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Original Article

Demographic, clinical, and paraclinical findings of patients with vertigo in Rafsanjan city

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Abstract

Introduction: Vertigo is a common clinical complaint with various underlying causes, making a clear understanding of patient characteristics essential for accurate diagnosis and management. This study aimed to investigate the age distribution, sex, medical history, and neurological symptoms in patients with vertigo.

Methods: We collected data from 100 patients with complaints of vertigo who were referred to Ali Ibn Abi Taleb Hospital. Inclusion criteria included: 1) Age between 18 and 80 years, 2) A definitive diagnosis of true vertigo, and 3) Completion of the informed consent form. The collected information encompassed demographic characteristics, paraclinical evidence, and specifics of the vertigo. Statistical analysis was performed using descriptive statistics (frequency) and inferential statistics (chi-square test) within a 95% confidence interval.

Results: Of the patients, 84% were diagnosed with peripheral vertigo, 63% were women, and 39% were aged between 45 and 65 years. A significant relationship was found between the type of vertigo and paraclinical evidence ($P<0.000$), and history of stroke ($P=0.001$). However, there was no significant relationship between the type of vertigo and history of head trauma and transient ischemic attack (TIA) ($P>0.05$). Additionally, no correlation was observed between vertigo and symptoms such as nausea, vomiting, auditory issues, or other neurological symptoms.

Conclusion: The findings of this study show that the occurrence of central vertigo increases as people age. Most patients with abnormal paraclinical evidence were diagnosed with central vertigo, and many patients with a history of stroke experienced central vertigo. Therefore, it is important for physicians treating vertigo to provide appropriate management, carefully review patients' medical histories and symptoms, and use paraclinical findings when needed.

Introduction

True vertigo and dizziness, a multisensory syndrome with various causes and pathogenesis, is one of the most common clinical complaints in medicine, with an annual prevalence of about 11% and a lifetime prevalence of about 20-30%.[1] Vertigo is an illusion of motion that can manifest with a patient's positional changes. It encompasses peripheral and central causes, with about 90% of vertigo cases having a peripheral etiology. Common peripheral causes include benign paroxysmal positional vertigo (BPPV), vestibular neuritis, and Ménière disease. Vestibular migraine is one of the most causes of vertigo.[2]

In comparison, patients' complaints of dizziness are like a light feeling in the head, a feeling of fullness in the head, and fear of falling. For differentiating between true vertigo and pseudo-vertigo in patients experiencing dizziness or lightheadedness, history and physical examination can be helpful. It is determined that disturbance in the inner ear equilibrium system, eyes, brainstem, and cerebellum can cause vertigo. Vertigo is generally divided into two types: peripheral vertigo and central vertigo in terms of the site of anatomical dysfunction. Associated nausea and vomiting suggest a peripheral rather than central cause.[3,4]

Vertigo is among the most common reasons people contact the emergency department in Rafsanjan and is also one of the leading complaints received by emergency services. Vertigo varies depending on age and sex. Vertigo affects patients in many ways. An individual's well-being is affected by ageing and vertigo. Previous studies have suggested that a history of head trauma, TIAs, stroke, and migraine headaches may be associated with complaints of vertigo. According to the severity and type of vertigo,

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there are a variety of symptoms associated with vertigo, including nausea and vomiting, [5] falling with dizziness,[5-7] auditory symptoms, and different neurological symptoms.[8,9]

It is crucial to consider the relationship between the patient's past medical history, vertigo symptoms, and paraclinical evidence in two types of vertigo to make a better diagnosis, to choose or not to select paraclinical services, to save patients' time and money, and to provide treatment that is appropriate for them. According to the abovementioned points, the objective of the present study is to evaluate the demographic, clinical findings, and paraclinical evidence in patients referring to the emergency department of Ali Ibn Abi TalibHospital with a complaint of vertigo, which was performed for the first time in Rafsanjan.

Methods

In this descriptive cross-sectional study, one hundred patients with a chief complaint of vertigo were referred to the emergency department of Ali Ibn Abi Talib Hospital from the beginning of May 2018 to August 2019, a consent-based entry criteria were used in our study. This study was confirmed by the Ethics Committee of Rafsanjan University of Medical Sciences and is pursuant to the tenets of the Helsinki Declaration. All participants signed the informed consent form to participate in the study. Adequate information about the goals and methods of the research was provided to the participants.

Inclusion criteria were (1) Age 18 to 80 years, (2) Definitive diagnosis of true vertigo, and (3) completing the informed consent form. Exclusion criteria were (1) dizziness due to postural hypotension, (2) primary somatoform dizziness due to anxiety disorders, depression, paranoid disorders, as well as obsessive-compulsive disorder, (3) drug poisoning, and (4) anemia. Data collection tools included a checklist capturing demographic characteristics (age, sex, level of education, marital status, and residence) and a researcher-made checklist of vertigo. In this researcher-made checklist of vertigo, the characteristics of vertigo and its accompanying symptoms, history of drug use, and other diseases were completed by a trained medical student.

In taking the patients› history and completing the checklist, items such as an accurate description of vertigo, the severity of vertigo symptoms, temporary or persistent symptoms, the severity of symptoms, accompanying symptoms such as hearing loss, and an accurate description of the initial incident were recorded. A neurologist or emergency medicine physician performed the neurological, ear, nose, and throat examinations. If the examination and history were not accurate and the type of vertigo was unknown, magnetic resonance imaging (MRI) or computed tomography (CT) scan was performed. Finally, with the total information obtained, patients were divided into central and peripheral vertigo.

Statistical analysis

Data were collected and analyzed using descriptive statistics (frequency) and inferential statistics (chi-square test) via SPSS software version 21 in a 95% confidence interval (CI). The significance level was considered less than 0.05. For statistical analysis, three age groups were considered: 18 to 45 years old, 45 to 65 years old, and more than 65 years old, which were necessary for neurological diseases and the study of vertigo.

Results

In this study, 100 patients with an average age of 56.3 ± 17.8 years had complaints during the mentioned period, of whom 63 were women and 37 were men. Also, 84% of these people had peripheral vertigo, and 16% had central vertigo. A total of 39 patients were in the range of 45 to 65 years old (Table 1). Based on the results of the chi-square test, it was found that there was a significant relationship between age group and type of vertigo in patients: p-value = 0.002 (Table 1). As in Table 1, central vertigo in patients increased with age. However, the values of the Cramer (= 0.352) coefficients indicated that this relationship was not very strong.

Based on the results of the chi-square test, it was found that there was no significant relationship between sex and type of vertigo in patients at a 95% confidence level: *P* value = 0.240 (Table 1).

The paraclinical examination was performed on 39 patients, of whom 18 were normal and 21 were abnormal. In 21 abnormal cases, ten cases showed cerebrovascular involvement, four cases had a stroke, two cases were diagnosed with brain tumors, one case showed acute cerebellar infarction, one case revealed thalamic infarction, one case showed lacunar pons infarction, one case showed subarachnoid hemorrhage, one case had cerebral atrophy and large ventricles (Table 1).

According to the results of the chi-square test, it was found that there was a significant relationship between the type of vertigo and paraclinical evidence (CT or MRI): *P* value = 0.000 (Table 1). The values of Phi and V-Kramer coefficients (= 0.668) show that this relationship was relatively strong. As outlined in Table 1, patients with abnormal CT or MRI evidence often had central vertigo.

13% of patients with vertigo have a history of trauma. There is no significant relationship between the type of vertigo and the history of trauma (*P* value = 0.456) (Table 2).

As many as 6% of participants had a history of stroke. There was a significant relationship between the type of vertigo and the history of stroke (*P* value < 0.001) (Table 2). The values of Phi and V-Kramer coefficients (*P* value = 0.579) showed that this relationship is relatively strong. Patients with a history of stroke often had central vertigo. Also, 6% of the members of the statistical sample had a history of TIAs. There was no significant relationship between the type of vertigo and the history

Table 1. Frequency distribution of vertigo according to age groups, sex, and paraclinical evidence in patients referring to the emergency department of Ali Ibn Abi Talib Hospital in Rafsanjan

Type of vertigo	Paraclinical evidence (n=39)		Sex (n=100)		Age group (n=100)		
	Normal	Abnormal	Female	Male	18≤x>45	45≤x>65	x≥65
Central	1(2.5%)	15(38.5%)	8(8%)	8(8%)	1(1%)	4(4%)	11(11%)
Peripheral	17(43.5%)	6(15.5%)	55(55%)	29(29%)	28(28%)	35(35%)	21(21%)
Chi Square	17.383		1.381		12.396		
P Value	0.000		0.240		0.002		

Table 2. Frequency distribution of vertigo according to the history of head trauma, history of stroke, history of transient ischemic attacks, and nausea and vomiting in patients referring to the emergency department of Ali Ibn Abi Talib Hospital in Rafsanjan.

Type of vertigo	Nausea and vomiting		Transient ischemic attack history		Stroke history		Head trauma history	
	Have	Do not have	Have	Do not have	Have	Do not have	Have	Do not have
Central	11(11%)	5(5%)	1(1%)	15(15%)	6(6%)	10(10%)	3 (3%)	13(13%)
Peripheral	46(46%)	38(36%)	4(4%)	80(80%)	0(0%)	84(84%)	10(10%)	74(74%)
Chi-square	1.073		0.063		33.511		0.557	
P value	0.300		0.802		0.001		0.456	

of TIAs, (*P* value = 0.802) (Table 2). Also, 57% of patients with vertigo had nausea and vomiting. There was no significant relationship between the type of vertigo with nausea and vomiting (*P* value = 0.300) (Table 2).

Hearing symptoms include tinnitus, heaviness and hearing loss, and feeling fullness in the ear. Among all patients, 24% of the participants had tinnitus, 32% had hearing loss, and 33% felt fullness in the ear. There was no significant relationship between the type of vertigo and tinnitus (*P* value = 0.592), heaviness and hearing loss (*P* value = 0.272), and feeling fullness in the ear (*P* value = 0.676) (Table 3). Neurological symptoms include "diplopia", "dysarthria", and "limb weakness". According to the study, 9% of patients had diplopia, 13% had speech disorders, and 9% had limb weakness. There was no significant relationship between the type of vertigo and diplopia (*P* value = 0.675), weakness in the limbs (*P* value = 0.170), and heaviness, as well as speech disorder (*P* value = 0.948) (Table 3).

Discussion

The results of this study are based on data from one hundred patients with true vertigo who were referred to the emergency department of Ali Ibn Abi Talib Hospital in Rafsanjan. The findings suggest that most patients with vertigo in this setting were women aged 45 to 65 years. Peripheral vertigo was more prevalent among the participants, while central vertigo increased with age. Notably, most patients with abnormal paraclinical evidence exhibited central vertigo, and a history of stroke was associated with central vertigo, likely due to decreased blood flow, insufficiency, and arterial narrowing. There was no significant association between the type of vertigo and a history of head trauma, transient ischemic attacks (TIAs). Symptoms such as nausea, vomiting, auditory symptoms, and neurological signs were not distinctly associated with either type of vertigo, indicating that these symptoms can occur in both forms. Thus, physicians must provide appropriate treatment for patients presenting with vertigo, review their medical history, and utilize paraclinical findings when necessary.

The study revealed that the majority of patients experienced peripheral vertigo, predominantly within the 45 to 65 age group, with a higher prevalence among women. This aligns with previous studies indicating that the majority of patients experienced peripheral vertigo, peripheral vertigo prevalence increases with age, and that vertigo is more common in women,[10-12] although its severity is not significantly influenced by sex.[10] Consequently, healthcare providers should consider age and sex factors when diagnosing and treating vertigo.

In 57% of patients with vertigo, nausea and vomiting were reported as accompanying symptoms; however, no significant relationship was found between these symptoms and the type of vertigo. Supporting our findings, Sabri et al. reported that 56.6% of patients with vertigo experienced nausea and vomiting.[12] This suggests that while nausea and vomiting are common in vertigo cases, they do not differentiate between peripheral and central types.

Our study found no significant difference between sex and type of vertigo, although other studies have indicated that the frequency of peripheral vertigo, particularly BPPV, is higher in women.[13] Thus, further research is needed to clarify the relationship between sex and the type of vertigo.

The findings indicated that patients with abnormal paraclinical evidence (CT or MRI) predominantly had central vertigo, with most showing signs of small cerebrovascular involvement. Approximately 20% had abnormal imaging, suggesting that the majority (80%) did not require CT or MRI. Since mild stroke or TIA is

Table 3. Frequency distribution of vertigo type with neurological symptoms and hearing symptoms in patients referring to the emergency department of Ali Ibn Abi Talib Hospital in Rafsanjan (n = 100)

Type of vertigo	Weakness in limbs		Dysarthria		Diplopy		Fullness in the ear		Ear pressure & hearing loss		Tinnitus	
	Have	Do not have	Have	Do not have	Have	Do not have	Have	Do not have	Have	Do not have	Have	Do not have
Central	0 (0%)	16 (16%)	2 (2%)	14 (14%)	1 (1%)	15 (15%)	6 (6%)	10 (10%)	7 (7%)	9 (9%)	3 (3%)	13 (13%)
Peripheral	9 (9%)	75 (75%)	11 (11%)	73 (73%)	8 (8%)	76 (76%)	27 (27%)	57 (57%)	25 (25%)	59 (59%)	21 (21%)	66 (66%)
Chi-square	1.884		0.004		0.176		0.174		1.209		0.288	
P value	0.170		0.948		0.675		0.676		0.272		0.592	

diagnosed with MRI and CT,[14] and the involved area is also known due to the posterior involvement, there were vertigo symptoms along with CT or MRI abnormalities in line with other studies.[15] Therefore, clinicians should judiciously evaluate the need for imaging in patients presenting with vertigo.

In contrast to our research, other investigations have found an essential link between a history of trauma and vertigo,[16] listing it as one of the significant risk factors for the condition.[17] Although the most common vertigo caused by trauma is a benign vertigo attack resulting from the separation of otoliths from the macula, the difference between our study and others could be attributed to the severity of the trauma and the differences in sample size.[18] Thus, the impact of trauma on vertigo may vary significantly based on these factors.

Our investigation showed a strong correlation between the percentage of patients with a history of stroke and central vertigo. Studies that support our findings indicate that individuals with a history of stroke experience central vertigo.[19] Additionally, another study linked peripheral vertigo to a stroke-free past.[20] Consequently, the relationship between stroke history and the type of vertigo experienced is a critical consideration in understanding these conditions.

Still, the present study's findings showed that 5% of patients had a history of TIA, with no significant link found between the type of vertigo and TIA history. Other studies have also reported no significant connection between dizziness and TIAs, indicating that a history of TIA may not be heavily related to vertigo.[21] Therefore, it seems that TIA might not be a major factor in developing vertigo symptoms. On the other hand, other conditions, such as acute peripheral vestibular dysfunction, can mimic a stroke. This condition is more common than stroke and often causes isolated vertigo without other brainstem symptoms or signs that could imitate transient ischemic symptoms, leading to the possibility of a false TIA history.[22,23] Additionally, 90% of TIAs—transient ischemic attacks originating from the posterior circulation—present only with dizziness and are frequently missed during the first medical visit. 24 Thus, distinguishing between acute peripheral vestibular dysfunction and stroke is vital for accurate diagnosis and treatment.

Our findings also indicated that the correlation of vertigo severity was higher in patients with central vertigo. Identifying the peripheral and central types of vertigo is crucial after an initial episode. While benign paroxysmal vertigo, acute vestibular neuronitis, and Meniere's disease are the most prevalent types, other conditions like multiple sclerosis, perilymphatic fistulas, migraine, and intracranial neoplasms should also be considered when assessing vertigo severity.[24] According to other studies, patients with peripheral vertigo experience more severe symptoms than those with central vertigo, which contradicts our findings. This discrepancy may be attributed to a smaller target population in our study and variations in the epidemiology of peripheral vertigo across different communities.[6] According to the results of the present study, it was found that 33% of patients had auditory symptoms (tinnitus, heaviness and hearing loss, and a feeling of fullness in the ear) with vertigo. Still, there was no significant relationship between the type of vertigo and auditory symptoms. Many studies in line with our study found no significant differences between vertigo and these symptoms.[25,26] Thus, further research may be needed to explore the relationship between auditory symptoms and different types of vertigo.

One limitation of the present study was the non-participation of certain patients with vertigo who referred to the emergency department of Ali Ibn Abi Taleb Hospital. For future research, it is recommended to include inpatients in addition to outpatients, thereby increasing the sample size. Additionally, future studies should explore other neurological symptoms, such as focal neurological disorders, as well as investigate the roles of blood factors and environmental pollutants in relation to the prevalence and types of vertigo. Ultimately, addressing these factors will enhance our understanding of vertigo and improve diagnostic and treatment approaches.

Conclusion

The majority of patients presenting with symptoms of vertigo were women aged between 45 and 65, with a predominant diagnosis of peripheral vertigo. Those in the central vertigo group often had a history of falls associated with their vertigo symptoms. Furthermore, most patients exhibiting abnormal paraclinical findings were diagnosed with central vertigo, and a significant number of patients

with a history of stroke also experienced central vertigo. Notably, the incidence of central vertigo increased with age. Therefore, it is essential for physicians to consider patients' medical histories and associated symptoms when evaluating cases of vertigo, and to utilize paraclinical examinations when necessary.

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Study Highlights

What is current knowledge?

- The current knowledge is that vertigo symptoms are most commonly seen in women aged 45 to 65, with peripheral vertigo being the predominant diagnosis. Patients with central vertigo often have a history of falls, abnormal paraclinical findings, and stroke history, and the incidence of central vertigo increases with age.

What is new here?

- The new information presented emphasizes the importance of carefully considering patients' medical histories and associated symptoms when evaluating vertigo. It also highlights the critical role of paraclinical examinations in distinguishing central vertigo, especially given its increased incidence with age and its association with serious conditions like stroke and falls. This underlines a more targeted diagnostic approach for vertigo management.

Competing Interests

The authors declare that they have no conflict of interest.

Ethical Approval

This study received approval from the Ethics Committee of Rafsanjan University of Medical Sciences (permit number: IR.RUMS.REC.1396.161) and adheres to the principles outlined in the Helsinki Declaration. All participants provided informed consent to take part in the study.

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References

1. Kerr AG. Assessment of vertigo. Ann Acad Med Singap. 2005;34(4):285-8.
2. Bronstein AM, Golding JF, Gresty MA. Visual vertigo, motion sickness, and disorientation in vehicles. Semin Neurol. 2020;40(1):116-29. doi: 10.1055/s-0040-1701653.
3. Brandt T. Vertigo: Its Multisensory Syndromes. Springer Science & Business Media; 2013.
4. Bronstein AM. Oxford Textbook of Vertigo and Imbalance. Oxford: Oxford University Press; 2013.
5. Karatas M. Central vertigo and dizziness: epidemiology, differential diagnosis, and common causes. Neurologist. 2008;14(6):355-64. doi: 10.1097/NRL.0b013e31817533a3.
6. Fife TD. Approach to the history and evaluation of vertigo and dizziness. Continuum (Minneap Minn). 2021;27(2):306-29. doi: 10.1212/con.0000000000000938.
7. Casani AP, Gufoni M, Capobianco S. Current insights into treating vertigo in older adults. Drugs Aging. 2021;38(8):655-70. doi: 10.1007/s40266-021-00877-z.
8. Khoujah D, Chang WW. The emergency neurology literature 2020. Am J Emerg Med. 2022;54:1-7. doi: 10.1016/j.ajem.2022.01.019.
9. Ng AC. Posterior circulation ischaemic stroke. Am J Med Sci. 2022;363(5):388-98. doi: 10.1016/j.amjms.2021.10.027.
10. Neuhauser HK, Lempert T. Vertigo: epidemiologic aspects. Semin Neurol. 2009;29(5):473-81. doi: 10.1055/s-0029-1241043.
11. Murdin L, Schilder AG. Epidemiology of balance symptoms and disorders in the community: a systematic review. Otol Neurotol. 2015;36(3):387-92. doi: 10.1097/mao.0000000000000691.
12. Saberi A, Nemati SH, Pourafshar P. Clinical, demographic, and paraclinic findings of central and peripheral vertigo. J Guilan Univ Med Sci. 2014;23(91):1-7. [Persian].
13. Roberts RA, Jacobson GP, Hatton K. Multiple co-occurring vestibular disorders identified using the dizziness symptom profile. Am J Audiol. 2020;29(3):410-8. doi: 10.1044/2020_aja-19-00119.
14. Moreau F, Modi J, Almekhlafi M, Bal S, Goyal M, Hill MD, et al. Early magnetic resonance imaging in transient ischemic attack and minor stroke: do it or lose it. Stroke. 2013;44(3):671-4. doi: 10.1161/strokeaha.111.680033.
15. Saber Tehrani AS, Kattah JC, Kerber KA, Gold DR, Zee DS, Urrutia VC, et al. Diagnosing stroke in acute dizziness and vertigo: pitfalls and pearls. Stroke. 2018;49(3):788-95. doi: 10.1161/strokeaha.117.016979.
16. Balatsouras DG, Koukoutsis G, Aspris A, Fassolis A, Moukos A, Economou NC, et al. Benign paroxysmal positional vertigo secondary to mild head trauma. Ann Otol Rhinol Laryngol. 2017;126(1):54-60. doi: 10.1177/0003489416674961.
17. Honoré TV, West N, Klokker M. [Benign paroxysmal positional vertigo is an overlooked complication of head trauma]. Ugeskr Laeger. 2019;181(10):V09180605. [Danish].

18. Kolev OI, Sergeeva M. Vestibular disorders following different types of head and neck trauma. Funct Neurol. 2016;31(2):75-80. doi: 10.11138/fneur/2016.31.2.075.
19. Chase M, Joyce NR, Carney E, Salciccioli JD, Vinton D, Donnino MW, et al. ED patients with vertigo: can we identify clinical factors associated with acute stroke? Am J Emerg Med. 2012;30(4):587-91. doi: 10.1016/j.ajem.2011.02.002.
20. Hashemilar M, Asadzadeh F, Talebi M, Pourisa M, Ghojazadeh M, Herfehdoust F. Assessment of factors related to secondary vertigo due to vascular causes verified with brain-MRI (DWI). 2014;25(2):129-38. [Persian].
21. Sabeti M, Naser Moghadasi A, Aloosh M, Paknejad SM, Toghae M. Transient ischemic attacks and presence of an acute brain lesion in diffusion-weighted MRI: study of 50 patients. Tehran Univ Med J. 2012;70(7):430-5. [Persian].
22. Caplan LR, Wityk RJ, Glass TA, Tapia J, Pazdera L, Chang HM, et al. New England medical center posterior circulation registry. Ann Neurol. 2004;56(3):389-98. doi: 10.1002/ana.20204.
23. Coutts SB, Simon JE, Eliasziw M, Sohn CH, Hill MD, Barber PA, et al. Triaging transient ischemic attack and minor stroke patients using acute magnetic resonance imaging. Ann Neurol. 2005;57(6):848-54. doi: 10.1002/ana.20497.
24. Labuguen RH. Initial evaluation of vertigo. Am Fam Physician. 2006;73(2):244-51.
25. Wang Y, Liu J, Cui Z, Yan L, Si J. Analysis of risk factors in patients with peripheral vertigo or central vertigo. Neurologist. 2018;23(3):75-8. doi: 10.1097/nrl.0000000000000179.
26. Shahrami A, Norouzi M, Kariman H, Hatamabadi HR, Arhami Dolatabadi A. True vertigo patients in emergency department; an epidemiologic study. Emerg (Tehran). 2016;4(1):25-8.