

Dizziness In A Tertiary Neurological Department A Retrospective Study

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Research Article

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Abstract

Background

Dizziness is a common and challenging condition among population. There is little published study which surveys the characteristics of dizziness of inpatients in the department of neurology.

Objective

This study was to investigate the inpatients with dizziness as the chief complaint in a neurology department.

Materials and Methods

We conducted a retrospective study of inpatients with dizziness attending a tertiary neurological department in Beijing. We audited 211 patients with dizziness as the chief complaint from 1841 patients discharged from our tertiary neurological department.

Results

The inpatients with dizziness as the chief complaint accounted for 11.5% of all inpatients. Dizziness was more common in women than in men ($p=0.004$). There were more patients presenting with vertigo (40.8%) and light-headedness (39.8%) than disequilibrium (17.1%) and pre-syncope (2.4%). Nausea (48.3%), vomiting (34.1%), headache (13.3%), walk unsteadily (13.3%) and ear symptoms (12.8%) were the most common accompanying symptoms. Hypertension, diabetes, cerebrovascular diseases, dyslipidemia, and coronary heart disease were the most common diseases in past medical history. Dix-Hallpike test (24.6%) and Romberg's sign (11.4%) were positive in dizziness patients. Nystagmus (2.4%), vision changes (1.4%) and hearing disorders (8.5%) were relatively rare symptoms. MRI (60.2%), CT (31.8%), carotid duplex ultrasound (30.8%), echocardiography (28.0%) were common auxiliary examination. Benign paroxysmal positional vertigo (24.2%) and stroke/transient ischemic attack (19.0%) were common causes of dizziness. 97.2% of inpatients with dizziness can be improving after treatment.

Conclusion

Dizziness was a common and challenging condition. Vertigo and light-headedness were the most common dizziness types. Benign paroxysmal positional vertigo and stroke/transient ischemic attack were the common dizziness disorders. The prognosis of most patients with dizziness was good.

Introduction

Dizziness is the third major complaint among individuals who mentioned any health problems after fever and headache.^[1] Dizziness (including vertigo) affects about 15% to over 20% of adults yearly in large population-based studies.^[2] Also, dizziness is a common and challenging condition seen in outpatients, emergency patients and inpatients. More than one-third of Americans see a health physician for dizziness during their lifetime.^[3] Although most dizziness is due to benign causes, life-threatening causes also need to be excluded. There are some rare life-threatening diseases in patients with dizziness (with cerebrovascular disease accounting for 6%, cardiac arrhythmia for 1.5% and brain tumor for <1%).^[4, 5] Additionally, dizziness usually leads to some other complications such as falls and some other accidents, which significantly affect the patient's quality of life. However, clinicians are still unable to correctly diagnose and treat many patients with dizziness at present. In addition to emergency departments and otolaryngology departments, our neurologists often see patients with dizziness as the chief complaint. To date, there are very few investigations of patients with dizziness in neurology. Based on above-mentioned, this study was to investigate the inpatients with dizziness in a neurology department from the aspects of demographic characteristics, characteristics of symptoms, past medical history, physical examination and auxiliary examination, clinical diagnosis, and treatment effect.

Methods

In this 16-month retrospective study, the profiles of all dizziness inpatients referred to the department of neurology of a tertiary hospital, from September 2019 to December 2020, were evaluated. All inpatients with dizziness as the chief complaint referred to our neurological department during this time were included. We excluded patients who had symptoms of dizziness but did not have dizziness as their chief complaint. Demographic data, baseline characteristics of the patients (dizziness type, past medical history, accompanied symptoms), physical examination and auxiliary examination, clinical diagnosis, and treatment effect were recorded using a checklist. Patients were diagnosed based on the findings of symptoms, past history, auxiliary examination, and clinical examination such as presence or absence of headache, tinnitus, hearing loss, nystagmus characteristics, signs of sympathetic release, focal neurologic findings, etc. The diagnosis of dizziness conformed to the latest international diagnostic standards. The final decision on the diagnosis of dizziness was made based on the results of brain imaging or para-clinical findings and the opinion of an expert neurologist. The researchers adhered to the principles of Helsinki Declaration and confidentiality of patient information over the course of the study.

Statistical analysis

Data analyses were carried out using Statistical Package for the Social Sciences (SPSS) (version 25: SPSS, Inc, an IBM Company, Chicago, Illinois). Normally distributed continuous variables were reported as mean value±standard deviation; differences were assessed by a two tailed t test. Categorical variables were introduced as frequency and percentage; a chi square test or Fisher's exact test was performed to establish differences between groups. Significance level was considered $p < 0.05$.

Results

1. Demographic characteristics

In our study, 211 inpatients with initial diagnosis of dizziness were referred to our department of neurology. During the same period, 1841 inpatients were referred to our department of neurology. The 211 inpatients with the mean age of 58.76 ± 14.817 years (minimum 17 and maximum 89) were enrolled (44.1% male and 55.9% female). The 1841 inpatients with the mean age of 65.92 ± 18.612 years (minimum 7 and maximum 95) were enrolled (54.6% male and 45.4% female). Table 1 shows the number of dizziness inpatients and total inpatients in the department of neurology. It reveals that the incidence of dizziness was higher in women than in men. There was significant difference in dizziness incidence ($p=0.004$). Table 2 shows the number of dizziness inpatients in different age groups. There was no sex different in dizziness incidence of different age groups ($p=0.549$).

Table 1
The number of dizziness inpatients and total inpatients in the Department of Neurology

	Dizziness inpatients (%)	Total inpatients (%)
Male	93 (44.1)	1005 (54.6)
Female	118 (55.9)	836 (45.4)

Table 2
The number of dizziness inpatients in different age groups (years)

	Male (%)	Female (%)	Total (%)
<30	3 (1.4)	6 (2.8)	9 (4.3)
30-39	5 (2.4)	10 (4.7)	15 (7.1)
40-49	14 (6.6)	16 (7.6)	30 (14.2)
50-59	23 (10.9)	27 (12.8)	50 (23.7)
60-69	20 (9.5)	35 (16.6)	55 (26.1)
70-79	22 (10.4)	17 (8.1)	39 (18.5)
≥ 80	6 (2.8)	7 (3.3)	13 (6.2)

2. Characteristics of symptoms

The distribution of different types of dizziness was described in Table 3, with more patients presenting with vertigo (40.8%) and light-headedness (39.8%) than disequilibrium (17.1%) and pre-syncope (2.4%). There were more females than males among patients with vertigo (28.0% vs. 12.8%), whereas the ratio of

females to males was roughly the same among those with light-headedness (21.3% vs. 18.5%) and pre-syncope (1.4% vs. 0.9%). There was significant sex different in dizziness types ($p=0.001$). Nausea (48.3%), vomiting (34.1%), headache (13.3%), walk unsteadily (13.3%) and ear symptoms (tinnitus, hearing loss and aural fullness) (12.8%) were the most common accompanying symptoms in 211 inpatients with dizziness in Table 4.

Table 3
Types of dizziness in 211 patients with the chief complaint of dizziness

	Male (%)	Female (%)	Total (%)
Vertigo	27 (12.8)	59 (28.0)	86 (40.8)
Light-headedness	39 (18.5)	45 (21.3)	84 (39.8)
Disequilibrium	25 (11.8)	11 (5.2)	36 (17.1)
Pre-syncope	2 (0.9)	3 (1.4)	5 (2.4)

Table 4
Common accompanying symptoms in 211 inpatients with dizziness

	Number of patients	Percentage (%) (95% CI)
Nausea	102	48.3 (41.5-55.1)
Vomiting	72	34.1 (27.7-40.6)
Headache	28	13.3 (8.7-17.9)
Tinnitus, hearing loss and aural fullness	27	12.8 (8.3-17.3)
Symptoms of nervous system defect	20	9.5 (5.5-13.5)
Walk unsteadily	28	13.3 (8.7-17.9)
Others	23	10.9 (6.7-15.1)
Nothing special	39	18.5 (13.2-23.8)

3. Past medical history

The past medical history of 211 inpatients with dizziness as the chief complaint was described in Table 5. 40.8% of patients had past history of hypertension. Besides, diabetes (17.1%), cerebrovascular disease (stroke or transient ischemic attack) (16.6%), dyslipidemia (15.2%), and coronary heart disease (11.4%) were the most common diseases in past medical history of 211 inpatients with dizziness. However, past history of 30.3% of patients was nothing special.

Table 5
Past medical history of 211 inpatients with
dizziness

Past medical history	Number (%)
Hypertension	86 (40.8)
Diabetes	36 (17.1)
Dyslipidemia	32 (15.2)
Anxiety and depression	5 (2.4)
Headache	6 (2.8)
Coronary heart disease	24 (11.4)
Stroke/Transient ischemic attack	35 (16.6)
Ear disease	10 (4.7)
Head trauma	1 (0.5)
Others	21 (10.0)
Nothing special	64 (30.3)

4. Physical examination and auxiliary examination

Physical examination and auxiliary examination of 211 inpatients with dizziness were described in Table 6. In terms of physical examination, 29.4% of patients with dizziness as the chief complaint in our department of neurology had neurological defect symptoms. Dix-Hallpike test was positive in 24.6% of patients. Romberg's sign was positive in 11.4% of patients. Nystagmus (2.4%), vision changes (1.4%) and hearing disorders (8.5%) were relatively rare symptoms. Unfortunately, there was no record of HINTS test in all 211 patients. In terms of auxiliary examination, 60.2% of patients underwent a brain MRI examination. In addition, brain CT (31.8%), carotid duplex ultrasound (30.8%), echocardiography (28.0%) were common auxiliary examination in dizziness patients, whereas vestibular function tests (2.4%) and head-up tilt test (1.4%) were less used in dizziness patients.

Table 6
Physical examination and auxiliary examination of 211 inpatients with
dizziness as the chief complaint

Physical examination and auxiliary examination	Number of patients (%)
Nystagmus	5 (2.4)
Dix-Hallpike	52 (24.6)
HINTS	0 (0)
Romberg's sign	24 (11.4)
Neurological defect symptoms	62 (29.4)
Vision changes	3 (1.4)
Hearing disorders	18 (8.5)
Negative physical examination	128 (60.7)
Brain CT ^a	67 (31.8)
Brain MRI ^b	127 (60.2)
Carotid duplex ultrasound	65 (30.8)
Echocardiography	59 (28.0)
Vestibular function tests	5 (2.4)
Head-up tilt test	3 (1.4)
a. Computed Tomography b. Magnetic Resonance Imaging	

5. Clinical diagnosis

Table 7 provided description of clinical diagnosis of 211 inpatients with dizziness as the chief complaint. Benign paroxysmal positional vertigo (24.2%) was the most common disease in 211 patients with dizziness. Stroke/Transient ischemic attack (19.0%) was the second most common cause of dizziness in our department of neurology. Other diseases such as vestibular migraine (2.8%), Meniere's disease (0.9%), persistent postural-perceptual dizziness (0.9%), sudden deafness with vertigo (0.5%) were quite rare in patients with dizziness as the chief complaint. However, up to 44.1% of patients with dizziness were undiagnosed.

Table 7
Clinical diagnosis of 211 inpatients with dizziness as the chief complaint

Clinical diagnosis	Number of patients	Percentage (95% CI)
Benign paroxysmal positional vertigo	51	24.2 (18.3-30.0)
Stroke/Transient ischemic attack	40	19.0 (13.6-24.3)
Vestibular migraine	6	2.8 (0.6-5.1)
Meniere's disease	2	0.9 (0.4-2.3)
Persistent postural-perceptual dizziness	2	0.9 (0.4-2.3)
Sudden deafness with vertigo	1	0.5 (0.5-1.4)
Syncope	1	0.5 (0.5-1.4)
Postural hypotension	1	0.5 (0.5-1.4)
Others	14	6.6 (3.2-10.0)
Unable to specify	93	44.1 (37.3-50.8)

6. Treatment effect

Treatment effect of 211 patients with dizziness as the chief complaint was described in Table 8. The most common outcome was improving and it accounted for 97.2% of all 211 patients. Two patients were healing and 3 patients were untreated. Only 1 patient was dying.

Table 8
Treatment effect of patients with dizziness (n=211)

Treatment effect	Number (%)
Healing	2 (0.9)
Improving	205 (97.2)
Untreated	3 (1.4)
Dying	1 (0.5)

Discussion

Dizziness is seen frequently in patients in department of neurology. Because dizziness is a vague term that include a wide array of medical disorders, it is important to master the characteristics of dizziness diseases from the aspects of demographic characteristics, characteristics of symptoms, past medical history, physical examination and auxiliary examination, clinical diagnosis, and treatment effect. A striking finding from this study was that the inpatients with dizziness as the chief complaint accounted

for 11.5% of all inpatients in the department of neurology. Dizziness was more common in women than in men. These findings are in accordance with the data from other studies.^[6, 7] However, our study shows that there was no sex difference in dizziness incidence of different age groups ($p=0.549$).

The patient history can generally classify dizziness into one of four categories: vertigo, disequilibrium, pre-syncope, or lightheadedness.^[8] However, symptom types might substantially overlap in individual patients. Kevin A Kerber et al. found that substantial overlap of dizziness types exists among US adults with dizziness.^[9] Usually, vertigo symptom lasts for a short time. People having features of traditionally vertigo symptom also typically report multiple dizziness types. In our study, the primary type of dizziness was used as the classification criterion. Vertigo and light-headedness were the most common dizziness types in our department of neurology. Disequilibrium was relatively less common dizziness type. Pre-syncope was the primary dizziness symptom in only three patients. Our findings suggest that the traditionally emphasis on dizziness types may have limited clinical utility.

Accompanying symptoms may indicate certain diseases. Some common dizziness diseases are also based on symptoms as diagnostic criteria. Therefore, it is important to ask detailed questions about accompanying symptoms in patients with dizziness. However, some accompanying symptoms are relatively specific for diagnosis of dizziness diseases. Headache symptoms in patients with dizziness may suggest a possible diagnosis of vestibular migraine. Tinnitus, hearing loss and aural fullness in patients with dizziness may suggest Meniere's disease or other ear diseases. In our study, nausea and vomiting were the most common accompanying symptoms in patients with dizziness, but these symptoms were non-specific and appeared in many diseases. Conversely, specific accompanying symptoms (such as headache for vestibular migraine, symptoms of nervous system defect for cerebrovascular disease, tinnitus, hearing loss and aural fullness for ear diseases) were common in patients with dizziness.

Past medical history is another important aspect in diagnosing patients with dizziness. Hypertension was the most common past history in dizziness inpatients in the department of neurology. Diabetes, dyslipidemia, coronary heart disease and stroke/transient ischemic attack were also relatively common diseases in the past medical history of dizziness patients. On the contrary, headache, ear diseases, headache trauma, anxiety and depression were less common. There are two possible reasons. Dizziness patients with ear symptoms may be referred to the department of otology. Secondly, some patients with headache, head trauma, anxiety and depression unwilling to be hospitalized for further diagnosis and treatment. This was different from otolaryngology and the emergency department.^[10-12]

Some signs can often be found in physical examination and auxiliary examination in patients with dizziness. Neurological defect symptoms were most common positive sign in patients with dizziness. Dix-Hallpike test was simple and important for diagnosis of benign paroxysmal positional vertigo. In our study, Dix-Hallpike test was used for 24.6% patients. Acute vestibular syndrome (AVS) is common in department of neurology. Generally, physicians use the HINTS (head impulse, nystagmus, test of skew) test to make a differential diagnosis of acute vestibular syndrome. Physicians can use the HINTS test to

differentiate vestibular neuritis (the most common cause of an AVS) from ischemic stroke involving the cerebellum or the brainstem (the second most common cause of an AVS).^[13] In our study, there was no record in the inpatients with dizziness. There are several possible reasons for no record of HINTS test. Firstly, our neurologist didn't know what the HINTS mean or how to do the HINTS test. Then, physicians relied too heavily on imaging tests like CT and MRI. Thirdly, physicians didn't understand the specificity and sensitivity of HINTS test in diagnosis of stroke. Conversely, 31.8% patients had a brain CT scan and 60.2% patients underwent a brain MRI test. Carotid duplex ultrasound and echocardiography were also common auxiliary examination in patients with dizziness.

Benign paroxysmal positional vertigo was the most common disease in patients with dizziness in our study. Stroke/Transient ischemic attack was the second most common dizziness disorder. Only 6 patients was diagnosed with vestibular migraine, 2 patients were diagnosed with Meniere's disease. Two patients was diagnosed with persistent postural-perceptual dizziness. Only 1 patient was diagnosed with sudden deafness with vertigo, or syncope, or postural hypotension. Our results were different from K Hanley's study in general practice.^[14] Unfortunately, up to 44.1% of patients were discharged without a definite diagnosis.

Like any other study, our study showed that 97.2% of inpatients with dizziness can be improving after treatment. It illustrated that most dizziness diseases were benign. However, only 2 patients were healing and only 1 patient was dying. Based on this fact, we should rule out some malignant diseases as soon as possible and let these patients get the right treatment in time.

It was a retrospective study based on past medical records, so the results were objective. Inevitably, our study has some limitations. Because our study was conducted among hospitalized patients in the department of neurology, the results can only reflect the characteristics of dizziness of inpatients in the department of neurology. The study was different from population-based studies and other studies from otolaryngology department or emergency department. On the other hand, because there was no standardized design in advance, the quality of medical records was uneven. Therefore, we plan to conduct a Randomized Controlled Trial in the near future.

Conclusion

Dizziness was a common clinical symptom. The inpatients with dizziness as the chief complaint accounted for 11.5% of all inpatients in the department of neurology. Dizziness was more common in women than in men. Vertigo and light-headedness were the most common dizziness types in the department of neurology. Some accompanying symptoms (such as headache, ear symptoms) and previous history were critical to the diagnosis of dizziness. Usually, some signs can be found in physical examination and auxiliary examination in patients with dizziness. Therefore, it was necessary to master some simple beside physical examination (such as HINTS, Dix-Hallpike) to differentiate dizziness diseases. Benign paroxysmal positional vertigo was the most common disease in patients with dizziness in our study and stroke/transient ischemic attack was the second most common dizziness disorder.

Although the prognosis of most patients with dizziness was good, some malignant dizziness diseases must be excluded.

Declarations

Ethics approval and consent to participate

The authors declared that all methods were carried out in accordance with relevant guidelines and regulations. The experimental protocol was established, according to the ethical guidelines of the Helsinki Declaration and was approved by the Human Ethics Committee of the Sixth Medical Center of PLA of Chinese General Hospital. Written informed consent was obtained from individual or guardian participants.

Consent for publication

Not applicable.

Availability of data and materials

All data generated or analysed during this study are included in this published article.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

Youjin Shen wrote the main manuscript text. Youjin Shen and Wentao Liu prepared figures. All authors read and approved the final manuscript.

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