

## ORIGINAL RESEARCH

## True Vertigo Patients in Emergency Department; an Epidemiologic Study

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**Abstract**

**Introduction:** Vertigo prevalence is estimated to be 1.8% among young adults and more than 30% in the elderly. 13-38% of the referrals of patients over 65 years old in America are due to vertigo. Vertigo does not increase the risk of mortality but it can affect the patient's quality of life. Therefore, this study was designed to evaluate the epidemiologic characteristics of vertigo patients referred to the emergency department (ED). **Methods:** In this 6-month retrospective cross-sectional study, the profiles of all vertigo patients referred to the ED of Imam Hossein Hospital, Tehran, Iran, from October 2013 to March 2014 were evaluated. Demographic data and baseline characteristics of the patients were recorded and then patients were divided into central and peripheral vertigo. The correlation of history and clinical examination with vertigo type was evaluated and screening performance characteristics of history and clinical examination in differentiating central and peripheral vertigo were determined. **Results:** 379 patients with the mean age of  $50.69 \pm 11.94$  years (minimum 18 and maximum 86) were enrolled (58.13% female). There was no sex difference in vertigo incidence ( $p = 0.756$ ). A significant correlation existed between older age and increase in frequency of central cases ( $p < 0.001$ ). No significant difference was detected between the treatment protocols regarding ED length of stay ( $p = 0.72$ ). There was a significant overlap between the initial diagnosis and the final decision based on imaging and neurologist's final opinion ( $p < 0.001$ ). In the end, 361 (95.3%) patients were discharged from ED, while 18 were disposed to the neurology ward. No case of mortality was reported. **Conclusion:** Sensitivity and specificity of history and clinical examination in differentiating central and peripheral vertigo were 99 (95% CI: 57-99) and 99 (95% CI: 97-99), respectively.

**Key words:** Vertigo; epidemiology; mass screening; emergency department

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**Introduction:**

Vertigo is an unpleasant symptom of diseases such as labyrinthitis, Meniere's disease, migraine, multiple sclerosis, and cervical spine osteoporotic lesions. Vertigo prevalence is estimated to be 1.8% among young adults and more than 30% in the elderly (1, 2). Its incidence increases with age, 13-38% of the referrals of patients over 65 years old in America are due to vertigo (3-6). Usually, vertigo does not increase the risk of mortality but it can affect the patient's quality of life. The best treatment modality is still a matter of question. Currently, various therapeutic strategies such as medication, surgery, rehabilitation, and physical maneuvers are available (7-10). Most cases of vertigo are caused by benign and self-restricting diseases. Differentiation of central types of vertigo, which require hospitalization and

supplementary diagnostic and therapeutic measures, is of great importance. Based on above-mentioned, this study was designed to evaluate the epidemiologic characteristics of vertigo patients referred to the emergency department (ED).

**Methods:**

In this 6-month retrospective cross-sectional study, the profiles of all vertigo patients referred to the ED of Imam Hossein Hospital, Tehran, Iran, from October 2013 to March 2014 were evaluated. Census sampling was used and all the vertigo patients referred to the hospital during this time were included. Demographic data and baseline characteristics of the patients including medical history, accompanied symptoms (nausea, hearing loss, tinnitus, headache), services that visited the patient, treat-



ment strategies, medications, and disposition were recorded using a checklist. Patients were then divided into central and peripheral vertigo groups based on the findings of their history and clinical examination such as presence or absence of tinnitus, hearing loss, nystagmus characteristics, signs of sympathetic release, focal neurologic findings, etc. The final decision on the type of vertigo (peripheral or central) was made based on the results of brain imaging or para-clinical findings and the opinion of an expert neurologist. Standard indications of brain computed tomography (CT) were considered age over 55 years, abnormal neurologic findings on examination, history of diabetes and hypertension. In addition, brain magnetic resonance imaging (MRI) indications were history of multiple sclerosis and abnormal cerebellar tests (heel to shin or finger to nose examination). The Ethics Committee of Shahid Beheshti University of Medical Sciences approved this study. The researchers adhered to the principles of Helsinki Declaration and confidentiality of patient information over the course of the study.

#### Statistical analysis

Data were statistically analyzed using SPSS version 21. Quantitative variables were reported as mean  $\pm$  standard deviation and qualitative ones were introduced as frequency and percentage. The correlation of history and clinical examination with vertigo type (central or peripheral) was evaluated and finally screening performance characteristics of history and clinical examination in differentiating central and peripheral vertigo were determined. Significance level was considered  $p < 0.05$ .

#### Results:

##### Demographic

492 patients with initial diagnosis of vertigo were referred to the ED over the course of the study, 18 of them were excluded due to lack of access to their profile and 8 due to initial misdiagnosis. The other 379 patients with the mean age of  $50.69 \pm 11.94$  years (minimum 18 and maximum 86) were enrolled (58.13% female). Table 1 shows the baseline characteristics of these patients. There was no sex difference in vertigo incidence ( $p = 0.756$ ). 239 (65.3%) of the participants were in the 40-60 years age range. Figure 1 displays the age distribution of central and peripheral vertigos. A significant correlation existed between older age and increase in frequency of central cases ( $p < 0.001$ ). Table 2 shows the correlation between the results of history and clinical examination and final decision of central or peripheral vertigo.

##### Treatment

71 (18.7%) patients did not respond to the initial medication and needed rescue doses. Most used treatment protocols are shown in table 3. Among double drug treatments, promethazine + ondansetron, promethazine + metoclopramide, diazepam + ondansetron, and diazepam + metoclopramide most efficiently relieved symptoms, respectively ( $p < 0.001$ ). In addition, in single drug

**Table 1:** Baseline characteristic of the studied patients

Baseline characteristics	Number (%)
<b>Sex</b>	
Female	220 (58.13)
Male	159 (41.86)
<b>Age (year)</b>	
Under 40	72 (18.99)
40-50	111 (29.28)
50-60	140 (36.93)
Over 60	56 (14.77)
<b>Triage level#</b>	
4 and 5	87 (17.68)
3	405 (82.13)
<b>Medical history</b>	
Hypertension	78 (20)
Diabetes	33 (8.7)
Seizure	3 (0.7)
head trauma	4 (1)
Multiple sclerosis	1 (0.2)
Vertigo	28 (7)
<b>Accompanying symptoms</b>	
Nausea and vomiting	335 (88.39)
Tinnitus	31 (8.17)
Headache	14 (3.69)
Hearing loss	2 (0.52)
<b>Cerebellar tests</b>	
Normal	366 (96.54)
Abnormal	13 (3.43)
<b>CT scan*</b>	
With indication	173 (80.09)
Without indication	43 (19.90)
<b>MRI**</b>	
With indication	14 (36.84)
Without indication	24 (63.16)
<b>Services visited</b>	
Internal neurology service	68 (17.9)
Neurosurgery service	2 (0.5)

#, Base on emergency severity index (ESI) triage system.\* Computed tomography (CT) scan indications: age over 55, Abnormal neurologic findings, history of diabetes and hypertension. \*\* Magnetic resonance imaging (MRI) indications: abnormal cerebellar tests and history of multiple sclerosis.

treatments promethazine was the most efficient, while diazepam and ondansetron were both inefficient in symptom relief ( $p = 0.84$ ). No significant difference was detected between the treatment protocols regarding ED length of stay ( $p = 0.72$ ). Dix-Hallpike diagnostic maneuver was not carried out for any of the patients in ED.

##### Diagnostic

Brain CT showed hemorrhage in only 2 (0.5%) of the patients. Neurology service consultation was required for 64 (16.9%) patients, while neurosurgery service consultation was necessary for 2 due to evidence of hemorrhage in brain CT scan (0.5%). Based on the history and initial physical examination, 13 (3.4%) patients were diagnosed with central vertigo (all over 40 years old).



There was a significant overlap between the initial diagnosis and the final decision based on imaging and neurologist's final opinion ( $p < 0.001$ ). Screening performance characteristics of history and clinical examination in differentiation of vertigo with 95% confidence interval are reported in table 4.

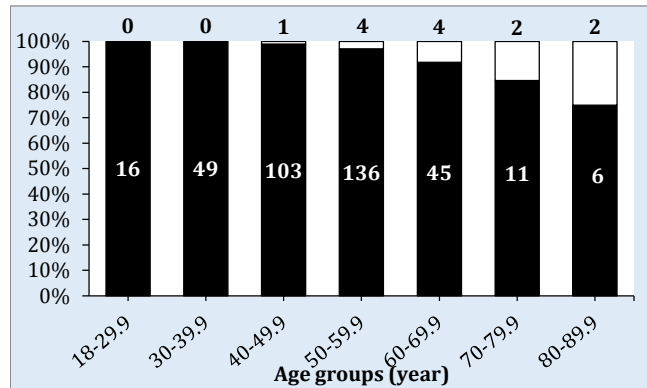
#### Outcome

In the end, 361 (95.3%) patients were discharged from ED, while 18 were disposed to the neurology ward due to persistence of symptom or positive imaging findings. No case of mortality was reported.

#### Discussion:

The findings of the present study revealed 3.4% central vertigo frequency, 18.7% resistance to the initial treatment modality, 0.5% positive findings of brain imaging, and 4.7% need for hospitalization in true vertigo patients referred to the ED. In previous studies, up to 25% of central causes of vertigo has been reported, which is in contrast with the findings of this study (11). Based on the results of the present study, history and initial clinical examination of the patients has high sensitivity and specificity for differentiating central and peripheral vertigo, which is in line with the results of Karatas et al. who introduced history and neurological examination along with imaging as keys for differentiation of central and peripheral causes (11). Although, the absolute frequency of female patients was higher in this study, no significant correlation was detected between sex and type of vertigo (central or peripheral) as previous studies had also stated (12, 13). Frequency of central vertigo increased with age. This was also in line with previous studies such as Min Yin's study, which evaluated 2169 patients aged 7-90 years over a 20-year period (12-16). Similar to a study by Degreli et al. nausea, vomiting, tinnitus, headache, and hearing loss were the most common accompanying symptoms in this order in the present study (12, 13).

Promethazine + ondansetron (double-drug) and promethazine (single drug) regimens were the most efficient in controlling symptoms in this study. Gananca et al. evaluated drug regimens in treating vertigo and showed that they are very effective in improving true



**Figure 1:** Frequency of central and peripheral vertigo based on age groups ( $p < 0.001$ ). Data are presented as frequency in this figure.

vertigo patients' conditions. They also reported that betahistine is more efficient in treating peripheral vertigo, while betahistine, cinnarizine, and clonazepam are more effective for central vertigo (17). In another study betahistine, prescription and Epley's physical maneuver were evaluated and compared regarding treatment of benign positional vertigo. The results showed that Epley's maneuver is more efficient than drug therapy in short-term treatment of benign positional vertigo (15). Degreli et al. assessed efficiency of diazepam, diphenhydramine, and dimenhydrinate in treating ED patients with acute vertigo. The results showed that these drugs were equally effective in treating vertigo but diazepam caused less sedation (12). Drug treatments did not have a significant effect on benign peripheral vertigo (18). In another study effectiveness of Epley's maneuver in treating benign paroxysmal peripheral vertigo patients was evaluated and symptom relief was seen in 92.5% of the patients (14). Since differentiating central vertigo plays a significant role in management of these patients in ED, evaluating the accuracy of history and initial clinical examination is very important. The results of this study indicate the acceptable accuracy of history and initial clinical examination in triage and initial screening of these patients. This will be more important when there is a lack of equipment and resources, and patients need to be

**Table 2:** Correlation between the results of history and clinical examination and final decision of central or peripheral vertigo

Variables	Frequency of vertigo type (%)		P value
	Central	Peripheral	
Nausea and vomiting	4 (1.2)	331 (98.8)	< 0.001
Hearing loss	0 (0.0)	2 (100.0)	0.93
Tinnitus	0 (0.0)	100 (100.0)	0.32
Vertigo	0 (0.0)	28 (100.0)	0.36
Head trauma	1 (25.0)	3 (75.0)	0.13
Headache	2 (14.3)	12 (85.7)	0.08
Seizure	0 (0.0)	3 (100.0)	0.90
Diabetes	4 (12.1)	29 (87.9)	0.02
Hypertension	8 (10.3)	70 (89.7)	< 0.001



**Table 3:** Most common treatment regimens prescribed for patients

Treatment regimens	Number (%)
Promethazine-ondansetron	96 (25.3)
Promethazine-metoclopramide	71 (18.7)
Diazepam-ondansetron	83 (21.9)
Diazepam-metoclopramide	59 (15.6)
Promethazine	45 (11.9)
Ondansetron	16 (4.2)
Diazepam	9 (2.4)

**Table 4:** Screening performance characteristics of history and clinical examination in differentiating central and peripheral vertigo

Screening characteristics	(95% Confidence Interval)
Sensitivity	90 (57-99)
Specificity	99 (97-99)
Positive predictive value	76 (49-93)
Negative predictive value	99 (98-99)
Positive likelihood ratio	3.3 (1.9-9.4)
Negative likelihood ratio	0.002 (0.0003-0.01)

referred to more equipped centers to undergo brain imaging. Only 3.4% of the vertigo patients had central causes and 0.5% of them had positive findings in their brain CT scan. 19.9% of the total 216 CT scans done did not have the indications mentioned in methods. Out of the 38 MRIs done, 63.16% were without indication. It seems that paying attention to minimum present clinical indications can broadly reduce the unnecessary expenses and side effects of radiation in patients. The present study was retrospective and done over a short period, which can lead to deficiency in data regarding outcome, final cause of vertigo, and other required data. A clinical survey is recommended to evaluate diagnosis and treatment of vertigo in patients referred to the ED and a standard protocol should be prepared for management of these patients.

#### Conclusion:

The findings of the present study revealed 3.4% central vertigo frequency, 18.7% resistance to the initial treatment modality, 0.5% positive findings of brain imaging, and 4.7% need for hospitalization in true vertigo patients referred to the ED. History and initial clinical examination showed acceptable accuracy in initial screening of central vertigo. It seems that doing imaging based on the existing indications leads to about 20% and 60% decrease in CT scan and MRI orders, respectively.

#### Conflict of interest:

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#### Authors' contributions:

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#### References:

- Sloane PD, Coeytaux RR, Beck RS, Dallara J. Dizziness: state of the science. *Ann Intern Med.* 2001;134(9\_Part\_2):823-32.
- Reid SA, Rivett DA. Manual therapy treatment of cervicogenic dizziness: a systematic review. *Man Ther.* 2005;10(1):4-13.
- Sloane P. Dizziness in primary care. Results from the national ambulatory medical care survey. *J Fam Pract.* 1989;29(1):33-8.
- Nakashima K, Yokoyama Y, Shimoyama R, et al. Prevalence of neurological disorders in a Japanese town. *Neuroepidemiology.* 1996;15(4):208-13.
- Moulin T, Sablot D, Vidry E, et al. Impact of emergency room neurologists on patient management and outcome. *Eur Neurol.* 2002;50(4):207-14.
- Kroenke K, Spitzer RL, Hahn SR, et al. Multisomatoform disorder: an alternative to undifferentiated somatoform disorder for the somatizing patient in primary care. *Arch Gen Psychiatry.* 1997;54(4):352-8.
- Strain G, Myers L. Hearing and equilibrium. In: Reece W, editor. *Dukes' physiology of domestic animals.* 12 ed. United Kingdom: CAB Direct; 2004. p. 852-64.
- Braunwald E, Fauci AS, Kasper DL, et al. Faintness, syncope, dizziness, and vertigo. *Harrison's Principles of Internal Medicine.* 1. Bahman: McGraw-Hill Professional Publishing; 2001. p. 111-8.
- Parfitt K, Martindale W. *The complete drug reference.* London: Pharmaceutical Press; 1999. p. 51.
- Cohen HS, Kimball KT. Increased independence and decreased vertigo after vestibular rehabilitation. *Otolaryngol Head Neck Surg.* 2003;128(1):60-70.
- Karatas M. Central vertigo and dizziness: epidemiology, differential diagnosis, and common causes. *Neurologist.* 2008;14(6):355-64.
- Değerli V, Çevik AA, Türkçüer i. Comparison of Intravenous Diazepam, Dimenhydrinate and Diphenhydramine on Patients with Acute Peripheral Vertigo in the Emergency Department: A Randomized, Double Blind, Clinical Trial. *Turk J Emerg Med.* 2007;7(1):10-7.
- Izadi P, Yarmohammadi ME, Afshinmajd S, et al. Effect of dimenhydrinate on benign paroxysmal positional vertigo. *Razi J Med Sci.* 2011;18(86):12-21.
- Dashti-Khadivaki G, Absalan A, Boroumand P. Therapeutic effect of Epley maneuver on patients with posterior semicircular canal in benign paroxysmal positional vertigo. *Zahedan J Res Med Sci.* 2010;12(2):36-9. [Persian].
- Ebadi H, Borgheie A, Mali M, Talebi M, Rabiei MR. Comparison Between the Effectiveness of Physical Maneuver and Medicinal Therapy in the Treatment of Benign Paroxysmal Positional Vertigo. *J Mazandaran Uni Med Sci.* 2007;17(58):1-8. [Persian].
- Yin M, Ishikawa K, Wong WH, Shibata Y. A clinical epidemiological study in 2169 patients with vertigo. *Auris Nasus Larynx.* 2009;36(1):30-5.
- Ganancia MM, Caovilla HH, Munhoz MS, et al. Optimizing the pharmacological component of integrated balance therapy. *Braz J Otorhinolaryngol.* 2007;73(1):12-8.
- Nuti D, Nati C, Passali D. Treatment of benign paroxysmal positional vertigo: no need for postmaneuver restrictions. *Otolaryngol Head Neck Surg.* 2000;122(3):440-4.

