129
Study 2	26	8
Study 3	58	36
Study 4	55	37
Study 6	100	78
Study 8	2991	2303

The pooled proportion of females among patients with sinus headache was 65% (95% CI: 0.53 to 0.77), based on a random-effects model. The proportion of female patients varied across studies, ranging from 31% to 77%, with most studies reporting a higher prevalence in females. This suggests a possible predominance of sinus headache among females (Figure 2).

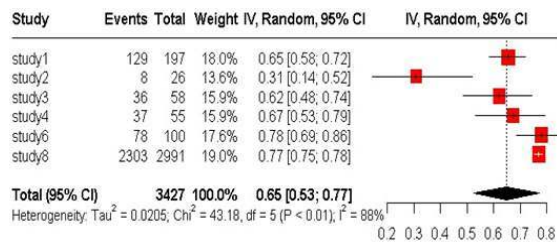


Figure 2. Forest plot of female proportion with sinus headache.

A total of 3531 patients diagnosed with sinus headache were reported across the eight included studies. Among them, 2644 were subsequently identified as having migraine that was initially misdiagnosed as sinus headache. Additionally, study 2, 3, and 7 reported confirmed cases of tension-type headache, with 5, 16, and 2 cases respectively. Except for study 4, all studies excluded individuals with a prior diagnosis of migraine. However, study 4 differentiated and reported patients without a prior migraine diagnosis separately. Studies 6 and 8 also identified and reported cases of probable or suspected migraine, totaling 23 and 239 cases respectively (Table 3).



Table 3. Migraine cases among sinus headache patients

Study ID	Number of patients with sinus headache	Of whom had confirmed migraine diagnosis	Notes
Study 1	197	67	(40 without aura, 27 with aura)
Study 2	26	11	There is additional 5 of 26 suffered from tension type headache.
Study 3	58	40	16 of 58 having tension type headache.
Study 4	55	40	only 31 patients of 40 did not received previous migraine diagnosis.
Study 5	35	26	
Study 6	100	52	52 only confirmed migraines that mistaken as sinus migraine. Additional 23 of 100 with probable migraine.
Study 7	69	21	Of 69; 38 had severe headache and 31 had mild headache which not considered chief complaint). 2 of 69 suffered from tension type headache.
Study 8	2991	2396	Additional 239 of 2991 had suspected migraine.

The pooled proportion of migraine cases among patients with sinus headache was 55% (95% CI: 0.42 to 0.68), based on a random-effects model. The proportion of confirmed migraine cases varied across studies, ranging from 30% to 80% (Figure 3).

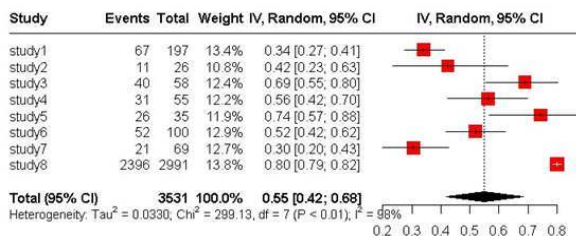


Figure 3. Forest plot of migraine proportion in sinus headache patients.

When probable or suspected migraine cases were included, the pooled proportion increased to 59% (95% CI: 0.44 to 0.74), based on a random-effects model (Figure 4).

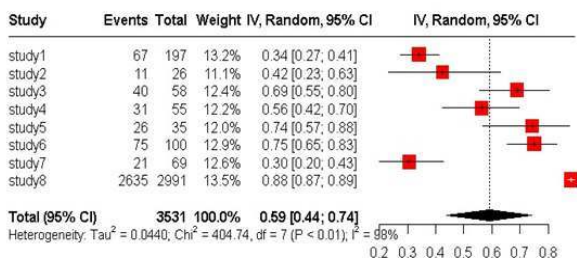


Figure 4. Forest plot of pooled migraine proportion including suspected cases.

Including the tension-type headache cases further increased the pooled proportion to 65% (95% CI: 0.49 to 0.82), as estimated using a random-effects model (Figure 5).

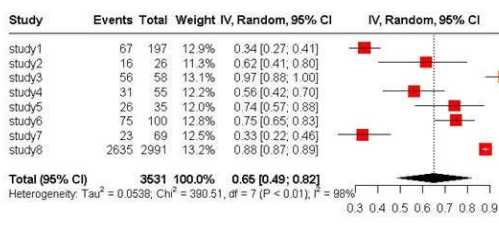


Figure 5. Forest plot of pooled proportion including tension-type headache cases.

Group 2 studies

Group 2 included four studies (9,16–18) in which all participants had a confirmed diagnosis of migraine, but their condition had previously been misdiagnosed as sinus headache or had been associated with sinus-related symptoms. Study 1 was a case-control study involving 417 students who experienced sinus migraine, highlighting a significant association between nasal and sinus symptoms and migraine. Study 2 investigated the etiology of primary sinus headache in 98 patients who had negative findings on endoscopy or computed tomography; among them, 61 were diagnosed with migraine, 26 with tension-type headache, and 11 with cluster headache. Study 3 reported that 106 out of 130 patients with migraine had previously been misdiagnosed with sinusitis and the mean time delay in migraine diagnosis was 7.75 ± 6.29 years, with a range of 1 to 38 years. Study 4 included 215 patients with confirmed migraine who had initially been misdiagnosed with sinus headache and showed a positive response to sumatriptan.

These studies were conducted in various countries, including Syria, Turkey, Kuwait, and the United States. The study designs encompassed case-control, prospective, retrospective, and randomized controlled trial, with



most being multicenter. The publication years of these studies ranged from 2007 to 2025. They were published in reputable journals such as *Medicine*, *Journal of International Medical Research*, *The Journal of Headache and Pain*, and *Clinical Therapeutics*. The study periods varied, with follow-up ranging from several months to few years of data collection. The participants' mean ages ranged from 23.8 to 44 years. The proportion of female participants varied across studies, with percentages reported between 70% and 79.9%.

Patients in the four included studies were diagnosed with migraine using validated tools such as the Migraine Screening Questionnaire, the International Headache Society (HIS) criteria, and the ICHD-III beta classification.

Sinus and nasal symptoms were frequently reported across the studies. These included nasal obstruction, nasal discharge, sinus severity, facial pain, ear pain or fullness, runny nose, watery eyes, postnasal drip, sneezing, and a sense of pressure in the sinus areas.

Despite the sinus-related presentation, migraine-associated features were consistently present. Patients frequently reported nausea, vomiting, photophobia, and phonophobia. In study 1, over half of the participants experienced severe, frequent headaches lasting more than four hours, and a significant proportion rated the pain severity as moderate to high on a 10-point scale. Study 2 further described headache pain localized to the frontal, temporal, or periorbital regions, often unilateral. The majority of patients characterized their pain as throbbing (72%) or crushing (65%), while others described burning or vague sensations. Study 4 found that among 215 patients, 129 had unilateral pain, 173 reported throbbing pain, and 153 experiencing pain that worsened with physical activity.

The included studies applied clear inclusion and exclusion criteria to distinguish primary headache disorders, such as migraine, from secondary causes like sinus infections. Generally, participants were adults without underlying acute or chronic illnesses. A key aspect of the exclusion criteria across studies was the elimination of any signs suggestive of active or recent sinus infection. This included the presence of fever, purulent or discolored nasal discharge, and radiological or endoscopic evidence of sinus pathology. Patients with anatomical nasal abnormalities, prior sinus surgeries, or sinonasal conditions such as polyposis or mucosal contact points were also excluded. These strict criteria were essential to ensure that headache symptoms not secondary to an infectious or structural sinus condition, thereby focusing the analysis on primary sinus headache or migraine with sinus-related features.

A total of 861 patients with sinus migraine or primary sinus headache were included across four studies, of whom 656 were females (Table 4).

Table 4. Female cases among sinus migraine or primary sinus headache patients

Study ID	Number of patients with sinus migraine	Of whom females
Study 1	417	333
Study 2	98 (61 migraine, 26 tension-type headache and 11 cluster headache)	72
Study 3	130	100
Study 4	216	151

The pooled proportion of females among these patients was 75% (95% CI: 0.71 to 0.80), based on a random-effects model. The proportion of female patients across individual studies ranging from 70% to 80%, indicating a consistently high prevalence among females. These findings suggest a possible predominance of primary sinus headache in the female population (Figure 6).

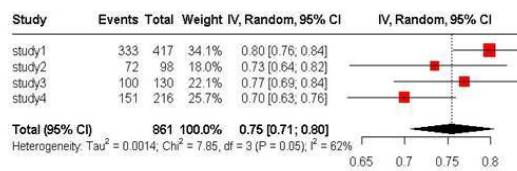


Figure 6. Forest plot of female proportion in sinus migraine or primary sinus headache cases.

Discussion

This systematic review and meta-analysis explored how frequently migraine is misdiagnosed as sinus headache and estimated the true prevalence of migraine among individuals initially diagnosed with sinus related-conditions. The combined analysis revealed that 55% (95% CI: 0.42-0.68) of these patients actually had migraine, a figure that rose to 59% when probable migraine cases were included, and further increased to 65% when tension-type headaches were also considered. A predominance of female patients was noted among those diagnosed with sinus headache, though this varied between studies (pooled estimate: 65%, 95% CI: 0.53-0.77). In contrast, female predominance in the sinus migraine group was more consistent, with a pooled estimate of 75% (95% CI: 0.71-0.80). This findings align with the study by Allais et al. (19), which characterized migraine as predominantly a condition affecting women.



These results reinforce longstanding concerns about the symptomatic overlap between sinus conditions and migraine. symptoms such as facial pressure, nasal congestion, and postnasal drip – typically associated with sinus disorders- are frequently reported in migraine as well. This overlap has been documented in studies by Abdelgafour et al.(5) , Kaymakçı et al.(13), Foroughipour et al.(7), Mehle et al.(10), Eross et al.(6), and Schreiber et al.(15).

Studies by Kari et al.(8) and Perry et al.(14) reported that individuals without sinus infections or structural abnormalities on imaging responded well to migraine-specific treatments. In contrast, other cases showed radiologic signs of sinus changes in migraine patients- findings that, according to Mehle (10), likely indicate a coexisting condition rather than a direct cause, highlighting a distinction between comorbidity and misdiagnosis.

This review has several limitations. The included studies varied in design, diagnostic criteria, and sample sizes, contributing to heterogeneity. Not all studies used standardized migraine criteria, which may affect consistency. Finally, due to limited demographic data in some studies, subgroup analyses based on sex or comorbidities could not be thoroughly explored.

Despite these limitations, the findings highlight the urgent need for improved clinical awareness and diagnostic protocols. Interdisciplinary collaboration between neurologists and ENT specialists can foster more accurate classification.

Conclusions

This systematic review and meta-analysis underscore that a large proportion of patients presenting with sinus headache symptoms may actually suffer from migraine, a condition often overlooked due to overlapping clinical features. The marked female predominance in these misdiagnosed cases further emphasizes the need for gender-sensitive diagnostic awareness. Accurate differentiation between sinus-related and primary headache disorders is crucial to avoid mismanagement and unnecessary interventions. Clinicians should maintain a high index suspicion for migraine in patients presenting with sinus symptoms, especially when traditional sinus treatment fail.

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Conflict of interest: No conflict of interest.
Funding: No funding was received.