International Journal of Pain Research
2026, Vol. 2, No. 2, pp. 56–60
https://doi.org/10.11648/j.ijpr.20260202.13

Research Article

Underestimated Prevalence of Headache and Vestibular Migraine

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Abstract

Headache is one of the most common clinical complaints and its frequency is highly variable. Sometimes the headache is daily, sometimes it occurs only once in a few years and goes unnoticed. According to the International Classification of Headache Disorders, 3rd edition, headache can be a manifestation of a disease (The Secondary Headache) or a distinct disease entity (The Primary Headache), as well as Painful Cranial Neuropathies, Other Facial Pain and Other Headaches. Migraine, a common type of The Primary Headache, is the leading cause of disability worldwide and seriously affects the quality of life of patients. Relevant studies have shown that the prevalence of headache is high in people aged 18-65 years old, which constitutes the main working age group and brings a heavy burden to families and society. As a result, headache has become a major public health problem requiring urgent attention but has not received the attention it deserves. Vestibular migraine, which presents with both migraine and vertigo/dizziness symptoms, has not been fully recognized and is often misdiagnosed due to its complex and variable symptoms, lack of specific biomarkers, and frequent comorbidity with other vestibular system diseases. Reevaluating headache disorders and vestibular migraine, along with enhancing awareness within the medical community and administrative departments, will contribute to improved quality of life for patients and the alleviation of familial and societal burdens.

Keywords

Headache, Migraine, Prevalence, Vertigo/Dizziness, Vestibular Migraine

1. Introduction

Headache is the most common chief complaint in clinical practice, and its frequency varies greatly, ranging from daily headache to a single headache over several years unnoticed. In terms of diagnosis, headache can be either a manifestation of a disease (secondary headache) or a distinct entity belonging to primary headache disorders. Current research indicates that migraine, a form of primary headache, is a leading global cause of disability, substantially impairing patients' quality of life. Vestibular migraine (VM) is a condition that combines both migraine symptoms and vertigo/dizziness. Due to its complex and variable symptoms, it is often misdiagnosed or missed in diagnosis. This article comments on recent epidemiological data, highlights the discrepancy between traditional estimates and newer findings, and argues for a reevaluation of

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Received: 30 March 2026; **Accepted:** 20 April 2026; **Published:** 8 May 2026

the disease burden of headache and VM.

2. Epidemiology and Burden of Headache Disorders

The Global Burden of Diseases (GBD) Study 2023 [1] reports a global age-standardized prevalence for headache disorders of 34.6% (95%UI 31.6-37.5), and the prevalence of migraine is approximately 14.1% (95%UI 12.1-15.9). Professor Liu Ruozhuo and his team [2] analyzed GBD2021 data and found that, based on years lived with disability (YLDs), migraine caused 6,988,199 YLDs (95%UI 1,133,319-15,186,289) in China in 2021. From 1990 to 2021, the disease burden of migraine in China continued to increase, while that in Australia remained stable. Nationally, there were 13.05 million new incident cases of migraine, with a total of 184.75 million individuals affected, yielding an incidence rate of approximately 0.92% and a prevalence rate of approximately 13.08% (based on the total national population at the end of 2021). Although this result aligns closely with global research data, it is significantly higher than the 9.3% prevalence rate reported in a Chinese epidemiological survey conducted a decade ago [3], suggesting that the prevalence of migraine may be on the rise.

Two decades ago, with support from the World Health Organization (WHO), Professor Timothy J. Steiner [4] launched "*Lifting The Burden*: The Global Campaign to Reduce the Burden of Headache Worldwide" and spearheaded the standardization of headache research. In 2007, the *Lifting The Burden* study [5] estimated the global proportion of adults with an active headache disorder at 46% of the adult population, a figure significantly higher than the headache prevalence estimates produced by the GBD study. However, considering the GBD's synthesis of widely diverse data sources and the substantial methodological heterogeneity across the individual epidemiological studies it incorporates, this 46% prevalence rate may itself represent an underestimate. With the ongoing accumulation of new, high-quality studies associated with *Lifting The Burden*, the 2022 reanalysis [6] indicates a global prevalence for active headache of 52.0% (95%CI 48.9-55.4), for migraine of 14.0% (95%CI 12.9-15.2), and for tension-type headache (TTH) of 26.0% (95%CI 22.7-29.5). The reported population prevalence of migraine remains stable at approximately 14%, yet migraine is identified as the primary source of disability and public health burden among headache disorders. The GBD 2023 study [1] indicates that the global health loss due to headaches amounts to 45.5 million (95%UI 31.4-62.0) YLDs. Migraine alone accounts for 40.9 million (95%UI 27.1-56.9) YLDs, representing approximately 89.89% of the total burden. This estimate only considers the impact of headache on healthy life span, and the impact would be even greater if indirect costs such as loss of work due to headache, especially for migraine patients, were also included. In a recent publication, Husøy et al. [7] utilized population-representative data from 17 countries, which were part of the Global Campaign against Headache and employed the standardized Headache-Attributed Restriction, Disability, Social Handicap and Impaired Participation (HARDSHIP) questionnaire. Data analysis showed that 65.5% (95%CI 65.0-66.0) of the patients had headache in the previous year. The estimated prevalence of headache and migraine in adults aged 18-65 years in the next year is about 65% and 25%, respectively. The authors believe that although the prevalence of headache and migraine is significantly higher than the results of previous GBD studies, it should be more reliable and accurate than GBD estimates due to the rigorous methodology and the use of a consistent and standardized HARDSHIP questionnaire. The high prevalence of headache in people aged 18-65 years, which is the main labor force age group in the world, makes us have to re-examine our understanding and cognition of headache. Headache should not be a "minor ailment" that goes unnoticed, but a public health problem that has a huge impact on society.

3. Prevalence and Diagnostic of VM

3.1. Prevalence

Vertigo/dizziness is another common clinical symptom, and its prevalence is about 15%-35% at different time points in the population [8], which often overlaps with headache, especially migraine attacks. Patients with migraine are often accompanied by vestibular symptoms such as vertigo/dizziness. As early as 2007, it was reported that vertigo/dizziness occurs in 51.7% of migraine patients and can manifest as different vestibular symptoms, such as spontaneous vertigo, positional or head motor vertigo. Complaints of vertigo and dizziness are more severe in migraine patients than in the controls who do not suffer from frequent headaches (51.7%vs. 31.5%) [9]. The latest study in China Taiwan [10] found that 68.4% of 2801 newly diagnosed migraine patients had vestibular symptoms, mainly vertigo, and 15.2% met the diagnostic criteria of VM. Accumulating clinical and experimental evidence suggests that VM, an episodic vestibular syndrome associated with migraine, may represent a distinct disease entity characterized by recurrent spontaneous or provoked vertigo/dizziness with with concomitant nausea and migrainous features.

3.2. Diagnostic Criteria

In 2012, the diagnostic criteria for VM were jointly formulated by the Committee for Classification of Vestibular Disorders of the Bárány Society and the Migraine Classification Subcommittee of the International Headache Society (IHS) [11], and have been included in the appendix of the International Classification of Headache Disorders-3 (ICHD-3) [12]. It was updated in 2021 [13]. The Chinese Expert Consensus on the Diagnosis and Treatment of Vestibular Migraine (2018)

defines diagnostic criteria for both definite and probable VM [14].

The diagnosis of VM was based on recurrent vestibular symptoms, migraine history, temporal association between vestibular and migraine symptoms, and exclusion of other causes of vestibular symptoms. Vestibular symptoms that meet the diagnostic criteria for VM include various types of vertigo as well as dizziness with nausea induced by head movement, and must be moderate or severe, with acute episodes limited in duration to between 5 minutes and 72 hours. Clinically, VM should be considered in patients presenting with both vestibular and migraine symptoms. However, it must be recognized that not all patients presenting with these symptoms have VM. The symptoms may instead represent migraine comorbid with other vestibular disorders such as vestibular neuritis, Ménière's disease (MD), or benign paroxysmal positional vertigo (BPPV), or it may indicate VM coexisting with these conditions. The basis of correct diagnosis is to accurately grasp the diagnostic criteria (Table 1) and clinical characteristics, and also to master the characteristics of its differential diagnosis (such as MD, migraine with brainstem aura, recurrent vestibulopathy, BPPV, motion sickness, episodic ataxia 2, etc.).

Table 1. *Vestibular migraine and probable vestibular migraine diagnostic criteria.*

Vestibular migraine
A. At least 5 episodes with vestibular symptoms of moderate or severe intensity, lasting 5 min to 72 hours B. Current or previous history of migraine with or without aura according to the International Classification of Headache Disorders (ICHD-3) C. One or more migraine features with at least 50% of the vestibular episodes 1) headache with at least two of the following a～d characteristics: a) one-sided location b) pulsating quality c) moderate or severe pain intensity d) aggravation by routine physical activity 2) photophobia and phonophobia 3) visual aura D. Not better accounted for by another vestibular or ICHD-3 diagnosis
Probable vestibular migraine
A. At least 5 episodes with vestibular symptoms of moderate or severe intensity, lasting 5 min to 72 hours B. Only one of the criteria B and C for vestibular migraine is fulfilled (migraine history or migraine features during the episode) C. Not better accounted for by another vestibular or ICHD-3 diagnosis

Vestibular symptoms include: spontaneous internal or external vertigo, positional vertigo, visually-induced vertigo, head motion-induced vertigo, and head motion-induced dizziness with nausea. Vestibular symptoms are rated “moderate” when they interfere with but do not prohibit daily activities and “severe” if daily activities cannot be continued.

3.3. Diagnostic Challenges

Patients with VM often experience several different types of vestibular symptoms throughout the course of the disease [15]. A single episode of vestibular symptoms in VM can last minutes to hours, and in a small number of patients it may take weeks to fully recover from the previous episode [13]. Currently, no specific biomarkers are available for the diagnosis of VM. Using single-cell RNA sequencing (scRNA-seq) and single-cell assay for transposase-accessible chromatin with sequencing (scATAC-seq), Pablo et al. analyzed samples from 18 patients and 6 controls and found no significant difference in the immune transcriptome between patients with migraine without vestibular symptoms and those with VM [16]. Comorbidity is common in VM. MD is clinically characterized by episodic vertigo, fluctuating hearing loss, tinnitus, and aural fullness. However, endolymphatic hydrops can also be observed in patients with VM [17]. Vertigo attacks in MD typically last from 20 minutes to 12 hours, which demonstrates an overlap in attack duration with VM. In its early stages, MD may present with vestibular symptoms alone, and approximately half of MD patients also have comorbid migraine [18]. Indeed, comorbid cases of VM and MD have been reported. Furthermore, VM is a common precipitating factor for persistent postural-perceptual dizziness (PPPD) [19], suggesting the potential for comorbidity between the two conditions. A retrospective analysis of 36 consecutive patients with PPPD found that 19 patients met the diagnostic criteria for migraine, 6 of whom also met the criteria for VM [20]. VM, with its complex and variable symptoms, lack of specific biomarkers, and frequent comorbidity with other vestibular disorders, brings significant challenges to clinical diagnosis and treatment, leading to its persistent underrecognition and frequent misdiagnosis or oversight.

4. Future Directions

Headache, one of the most prevalent clinical symptoms, with high morbidity and significant impairment of patients' quality of life, has emerged as a major public health issue with substantial impact on families and society, but has not received adequate attention. VM, with both migraine and vertigo/dizziness symptoms, is frequently misdiagnosed or underdiagnosed due to its complex and variable clinical manifestations. Re-examination of headache and VM and improving the cognition of the medical community and administrative departments are conducive to improving the quality of life of patients and reducing the burden on family and society.

Abbreviations

BBPV	Benign Paroxysmal Positional Vertigo
GBD	Global Burden of Diseases
HARDSHIP	Headache-Attributed Restriction, Disability, Social Handicap and Impaired Participation
HIS	International Headache Society
ICHD-3	The International Classification of Headache Disorders-3
MD	Ménière's Disease
PPPD	Persistent Postural-perceptual Dizziness
scATAC-seq	Single-cell Assay for Transposase-accessible Chromatin with Sequencing
scRNA-seq	Single-cell RNA Sequencing
TTH	Tension-type Headache
VM	Vestibular Migraine
WHO	World Health Organization
YLDs	Years lived with Disability

Author Contributions

Zhou Wanru: Conceptualization, Data curation, Writing – original draft

Yao Wentao: Data curation, Investigation, Writing – original draft

Wang Hebo: Conceptualization, Supervision, Writing – review & editing

Conflicts of Interest

All authors declare no conflicts of interest.

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