JOURNAL LA MEDIHEALTICO

VOL. 07, ISSUE 05 (1250-1263), 2026
DOI: 10.37899/journallamedihealtico.v7i5.6021

The Relationship Between Migraine and Ischemic Stroke Risk: A Literature Review

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Article Info
Article history:
Received 25 September 2026
Received in revised form 14 October 2026
Accepted 9 November 2026

Keywords:
Migraine;
Migraine with Aura
Ischemic Stroke
Stroke Risk
Systematic Literature Review

Abstract

Migraine is a neurovascular disorder associated with an increased risk of ischemic stroke, particularly in individuals experiencing aura. However, the strength and causality of this association remain uncertain. This study aimed to review recent evidence on the relationship between migraine and ischemic stroke, considering migraine subtype, aura status, age, sex, and vascular risk factors. A systematic literature review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Articles published between 2020 and 2026 were identified through PubMed, ScienceDirect, and Google Scholar. Ten studies, comprising cohort and case-control studies, systematic reviews and meta-analyses, and Mendelian randomization analyses, were synthesized descriptively. Most studies reported an increased risk of ischemic stroke among individuals with migraine. Meta-analyses found hazard ratios of 1.205 (95% CI 1.151–1.262) and 1.35 (95% CI 1.03–1.78), while a population-based study reported an odds ratio of 1.38 (95% CI 1.24–1.53). Associations were generally stronger for migraine with aura and among women, younger individuals, and people with chronic migraine. Nevertheless, Mendelian randomization found no significant evidence of a causal relationship (OR 0.935; 95% CI 0.851–1.027). These findings suggest that migraine may serve as a marker of elevated cerebrovascular risk rather than an established direct cause of ischemic stroke. Differences in study design, population characteristics, and adjustment for vascular risk factors may contribute to inconsistent findings. Clinical attention to modifiable vascular risk factors and appropriate migraine management remains important, while further longitudinal and causal studies are needed to clarify the underlying relationship and inform preventive strategies.

Introduction

Stroke is a serious health issue. It arises from central nervous system dysfunction caused by an interruption in the blood supply to the brain. Stroke is the second leading cause of death and the sixth most common cause of disability worldwide. Approximately 15 million people suffer a stroke annually; about 6.6 million of these cases comprising 3.5 million women and 3.1 million men result in death. Stroke poses a more significant problem in low-income countries compared to high-income nations. More than 81% of stroke-related deaths and the rising mortality rate among those under 70 occur in low-income countries (Rahayu et al., 2023;

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Akinyemi et al., 2021; Aguirre et al., 2023; Feigin et al., 2025; Chukwudelunzu & Mbonde, 2024). Generally, strokes are classified into two main types: ischemic and hemorrhagic. Ischemic stroke occurs when blood flow to a specific area of the brain is insufficient due to a blockage in a cerebral artery, thereby reducing or completely cutting off the oxygen supply required by brain cells. Conversely, hemorrhagic stroke occurs when bleeding in the brain results from a ruptured blood vessel, damaging brain tissue and impairing neurological function (Maida et al., 2024; Alsbrook et al., 2023; Werring et al., 2024). Clinical signs vary; for instance, ischemic stroke is typically characterized by hemiparesis or hemiplegia (weakness or paralysis on one side of the body), sudden loss of sensation, slurred speech, visual disturbances, facial asymmetry, memory issues, and excruciating headaches (Leliopoulou & Holman, 2026). While it may also cause vertigo, intracerebral and subarachnoid hemorrhages present the specific clinical signs associated with hemorrhagic stroke (Familah et al., 2024; McDermott et al., 2025; Lee et al., 2025; Mendiola et al., 2023). Migraine is a neurovascular disorder characterized by recurrent headaches accompanied by symptoms such as nausea, phonophobia, and photophobia. Factors associated with migraines include dietary, psychosocial, and environmental elements (Oktarlina et al., 2024; Seng et al., 2022; Haghdoost & Togha, 2022; Elser et al., 2024). Migraines can be classified into those with aura and those without; the aura manifests as reversible visual or sensory disturbances, presenting as either positive symptoms (such as flashes of light or tingling) or negative symptoms (such as vision loss or numbness). These auras typically appear after five minutes and last for less than one hour (Yanti et al., 2024). These characteristics are significant because the association between migraines and ischemic stroke is reportedly stronger in individuals who experience migraines with aura, particularly among young women (Altamura et al., 2022; Scutelnic et al., 2024; Xie et al., 2023; Raggi et al., 2024; Park et al., 2025).

Globally, the age-standardized prevalence of migraines is estimated to be approximately 14% (Li et al., 2023; Chen et al., 2024; Liao et al., 2025). Observational studies indicate that individuals who suffer from migraines face an increased risk of ischemic stroke, especially those who experience migraines with aura. However, previous Mendelian randomization (MR) studies have failed to confirm a causal link between the two. The inconclusive results from these MR studies may stem from the possibility that migraines are more strongly associated with early-onset ischemic stroke than with late-onset ischemic stroke (Niu et al., 2024).

Previous studies indicate that migraines particularly migraines with aura may be associated with ischemic stroke in young adults, but not in older individuals. This age-related difference in risk may be explained by the fact that migraines and age-related risk factors, such as hypertension, likely share common underlying mechanisms. In older individuals, age-related risk factors may drive the biological mechanisms contributing to ischemic stroke to a point of saturation, leaving few remaining pathways through which migraines can influence the occurrence of ischemic stroke (Niu et al., 2024). Several potential mechanisms underlie the association between migraines and ischemic stroke. First, previous research suggests that migraines share a genetic basis with cardiometabolic and thrombotic risk factors. Second, migraines with aura are associated with a higher prevalence of patent foramen ovale (PFO) compared to migraines without aura, potentially increasing the risk of paradoxical embolism. Third, spreading depolarizations likely play a significant role in elevating the risk of ischemic stroke in individuals with migraines, particularly those who experience migraines with aura. Finally, other pathophysiological mechanisms may involve inflammatory markers, endothelial and vascular indicators, and sex hormones (Niu et al., 2024).

However, research findings regarding the link between migraines and stroke do not always show a consistent magnitude of risk. Variations in study results may arise from differences in population characteristics, age, sex, the presence of aura, vascular risk factors, diagnostic methods, and study design. Recent studies involving middle-aged and older populations also

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indicate that this association may vary depending on the presence of aura, age, and sex. These findings highlight the need to review existing research to gain a more comprehensive understanding of the relationship between migraines and ischemic stroke.

Based on the foregoing, migraines especially migraines with aura show a fairly consistent association with an increased risk of ischemic stroke. Nevertheless, the mechanisms underlying this relationship remain complex and are influenced by various clinical and vascular factors. Therefore, a literature review is needed to identify and analyze scientific evidence regarding the association between migraine and the risk of ischemic stroke, including risk variations based on migraine type, aura characteristics, and vascular risk factors, as well as potential underlying pathophysiological mechanisms. This literature review aims to provide a more comprehensive understanding of the role of migraine as a factor associated with the risk of ischemic stroke.

Methods

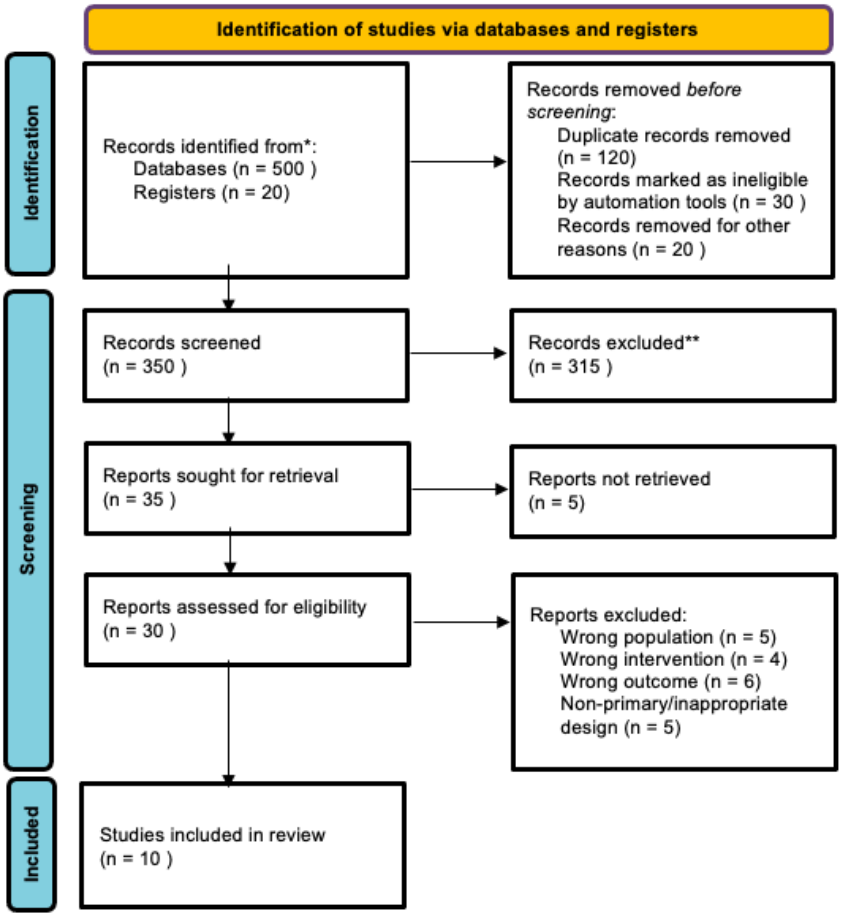


Figure 1. Literature selection flowchart based on PRISMA

Study Design

This study employed a Systematic Literature Review (SLR) approach guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework to examine the relationship between migraine and ischemic stroke risk. The review synthesized findings from observational studies, systematic reviews and meta-analyses, and Mendelian randomization studies to evaluate the strength and consistency of the reported associations. Particular attention was given to migraine characteristics, including aura status and chronicity, as well as age, sex, vascular risk factors, genetic evidence, and migraine treatment.

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Literature Search Strategy

The literature search covered publications from 2020 to 2026 using three scientific databases: PubMed, ScienceDirect, and Google Scholar. The search strategy combined relevant keywords using Boolean operators, including “migraine” AND “ischemic stroke,” “migraine with aura” AND “ischemic stroke,” and “migraine” AND “stroke risk.” The search focused on studies investigating the association between migraine and ischemic stroke, including differences in risk across migraine subtypes and population characteristics.

Eligibility Criteria and Study Selection

Studies were eligible for inclusion if they were published in English or Indonesian between 2020 and 2026, were available in full text, and provided findings relevant to migraine and ischemic stroke. Eligible publications included cohort studies, case-control studies, systematic reviews and meta-analyses, and Mendelian randomization studies. Studies examining migraine treatment and post-stroke outcomes were also considered when their findings contributed to understanding the broader clinical relationship between migraine and ischemic stroke. Duplicate publications, animal studies, case reports, editorials, and articles unrelated to the review objectives were excluded.

Study selection followed the identification, screening, eligibility assessment, and inclusion stages illustrated in the PRISMA flow diagram (Figure 1). A total of 10 articles met the review criteria and were included in the final qualitative synthesis.

Data Extraction and Analysis

Data were extracted from the 10 included articles and organized according to author, publication year, study title, journal, research design, and principal findings. Where available, quantitative findings were documented using hazard ratios (HR), odds ratios (OR), adjusted odds ratios (aOR), relative risks (RR), 95% confidence intervals, and reported statistical significance.

The findings were synthesized using a descriptive qualitative approach. The analysis focused on the association between migraine and ischemic stroke risk, differences between migraine with and without aura, and variations according to age, sex, migraine chronicity, and accompanying vascular risk factors. Evidence from Mendelian randomization studies was examined separately to distinguish observational associations from potential causal relationships. Findings related to post-stroke functional outcomes and migraine treatment were also considered as complementary clinical evidence. Differences in study design, population characteristics, and reported risk estimates were considered when interpreting the consistency of findings. No additional meta-analysis or pooled effect estimation was performed.

Result and Discussion

Table 1. List of Literature Used in the Study

No.	Author	Title	Publication and Year	Methods	Results and Discussion

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1.	I Made Oka Adnyana, I Putu Eka Widyadharma, Eric Hartono Tedyanto, Ida Ayu Sri Wijayanti, Ni Putu Ayu Putri Mahadewi	Migraine as a Risk Factor for Ischemic Stroke: A Systematic Review and Meta-Analysis of Cohort Studies	Egyptian Journal of Neurology, Psychiatry and Neurosurgery, 2022	Systematic review and meta-analysis of 12 cohort studies	The results indicate that migraine is associated with an increased risk of ischemic stroke, with an HR of 1.205 (95% CI 1.151–1.262; p<0.001). The risk was higher for migraine with aura (HR 1.442) compared to migraine without aura (HR 1.126). These findings suggest that migraine, particularly when accompanied by aura, may be a factor associated with an increased risk of ischemic stroke.
2.	Mei-Jun Shu, Jia-Rui Li, Yi-Cheng Zhu, Hang Shen	Migraine and Ischemic Stroke: A Mendelian Randomization Study	Neurology and Therapy, 2022	Two-sample Mendelian randomization using GWAS data	In contrast to observational studies, this study did not find a significant causal relationship between migraine and ischemic stroke overall (OR 0.935; 95% CI 0.851–1.027; p=0.159). These results indicate that the association observed in observational studies does not necessarily reflect a direct causal link; therefore, the potential presence of confounding factors must be considered.
3.	Kim-Ngan Ta-Thi, Kai-Jen Chuang, Chyi-Huey Bai	Association between Migraine and the Risk of Stroke: A Bayesian Meta-Analysis	Sustainability, 2021	Systematic review and Bayesian meta-analysis of 17 studies with >2.78 million participants	Analysis indicates a trend of increased stroke risk—including ischemic stroke—among migraine patients. However, differing results between fixed-effect and random-effects models suggest heterogeneity across studies. Therefore, the association between migraine and ischemic stroke should be interpreted with caution, taking into account patient

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					characteristics and vascular risk factors.
4.	Nick Seah, Catherine D. Chong, Oana M. Dumitrascu, Todd J. Schwedt, Zhichao Cao, Teresa Wu	Migraine is Associated with a Higher Risk of Ischemic and Hemorrhagic Stroke: An Analysis of the All of Us Database	Frontiers in Pain Research, 2025	Cross-sectional case-control analysis using the All of Us database	Studies indicate that patients with migraine have a higher risk of ischemic stroke compared to individuals without migraine, with an OR of 1.38 (95% CI 1.24–1.53) after adjusting for confounding factors. The risk is also elevated in patients with chronic migraine and migraine with aura. These findings reinforce the association between migraine and an increased risk of ischemic stroke in large populations.
5.	Cevdet Acarsoy, Lana Fani, Linda Al-Hassany, Brian P. Berghout, Peter J. Koudstaal, Antoinette Maassen Van Den Brink, M. Kamran Ikram, Daniel Bos	Migraine and the Risk of Stroke in a Middle-Aged and Elderly Population: A Prospective Cohort Study	Cephalalgia, 2022	Prospective cohort study	The study evaluated the association between migraine and stroke incidence in middle-aged and older populations. The results indicate that the relationship between migraine and stroke risk should be assessed based on migraine characteristics and accompanying vascular risk factors. These findings underscore the importance of considering migraine as a condition associated with cerebrovascular risk, particularly in individuals with additional risk factors.
6.	Weiming Zhao, Dong Wang, Yujie Tan, Ji Yang, Shuning Zhang	Migraine and the Correlation Between Stroke: A Systematic Review and Meta-Analysis	Medicine, 2024	Systematic review dan meta-analysis terhadap 9 penelitian	Meta-analysis results indicate that migraine is associated with an increased risk of stroke, with an OR of 2.04 (95% CI 1.73–2.40). Subgroup analysis

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					based on the presence of aura revealed an increased stroke risk in patients with both migraine with aura and migraine without aura. The risk was also higher among women (OR 2.26; 95% CI 1.67–3.05) and younger individuals (OR 2.39; 95% CI 1.90–3.01). These findings support the existence of a link between migraine and cerebrovascular events, with the risk being more pronounced in women and younger populations.
7.	Chester Yan Hao Ng, Benjamin Y. Q. Tan, Yao Neng Teo, Yao Hao Teo, Nicholas L. X. Syn, Aloysius S. T. Leow, Jamie S. Y. Ho, Mark Y. Chan, Raymond C. C. Wong, Ping Chai, Amanda Chee Yun Chan, Vijay Kumar Sharma, Leonard L. L. Yeo, Ching-Hui Sia, Jonathan J. Y. Ong	Myocardial Infarction, Stroke and Cardiovascular Mortality Among Migraine Patients: A Systematic Review and Meta-Analysis	Journal of Neurology, 2022	A systematic review and meta-analysis of 18 prospective cohort studies involving 370,050 migraine patients and 1,387,539 controls.	Research indicates that migraine is associated with an increased risk of ischemic stroke, with an HR of 1.35 (95% CI 1.03–1.78; p=0.03). Subgroup analysis shows that migraine with aura carries a higher risk of ischemic stroke compared to the group without migraine. These findings reinforce evidence from cohort studies that migraine particularly migraine with aura is a condition associated with an increased risk of ischemic stroke.
8.	Katie M. Linstra, Hendrikus J. A. van Os, Ynte M. Ruigrok, Paul J. Nederkoorn, Ewoud J. van	Sex Differences in Risk Profile, Stroke Cause and Outcome in Ischemic Stroke Patients With and Without Migraine	Frontiers in Neuroscience, 2021	A prospective multicenter study of 2,492 ischemic stroke patients, 425 of whom had a history of migraine.	The association between migraine and stroke varies by sex. Women with migraine face a higher risk of stroke at a young age (<50 years) compared to women without migraine (RR 1.7; 95%

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	Dijk, L. Jaap Kappelle, Peter J. Koudstaal, Marieke C. Visser, Michel D. Ferrari, Antoinette MaassenVan DenBrink, Gisela M. Terwindt, Marieke J. H. Wermer				CI 1.3–2.3). These findings suggest that the link between migraine and ischemic stroke may be more pronounced in young women. This difference is not fully explained by conventional cardiovascular risk factors, implying the likely existence of specific mechanisms linking migraine to ischemic stroke events.
9.	Mengmeng Wang, Iyas Daghlas, Zhizhong Zhang, Dan Ye, Shun Li, Dandan Liu	Genetic Liability to Migraine and Functional Outcome After Ischemic Stroke	European Stroke Journal, 2023	Mendelian randomization uses migraine GWAS data and ischemic stroke outcome data.	Research has found that a genetic predisposition to migraine is associated with poorer functional outcomes following ischemic stroke. Each doubling of the odds of migraine is genetically linked to a 22% increase in the odds of a poor functional outcome (OR 1.22; 95% CI 1.02–1.45; p=0.031). Although this study did not directly assess the risk of developing ischemic stroke, the results indicate that migraine may be linked to the course and prognosis of ischemic stroke.
10.	Eugene Jeong, Mulubrhan F. Mogos, You Chen	Association of Migraine Treatments with Reduced Ischemic Stroke Risk: Evidence from Two Large-Scale Real-World Data Analyses	Headache: The Journal of Head and Face Pain, 2025	A retrospective case-control study using data from Vanderbilt University Medical Center and the All of Us Research Program.	Study results indicate that among patients with migraine, propranolol use is associated with a reduced risk of ischemic stroke, particularly in women with migraine. In the VUMC dataset, propranolol reduced the odds of ischemic stroke by 45% (aOR 0.55; 95% CI 0.33–0.86), while in the *All of Us* dataset, the reduction was 59% (aOR 0.41; 95% CI 0.19–0.77). A

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					stronger association was observed in women with migraine without aura, with aORs of 0.53 and 0.28, respectively. Cox analysis also demonstrated a lower risk of ischemic stroke over a 10-year period among propranolol users. These findings suggest that the link between migraine and ischemic stroke is not solely related to the presence of migraine itself but may also be influenced by the treatment used, although further prospective research is required to confirm a causal relationship.

Based on a review of the 10 analyzed journals, it was generally found that migraine is associated with an increased risk of ischemic stroke. Most observational studies, systematic reviews, and meta-analyses indicate that patients with migraine face a higher risk of ischemic stroke compared to individuals without migraine. However, the magnitude of this risk varies across studies and is influenced by migraine characteristics particularly the presence of aura as well as gender, age, and other vascular risk factors.

In a systematic review and meta-analysis of 12 cohort studies, Adnyana et al. (2022) found a significant association between migraine and an increased risk of ischemic stroke, with a hazard ratio (HR) of 1.205 (95% CI 1.151–1.262). The risk was higher in patients with migraine with aura (HR 1.442) compared to those with migraine without aura (HR 1.126). These results suggest a tendency for the presence of aura to be a key characteristic in the relationship between migraine and ischemic stroke. This finding is supported by Ng et al. (2022), who conducted a meta-analysis of 18 prospective cohort studies and found that migraine is associated with a 35% increase in the risk of ischemic stroke (HR 1.35; 95% CI 1.03–1.78). Subgroup analysis also revealed a higher risk among patients with migraine with aura.

Similar results were observed by Seah et al. (2025) using data from the *All of Us* Research Program. After adjusting for various confounding factors, patients with migraine showed 1.38 times the odds of ischemic stroke compared to individuals without migraine (95% CI 1.24–1.53). The study also indicated that patients with chronic migraine carry a higher risk of stroke than those with episodic migraine. These findings indicate that migraine frequency and chronicity likely contribute to cerebrovascular risk, suggesting that the association between migraine and ischemic stroke is not determined solely by the presence or absence of a migraine diagnosis.

In addition to migraine type and chronicity, age and sex appear to be significant factors in the relationship between migraine and ischemic stroke. In a systematic review and meta-analysis, Zhao et al. (2024) found an increased risk of stroke among migraine patients, with an odds ratio (OR) of 2.04 (95% CI 1.73–2.40). Subgroup analyses revealed higher risks among women (OR 2.26; 95% CI 1.67–3.05) and younger individuals (OR 2.39; 95% CI 1.90–3.01). Linstra et al. (2021) also demonstrated that women with a history of migraine faced a higher risk of stroke

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before the age of 50 compared to those without migraine, with a relative risk (RR) of 1.7 (95% CI 1.3–2.3). These results suggest that the association between migraine and ischemic stroke may be more pronounced in younger women.

Acarsoy et al. (2022) conducted a prospective cohort study examining the link between migraine and stroke risk in middle-aged and older populations. Their findings indicate that the relationship between migraine and stroke risk in these age groups must be considered in the context of specific migraine characteristics and co-existing vascular risk factors. These findings demonstrate that the impact of migraine on cerebrovascular risk varies across age groups; therefore, age and the presence of vascular risk factors should be taken into account when assessing stroke risk in patients with migraine. These sex-based differences are likely linked to the interplay between migraine, hormonal factors, and vascular factors. In young women particularly those experiencing migraine with aura factors such as hormonal contraceptive use, smoking, hypertension, and thrombotic factors can further elevate the risk of ischemic stroke. Therefore, the presence of migraine should not be viewed in isolation but rather considered alongside other vascular risk factors.

Although most studies indicate a positive association, some research has yielded different results. Shu et al. (2022) employed a Mendelian randomization approach and found no significant causal link between migraine and ischemic stroke overall (OR 0.935; 95% CI 0.851–1.027; p=0.159). These findings are significant as they suggest that associations observed in observational studies do not necessarily imply a direct causal relationship between migraine and ischemic stroke; confounding or mediating factors may contribute to the observed link. Consequently, findings from both observational studies and genetic epidemiology should be considered in conjunction.

Ta-Thi et al. (2021) also highlighted uncertainty regarding the migraine-stroke relationship, noting that analysis results can vary depending on the statistical model employed. Their meta-analysis identified a positive association between migraine and stroke events in specific analyses, though a consistent link was primarily observed regarding stroke overall. Such variations in results may stem from heterogeneity in population characteristics, migraine definitions, stroke diagnostic methods, follow-up durations, and differences in the control of confounding factors. Thus, while there appears to be a link between migraine and ischemic stroke, the magnitude of the risk cannot be assumed to be uniform across all populations.

The mechanisms underlying the relationship between migraine and ischemic stroke are likely multifactorial. In patients with migraine particularly migraine with aura processes such as cortical spreading depression, endothelial dysfunction, altered vascular reactivity, hemodynamic disturbances, and a prothrombotic tendency are thought to contribute to increased susceptibility to ischemic events. Furthermore, vascular factors such as hypertension, smoking, diabetes, dyslipidemia, atrial fibrillation, and vascular abnormalities may reinforce this association. However, these mechanisms cannot be considered definitive evidence that migraines directly cause ischemic stroke.

A study by Wang et al. (2023) offers additional insight into the relationship between migraines and ischemic stroke. This Mendelian randomization study demonstrated that a genetic predisposition to migraines is associated with poorer functional outcomes following ischemic stroke, with an OR of 1.22 (95% CI 1.02–1.45). Although the study did not directly assess the risk of developing ischemic stroke, the findings suggest that migraines or genetic factors linked to them may also influence the disease course and recovery after an ischemic stroke.

Meanwhile, a study by Jeong et al. (2025) indicates that the association between migraine and ischemic stroke risk may also be influenced by migraine therapy. Propranolol use among women with migraine was associated with a lower risk of ischemic stroke across two large databases. In the VUMC database, propranolol showed an adjusted odds ratio (aOR) of 0.55,

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while in the *All of Us* database, the aOR was 0.41. A stronger association was observed in women with migraine without aura. These findings suggest that migraine control or the pharmacological characteristics of propranolol may be linked to a reduced risk of ischemic stroke. However, as the study employed a retrospective design, the results represent an association and do not prove that propranolol directly prevents ischemic stroke.

Overall, findings from ten studies reveal a relatively consistent pattern: patients with migraine tend to face a higher risk of ischemic stroke compared to individuals without migraine, particularly within specific subgroups. This risk appears more pronounced in cases of migraine with aura, as well as among women, younger individuals, and patients with chronic migraine. Conversely, Mendelian randomization results indicate that this association cannot yet be confirmed as directly causal. This suggests that genetic, vascular, hormonal, and lifestyle factors, along with migraine characteristics, likely interact to shape the risk of ischemic stroke.

Thus, migraine can be viewed as a condition associated with an increased risk of ischemic stroke rather than a sole causative factor. The clinical implication of these findings is the importance of identifying and managing vascular risk factors in migraine patients, especially young women and those with migraine with aura. Managing blood pressure, smoking, metabolic disorders, and other vascular factors can play a crucial role in reducing ischemic stroke risk within these groups. Further prospective research and studies utilizing causal designs are needed to elucidate the mechanisms underlying the link between migraine and ischemic stroke and to identify the patient groups at highest risk

Conclusion

Based on a review of ten journals, it can be concluded that migraine is associated with an increased risk of ischemic stroke compared to individuals without migraine. This association appears stronger in cases of migraine with aura, as well as in women, younger individuals, and patients with chronic migraine. While some studies indicate a significant increase in risk, others have not found a direct causal link. This suggests that the relationship between migraine and ischemic stroke is likely influenced by various factors, including vascular and hormonal factors, age, sex, lifestyle, and specific migraine characteristics. Thus, migraine can be viewed as a condition associated with an increased risk of ischemic stroke, though it is not the sole cause of the stroke itself. Given these findings, attention should be paid to ischemic stroke risk factors in migraine patients, particularly those with migraine with aura, young women, and those with chronic migraine. Healthcare professionals should provide education on blood pressure control, smoking cessation, maintaining a healthy diet and physical activity, and managing other metabolic risk factors. Appropriate monitoring and management of migraine are also crucial for maintaining cerebrovascular health. Future research should employ prospective designs with larger sample sizes and longer observation periods to clarify the causal relationship between migraine and ischemic stroke and to identify the patient groups at highest risk.

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