

# Narrative Review: Suicide Risk in Headache, Pulsatile Tinnitus, And Cognitive Decline

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## Abstract

Suicide has become a serious concern that presents a significant public health issue worldwide, with nearly 800,000 incidents occurring annually, according to the World Health Organization (WHO). Because its causes tend to be multifactorial, with varying comorbidities and precipitating factors, it is challenging to accurately predict the exact risk of suicide rate. This narrative review explores some of these underlying factors, particularly headache, pulsatile tinnitus, and cognitive decline, and their association with an increase in suicide risk. The review incorporates peer-reviewed publications from the past 20 years to explore contributing factors involving these neurovascular pain and cognitive impairment. Key findings from the literature reveal a substantial correlation between chronic headaches, particularly migraines, and heightened suicidal risk. This suggests that the debilitating nature of these conditions may exacerbate psychological distress and contribute to suicidal ideation. This review emphasizes the need for holistic and multidisciplinary approaches that address both the physical and psychological health of patients with chronic headaches, highlighting the importance of early intervention to mitigate suicide risk. Additionally, the effectiveness and suitability of screening methods for detecting suicide risk and depression in individuals with these conditions are examined.

**Keywords:** headache; pulsatile tinnitus; cognitive decline; neurovascular pain; suicide risk factors; screening; prevention

## Introduction:

While socioeconomic status and underlying psychiatric illnesses have long been identified as major contributors to suicide risk<sup>1</sup>, emerging evidence suggests that certain neurocognitive conditions may also play a pivotal role turning suicidal ideation into intent and planning. Specifically, chronic pain like migraines, tension/ cluster headaches, as well as pulsatile tinnitus and cognitive decline have been associated with increased psychological distress and suicidal ideation<sup>2</sup>. These conditions, often involving neurovascular-related pain and cognitive impairment, may lead to a sense of fear, hopelessness and despair, contributing to a perceived decline in quality of life and worse, suicide. Understanding the relationship between such physical pain, degenerative cognition and suicide risk is crucial for developing effective screening methods and interventions for at-risk individuals. This narrative review seeks to explore the connection between these underlying conditions and their contribution to both suicidal ideations and intent/action.

## Methods

The literature review involved gathering data from the following databases: PubMed, Psych INFO, Web of Science, Scopus, and Google Scholar. The search terms included suicide risk factors; suicide and migraine; suicide and cluster headache; suicide and tension headache; suicide and pulsatile tinnitus; suicide and cognitive decline; suicide attempts in patients with neurovascular pain; and suicide screening. The search was limited to publications between January 1, 2004, and June 1, 2024. Only English-language articles were considered. After the initial search, a screening process was conducted. Duplicate records were first removed, and then two independent reviewers (medical students) manually screened the titles and abstracts of the remaining studies. Only the full-text, peer-reviewed articles that appeared relevant based on the abstract review were retrieved for further evaluation. Qualitative studies were not included in this search and selection process.

## Headache And Suicide

### Types of Headaches

Headache is an encompassing term that includes migraine, cluster, and tension type headaches (TTH). Migraine is a disorder described as episodes of headaches that present as unilateral and sharp head pain, along with nausea and photophobia, often worsening with physical activity. The different types can be categorized into migraine without aura, migraine with aura, and chronic migraine. Migraine without aura is the most common type of migraine, in which a patient has a headache attack lasting from 4 to 72 hours with the above symptoms present. In contrast, migraines with aura are fully reversible headache attacks that last minutes and consist of visual, sensory, speech, language, motor, brainstem, or retinal symptoms, followed by the typical migraine symptoms. Finally, chronic migraines present as migraine symptoms on at least eight days a month, lasting 15 or more days in a month for greater than 3 months. The pathogenesis of migraine is complex, but involves the interaction of neuropeptides, serotonin and calcitonin gene related peptides (CGRP), and the trigeminal ganglion complex. Migraines also have a significant relationship with genetics; however, the specific role is still being studied. The first line therapy for migraines is triptans, but caution must be used due to its adverse profile. Additional pharmacotherapy includes antiemetics for specific emesis symptom relief, CGRP antagonists for those not responding to triptans or those with coronary artery disease, and selective serotonin 1F receptor agonists for those with cardiovascular risks<sup>3</sup>. Tension type headaches are recurrent episodes of headache that present with bilateral head tightness, described as “band-like,” that improves with physical activity. In TTH, either photophobia or phonophobia may be present, while nausea and vomiting symptoms must be absent. TTH can also be divided into categories: episodic, defined as 10 episodes occurring more than 1 day and less than 15 days per month for at least 3 months or headaches involving less than 180 days per year, and chronic, defined as involving more than 15 days per month for at least 3 months or more than 180 days per year. While the pathophysiology of episodic TTH remains largely unknown, Bendtsen et al. offers a model that suggests prolonged nociceptive stimuli from pericranial myofascial tissues could be what induces episodic to become chronic<sup>4</sup>. Distinguishing TTH from migraines or secondary headaches, caused by bacterial sinusitis, medication overuse, neck injuries, and underlying brain pathologies, can be difficult due to the many overlapping features. However, TTH still largely remains a clinical diagnosis, aided by the use of patient history and headache diaries. The best option for pharmacologic treatment is amitriptyline, a tricyclic antidepressant, but non-pharmacologic treatment, including physical therapy and psychological therapy, can be used as well. Finally, cluster headaches (CH) present as sharp, unilateral eye pain with the presence of cranial autonomic symptoms, including lacrimation, conjunctival injection, and nasal congestion and a sense of agitation during the attacks. Kudrow observed that the attacks occur at the same time each year, following a circannual and circadian rhythm pattern, suggesting involvement of the hypothalamus and suprachiasmatic nucleus in the pathophysiology<sup>5</sup>. It is also suspected that the trigeminal-autonomic reflex pathway is also involved, reflected in the pain and autonomic presentation of symptoms, respectively. First line treatment for CH includes breathing in 100% oxygen through a mask. Triptans can also be used to aid in relief as well. Additionally, treatment for CH can revolve around prevention by avoiding certain known triggers such as alcohol, strong smells, nitrate-containing food, and intravenous nitroglycerin<sup>6</sup>.

### Headache disorders and suicide risk

While the pathophysiology behind headaches remains unclear, there has been significant evidence linking an association between the debilitating

pain from headaches and an increased risk of suicide attempts. Breslau et al. sampled persons aged 25 to 55 and divided them into groups on the basis of having migraines, severe headaches other than migraines, and no history of severe headaches. The individuals' histories of psychiatric disorders and suicide attempts were studied and documented at baseline and then again 2 years later. Out of the 1,186 participants with completed data from baseline to the 2-year follow up, 65 of them had at least one suicide attempt<sup>5</sup>. Additionally, there was a greater than 4-fold risk of suicide attempt in people with migraine headaches compared to controls. This was demonstrated by a 2-year occurrence of suicide attempt of 8.7% for participants with migraines and 1.3% for the control group, providing evidence that there may be a greater role of the perception of pain on suicide risk<sup>7</sup>. Another study looks at just the role of CH on demoralization and, ultimately, suicidality. Koo et al. interviewed and compared 100 CH patients with 135 control participants. It was found that CH compared to control participants had greater active suicidal ideation (47% vs 26.7%), high suicide risk (38% vs 18.5%), lifetime depression history (67% vs 32.6%), and demoralization (28% vs 15.6%)<sup>8</sup>. These differences are not only accounted for by having chronic pain, but have also been linked with ineffective treatment options, limited access to those treatments, and the circannual, recurrent nature of CH. Additionally, in the United States, it takes about 5 years to diagnose cluster headaches, leading to a delay in management of symptoms and living with untreated chronic pain for longer<sup>9</sup>. Similar trends were observed in TTH. A clinical study conducted in 2019 explored the prevalence of suicidality and its risk factors among patients with tension-type headache (TTH)<sup>10</sup>. A total of 332 TTH patients and an equal number of healthy controls were assessed using various clinical tools, including the Headache Impact Test-6 and the Mini International Neuropsychiatric Interview. The results revealed that 24.7% of TTH patients exhibited suicidality, significantly higher than the control group<sup>11</sup>. Chronic TTH (CTTH) patients were particularly vulnerable, with a 3.3 times higher risk of suicidality compared to controls.

### Impact of Chronic Pain and psychiatric comorbidities

It is also important to consider the relationship effect of chronic pain on depression rates separately from headaches. According to the American Psychiatric Association in 2024, 30-40% of patients who are living with chronic pain experience depression. This is believed to be due to the shared pathway of the mesolimbic system between depression and chronic pain. The mesolimbic system monitors dopaminergic responses by favoring behaviors that lead to rewards and refraining from those that cause pain and negative emotions. This suggests that in depressive states, the mesolimbic system is responsible for regulating both pain and pleasure<sup>12</sup>. Karp et al. conducted a study to determine the impact of treatments for depression in patients with depression alone and patients living with both depression and chronic pain. It was found that patients who had greater pain prior to initiation of antidepressants required more aggressive treatments that took longer to achieve remission<sup>13</sup>. Additionally, there was a statistically significant association between pain and suicidal ideation. These findings are particularly important because pain severity was assessed before any treatment began, allowing it to be differentiated from general somatic distress in relation to treatment outcomes. Clinically, this is valuable, as patients reporting higher levels of pain prior to starting treatments, such as during their initial psychiatric evaluation, may have depression that is harder to treat. This suggests that such patients may need more intensive or prolonged treatment to achieve remission. This is especially relevant in primary care, where many patients present with both pain and vague physical symptoms as part of or leading into a depressive episode. These results align with those of Fava<sup>14</sup>, who found that patients with more somatic symptoms after eight weeks of fluoxetine treatment responded less well compared to those with fewer symptoms. Both studies indicate that pain and somatic symptoms

are linked to lower treatment response rates. However, unlike Fava's study, where symptoms were measured post-treatment and were nonspecific, our findings show that pain symptoms specifically can be addressed with treatment. We propose that treating these symptoms may require higher medication doses, dual-action antidepressants, and extended treatment duration to achieve full remission. It is important to note that patients with depression are more likely to be given opioids for pain and in higher doses than patients without depression, which can also contribute to a greater severity of pain. A retrospective cohort study investigated this multidimensional relationship between depression, opioid use, and pain<sup>15</sup>. Scherrer et al. examined medical records of patients who met the criteria of being free of opioid use for at least 2 years, had a depression diagnosis, and experienced depression remission at the follow up visit. Data included clinical encounters from January 1, 2000 through December 31, 2012. It was observed that patients who were in a period of depression remission had a twofold greater risk of depression recurrence if they started opioid therapy compared to patients who had no opioid exposure<sup>15</sup>. These findings have significant implications in the association between long duration of opioid use for pain and an increased risk of psychiatric comorbidities.

### **Pulsatile Tinnitus and Suicide**

Tinnitus refers to the deliberate, typically undesirable awareness of sound that emerges or appears to emerge spontaneously within the ear. In the majority of instances (~80%-90% of total tinnitus cases), there is no physical origin of the sound<sup>18</sup>. This is called non-pulsatile tinnitus (NPT) and it usually results from a dysfunction in hearing. It is typically described as a painless, continuous ringing, buzzing, hissing, or other static-like noise due to issues in the auditory system, such as damage to the inner ear hair cells, presbycusis, or other hearing disorders<sup>18</sup>. On the other hand, in pulsatile tinnitus (PT) (10%-20%), the perceived sound is rhythmic and synchronized with the heartbeat. It is related to turbulent blood flow or vascular issues, and it can be caused by conditions such as atherosclerosis, vascular malformations near the ear, or tumor-related pressure near the ear. The pulsation may be arterial or venous in origin, as well as from within the capillaries or the arteriovenous transition. Arteriosclerotic plaques and stenoses in the vessels of the head and neck are the most common cause of PT in the elderly<sup>19</sup>. In younger persons, fibromuscular dysplasia, characterized by segmental and non-atheromatous vascular abnormalities that frequently result in stenosis, can induce PT. Other stenoocclusive vascular conditions encompass vascular dissection, where a hematoma on the vessel wall narrows the vascular lumen, often causing sudden-onset neck pain<sup>19</sup>.

### **Hearing impairment**

Regardless of the exact pathophysiology, PT is commonly accompanied by hearing impairment, vertigo, and otorrhea. In the period from 2014 to 2020, the Otolaryngology unit at Christian Medical College in Tamil Nadu, India conducted a comprehensive assessment on 64 patients presenting with PT to evaluate their auditory capabilities. In their study, the pure tone audiometry showed 25% of cases with normal hearing, 12.5% with minimal, and 15.7% with mild hearing loss in the affected ear<sup>20</sup>. Nearly 47% had moderate or worse hearing loss. Sensorineural hearing loss was found in 30.6%, mixed type in 19.4%, and conductive hearing loss in 12.9% of patients<sup>3</sup>. This finding highlights the prevalence of hearing impairment among a significant proportion of individuals afflicted with PT. To delve deeper into the association between auditory impairment and contemplation of self-harm, it is essential to investigate the underlying explanations by which reduced auditory function may impact an individual's mental well-being. Vogel et al. conducted a study in 2014 at Dutch inner-city senior-secondary vocational schools, aiming to evaluate the relationship between hearing impairments and mental health. The

study indicated that 10% of students suffering from music-related hearing impairments, including tinnitus, were two times more prone to experience depressive symptoms, contemplate suicide, and evaluate their general and mental health negatively<sup>21</sup>. This alarming result may be attributed to the fact that impaired hearing can result in significant challenges later in life, as it might impact communication and behavioral abilities, thereby negatively affecting both educational outcomes and overall quality of life<sup>21</sup>. Another study investigates the correlation between hearing impairment and its impact on an individual's capacity to engage in effective social interactions, a critical aspect of maintaining a high quality of life. This cohort study was conducted within the framework of examining the effects of ototoxicity as an adverse consequence of chemotherapy in cancer patients. Participants underwent extensive interviews regarding the impact of their hearing impairments on their daily lives. Many expressed frustrations over how their symptoms of ototoxicity, including hearing loss and tinnitus, hindered effective communication<sup>22</sup>. Specifically, the study delved into the social repercussions of ototoxicity, noting how hearing loss and tinnitus can adversely affect social interactions. The study further highlighted a well-known and longstanding issue: the detrimental impact of reduced social engagement due to hearing loss and tinnitus. This aspect was corroborated by the participant interviews. Moreover, the concept of 'surrendering to tinnitus' was explored, defined as a negative acceptance of the condition. Several participants candidly discussed how ototoxicity notably diminished their quality of life<sup>23</sup>. These findings collectively underscore the significance of hearing function in the context of social interaction. The deprivation of this sensory capacity can lead to a profound loss of purpose for humans as social entities, potentially undermining one's sense of self-worth and the ability to contribute meaningfully to society. Ultimately, such decline may culminate in the emergence of suicidal ideation.

### **Sleep Disturbance**

Taking a step beyond the realm of hearing impairments and their influence on mental well-being, it is imperative to examine another critical aspect affecting individuals with tinnitus: the interplay between sleep disturbances and suicide risk. A retrospective analysis was performed on 2344 tinnitus patients at a specialized clinic for tinnitus in Germany from 2010 to 2020. This study aimed to explore the relationship between sleep satisfaction and a range of factors including quality of life, depression, the intensity of tinnitus, and its distinct features. The results indicated that while most patients (42.38% of total subjects) were either satisfied or very satisfied with their sleep, a significant 40.91% were dissatisfied or very dissatisfied with their quality of sleep due to tinnitus<sup>24</sup>. The rest of the patients maintained a neutral view regarding their sleep satisfaction. Those who were not satisfied with their sleep showed significantly higher levels of difficulty, as reflected in elevated scores on tests for depressive symptoms, tinnitus distress, and general quality of life<sup>25</sup>. Notably, factors related to the specific attributes of tinnitus, including its onset, laterality, or the kind of sound perceived, did not show statistically significant differences among the three groups<sup>25</sup>. However, PT, whether or not it occurred in sync with the heartbeat, was linked to sleep dissatisfaction, thus affecting the patient's mental health and well-being. Continuous tinnitus was found to be significantly more associated with sleep dissatisfaction than intermittent tinnitus<sup>25</sup>. With continuous tinnitus, it may be more difficult for the brain to habituate or get used to the noise. This lack of habituation can keep the sound at the forefront of a person's awareness, particularly in the absence of other environmental sounds during the night. Research suggests that continuous tinnitus might more profoundly affect the architecture of sleep, including the stages and cycles of sleep<sup>26</sup>. It can lead to frequent awakenings and lighter sleep stages, reducing the overall sleep quality. A study delves into whether

sleep disturbance is associated with suicidal attempts versus suicidal ideation: according to their prospective findings, sleep disturbances in adolescents were a substantial predictor of the risk of developing suicidal ideation, although they did not significantly predict suicide attempts<sup>27</sup>. It was important to note that depression did not act as the moderating factor in the association between sleep disturbance and suicidal ideations/attempts in adolescents. In another recent study, a meta-analysis of cross-sectional data involving 37,536 adolescents, it was determined that sleep disturbances significantly elevate the risk of suicidal ideation plans and attempts<sup>28</sup>. Interestingly, girls were found to be at a greater risk of sleep-related suicide attempts compared to boys. These findings emphasize that a notable portion of patients with PT experience sleep disturbances, and that sleep disruption alone is sufficient to elicit the presence of suicidal ideation, albeit not suicide attempts, in both adolescents and adults.

### Cognitive Decline and Suicide

Cognition refers to the mental processes involved in acquiring knowledge and understanding through thought, experience, and the senses. It includes various higher-level intellectual functions such as attention, memory, knowledge acquisition, decision-making, planning, reasoning, judgment, perception, comprehension, language, and visuospatial abilities<sup>29</sup>. These cognitive processes rely on existing knowledge and contribute to the creation of new knowledge. The term "cognitive deficit" broadly describes impairments in different cognitive domains. It is not confined to a specific disease or condition but can be a symptom of an underlying issue. "Cognitive deficit" is often used interchangeably with "cognitive impairment" and can either be a temporary condition or a progressive and permanent one<sup>29</sup>. Cognitive disorders, a subset of neurocognitive disorders (as classified in the DSM-5), refer to any condition that severely impairs cognitive functions to the extent that normal societal functioning becomes impossible without treatment. Alzheimer's disease is the most recognized condition associated with cognitive impairment<sup>28</sup>. Numerous studies have demonstrated that cognitive impairment in older adults is linked to increased risk of suicide and suicidal ideation. More interestingly, suicide risk has been shown to be elevated independent of psychiatric comorbidities including depression. Impaired executive functioning were implicated, and patients with recent diagnoses of dementia were shown to be at higher risk. Older adults with dementia, particularly in the early stages, have been shown to have a higher risk of suicide compared to those without dementia. Günak and authors demonstrated that US veterans 50 years and older with recent diagnosis of mild cognitive impairment and dementia were considerably higher than those without, even after adjusting for psychiatric comorbidities<sup>30</sup>. A narrative review by Conejero and authors in 2018 concluded that the risk of complete suicide increases during the early phase of cognitive decline, particularly due to the feeling of imposing increased burden on caregivers, anticipation of autonomy loss, deficit of inhibition and executive functions, and ability to execute suicidal plan at the early stages of dementia<sup>31</sup>. Rymo and authors showed in a sample of older adults acquired from population-based studies in Sweden that both past year and lifetime passive suicidal ideation was more frequent among individuals diagnosed with minor cognitive impairment vs those who were not. Regression models were adjusted for psychiatric comorbidities including depression<sup>32</sup>. Richard-Devantoy and authors showed in 2012 that cognitive deficits in inhibition led to suicidal vulnerability in a sample of 20 depressed patients using neuropsychological battery tests<sup>33</sup>. In 2015, they showed greater cognitive inhibition deficits in older adults who had attempted suicide via high-lethality methods compared to older adults who had attempted low-lethality methods and healthy controls<sup>34</sup>. Choi and authors showed that older adults with newly diagnosed dementia within 1 year were shown to be at elevated risk for suicide compared to

those who weren't, even after controlling for psychiatric comorbidities including depression and schizophrenia<sup>35</sup>.

### Common Risk Factors and Protective Factors Of Migraine And Cognitive Decline

Based upon several proposed mechanisms for migraine, various risk factors have been identified, such as the female sex, history of traumatic brain injury, advanced age, and low socioeconomic status<sup>36</sup>. Surprisingly, caffeine withdrawal or overuse could also contribute to not only the general type of headache but also migraine with prodromal aura<sup>37</sup>. Sleep deprivation, stress, obesity, and chronic inflammatory conditions also contribute to the development and/or exacerbation of migraine<sup>38</sup>. Some of these lifestyle-related etiologies overlap with the potential contributing factors of the other types of headaches. For example, cluster headaches can develop due to chronic smoking. Likewise, pulsatile tinnitus can also arise from lifestyle choices, such as excessive intake of food high in lipid content, as well as underlying cardiovascular conditions that ultimately lead to vascular stenosis of the carotid artery. Etiologies of cognitive decline are multifactorial, as there are various etiologies including genetic predispositions, cardiovascular-related factors, neurodegenerative causes, as well as lifestyle and environmental influences. Cognitive processes such as attention, memory, and executive function are crucial for daily functioning, and when impaired, they can lead to feelings of burden, loss of autonomy, and diminished self-control. Studies discussed above have shown that individuals with cognitive impairments, including those with early-stage dementia, are at heightened risk of suicide, even independent of psychiatric comorbidities like depression<sup>4</sup>. Similarly, key risk factors for suicidality in TTH patients included major depressive disorder (MDD), generalized anxiety disorder (GAD), low education level, insomnia, chronicity of the headache, and pericranial tenderness. The study highlights the importance of identifying and addressing these risk factors in TTH patients to reduce suicidality rates<sup>8</sup>. On the opposite end of the spectrum, there are protective factors that can be implemented early to prevent and stop an individual from attempting suicide. For example, a more robust screening tool for suicide can help mental health clinicians to better assess those at risk for suicidal behavior. In Gwangju, South Korea, a country where suicide is the fifth leading cause of death, a group of physicians developed Gwangju Checklist for Evaluation of Suicidality (G-CES)<sup>39</sup>. This checklist is designed to assess both risk and protective factors in order to predict and prevent suicidal behavior. It includes a section that asks the patient about whether they have protective factors, which are the following: religiosity, social support, motivation to seek professional help, ability to cope with stressors, responsibility to family, moral objections to suicide, and healthy lifestyle. They believe that screening for these positive factors can allow them to identify individuals who may have a lower risk of suicide, despite experiencing suicidal thoughts, and tailor interventions to reinforce these protective factors. By focusing on strengthening these aspects, clinicians can provide more targeted support and resources, potentially reducing the likelihood of a suicide attempt and promoting resilience in at-risk individuals<sup>39</sup>.

### Discussion

The findings discussed highlight the complex relationship between chronic head-related pain and suicide risk. All three types of headaches, migraines, CH and TTH have been shown to significantly increase the likelihood of suicide attempts. The study by Breslau et al. demonstrated a greater than four-fold increase in suicide risk among individuals with migraines compared to controls, suggesting that the intense and chronic nature of migraine pain may exacerbate psychological distress, leading to higher rates of suicidality. Similarly, Koo et al.'s research on CH patients

revealed a higher prevalence of suicidal ideation and risk compared to control groups, pointing to the demoralization and frustration experienced by patients due to ineffective treatment options and the recurrent, often unpredictable nature of CH. This is further supported by evidence from TTH studies, which show a significant increase in suicidality among chronic TTH patients, highlighting the cumulative impact of ongoing pain and psychiatric comorbidities<sup>7,8</sup>. The discussion also highlights the strong link between chronic pain and depression, with up to 40% of chronic pain sufferers also experiencing depressive symptoms. The shared pathways between the mesolimbic system, which regulates both pain and pleasure, and depressive states offer a plausible explanation for the heightened suicide risk in these populations. The work of Karp et al. suggests that patients with higher levels of pain prior to treatment may experience more challenging depressive episodes, requiring more aggressive and prolonged interventions to achieve remission. This calls for early and effective pain management to mitigate the psychological toll of chronic pain. Additionally, the role of opioid use in depression recurrence presents a critical issue in pain management, where long-term opioid use may worsen both pain and psychiatric outcomes, as evidenced by Scherrer et al. Interestingly, the association between migraine and bipolar depression (BD) points to a broader link between chronic pain and psychiatric comorbidities. The high prevalence of migraines among BD patients, and their shared pathophysiological pathways, suggest an interrelationship that further complicates treatment approaches. These findings emphasize the need for a more nuanced understanding of the interplay between chronic pain, psychiatric disorders, and suicide risk, encouraging future research to explore tailored interventions that address both the physical and psychological dimensions of pain management<sup>13,15</sup>. The discussion around PT and its contribution to suicide risk reveals a strong correlation between hearing impairment and mental health challenges. PT is often accompanied by hearing loss, vertigo, and other auditory disruptions that can significantly impact a person's quality of life. Studies, such as the one conducted by the Otolaryngology unit at Christian Medical College, demonstrate that nearly half of patients with PT experience moderate to severe hearing loss. This impairment can lead to communication difficulties, social isolation, and frustration, all of which contribute to a decline in mental well-being. Hearing impairment can often hinder an individual's capacity for social interaction, which is a critical aspect of maintaining mental health and self-worth. The frustration of losing such an essential human function can lead to feelings of demoralization, making individuals more vulnerable to suicidal ideation. Additionally, sleep disturbances, a common consequence of PT, further exacerbate the risk of suicide. Poor sleep quality has been closely linked to depression and heightened suicide risk in both adolescents and adults. Continuous tinnitus, especially when synchronized with the heartbeat, is particularly disruptive to sleep. The brain's inability to habituate to the persistent noise can cause frequent awakenings and fragmented sleep, further diminishing quality of life. Sleep disturbances alone are substantial predictors of suicidal ideation, even in the absence of depression as a moderating factor. This suggests that managing sleep problems in PT patients is critical to reducing their risk of developing suicidal thoughts<sup>20-22,25</sup>. Amidst the valuable insights gained from existing studies, several notable limitations emerge that warrant careful consideration and further investigation in order to achieve

a more comprehensive understanding of this complex phenomenon. Primarily, there may be a scarcity of research solely focused on PT and its connection to suicidal ideation. Much of the existing literature may combine PT and NPT, making it difficult to draw clear conclusions about the unique impact of PT on mental health. Additionally, given the overlapping symptoms between pulsatile and NPT, it can be challenging to attribute the observed suicidal risk solely to PT. Other factors, such as the psychological distress caused by tinnitus in general or underlying comorbidities, may contribute to the association between tinnitus and suicidal ideation. Likewise, tinnitus can vary significantly in terms of severity, duration, and characteristics. Research may need to consider these variations and their potential impact on sleep disturbance, hearing impairments, and suicidal ideation. Individuals with more severe or distressing tinnitus may be more vulnerable to mental health issues. As evident with the findings discussed, there is a complex and multifaceted relationship between cognitive decline and suicide risk, particularly in older adults with neurocognitive disorders such as dementia. It is worth noting that cognitive decline itself plays a critical role in suicidal vulnerability, as the elevated risk persists after accounting for other psychiatric comorbidities such as depression. This is evident in Günak et al. where older veterans recently diagnosed with dementia had a notably higher risk of suicide, independent of other psychiatric conditions. This suggests that the awareness of declining cognitive abilities, combined with fear of becoming a burden, loss of autonomy, and impaired executive functioning, creates a fertile ground for suicidal ideation. Early cognitive decline often coincides with retained awareness of the deterioration, leading to emotional distress and increased susceptibility to suicidal thoughts. Additionally, Conejero et al. and Rymo et al. further support these findings by showing that the early phase of cognitive impairment is particularly perilous, as individuals struggle with feelings of helplessness and an impending loss of independence. Deficits in executive functions, such as inhibition and decision-making, have been shown to impair judgment, which may contribute to the higher likelihood of carrying out suicide plans. Richard-Devantoy et al. highlighted how cognitive inhibition deficits in depressed older adults correlated with high-lethality suicide attempts, while Choi et al. demonstrated that older adults with newly diagnosed dementia were at elevated risk of suicide within the first year of diagnosis, further underscoring the urgency of early intervention during this critical period. Future implications of this research are profound. It highlights the need for comprehensive screening and monitoring of suicide risk in individuals diagnosed with cognitive impairments, particularly in the early stages. In addition, enhanced support systems, early therapeutic interventions, and increased awareness of the unique risks associated with cognitive decline could help reduce the suicide rates in this vulnerable population<sup>29-35</sup>.

## Conclusion

This narrative review sheds light on the significant associations between chronic headaches, pulsatile tinnitus, cognitive decline, and suicide risk. The debilitating nature of migraines, CH and TTH has been shown to increase psychological distress, leading to a higher risk of suicidal ideation and attempts. The chronic pain experienced by patients, coupled with psychiatric comorbidities like depression, contribute to the multifactorial and complex nature of heightened suicide risk.

Additionally, PT, often accompanied by hearing loss and sleep disturbances, also exacerbates mental health challenges, contributing to social isolation and increasing the likelihood of suicidal thoughts. The inability to habituate to constant auditory disruptions, especially in PT, can severely impact an individual's quality of life, creating a vicious cycle of sleep deprivation and emotional distress. Cognitive decline, particularly in early-stage dementia, presents another critical risk factor for suicide, with patients experiencing feelings of helplessness, loss of autonomy, and fear of becoming a burden. The awareness of declining cognitive abilities, combined with impaired executive functioning, can significantly increase vulnerability to suicidal ideation. These findings underscore the need for comprehensive screening tools that assess both risk and protective factors in these populations. A screening survey like the Gwangju Checklist for Evaluation of Suicidality (G-CES) can demonstrate that having these protective factors, such as social support and coping mechanisms, can help mitigate suicide risk. Future research should aim to develop more robust, multidisciplinary screening methods and interventions that address both the physical and psychological dimensions of these neurovascular pain and cognitive decline and their effects on suicide risk. Early therapeutic interventions and enhanced support systems, particularly in those with these conditions, are essential to reducing suicide rates. By focusing on both risk reduction and the reinforcement of protective factors, mental health clinicians can better tailor interventions and ultimately help prevent suicide in these vulnerable groups.

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