

Epidemiology of Vertigo – A National Survey

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ABSTRACT

Objective: Vertigo is a common complaint in general population, using the National Health Insurance (NHI) database, this study investigates the epidemiology of vertigo.

Study Design: Retrospective, cross-sectional study.

Setting: Data was retrieved from the 2006 National Healthcare Insurance (NHI) claim database.

Subjects and Methods: Claim data were retrieved for patients aged ≥ 18 with diagnosis of vertigo (ICD-9-CM codes: 386.XX or 078.81) from January to December, 2006. We describe the prevalence, recurrence and medical resources utilization of vertigo. We use logistic regression model to assess the independent effect of age, sex, level of care, specialty, and season on the risk of vertigo recurrence.

Results: A total of 527,807 patients suffered from vertigo in 2006 (mean age 55.1 ± 17.3 years-old, male vs. female 1: 1.96). The prevalence of vertigo was 3.13 per 100 adults. Within 1 year of index attack, 199,210 patients (37.7%) had recurrence. The prevalence and recurrence of vertigo significantly increased with age (χ^2 test, $P < 0.0001$). Age, sex, level of care, specialty, and season had various impacts on risk of vertigo recurrence.

Conclusions: Vertigo is a major health burden in general adult population. We also found that vertigo is prone to recurrence; the impact is especially prominent for elder

female.

Key words: vertigo, prevalence, recurrence, risk factor, National Healthcare

Insurance

Evidence Level: 2b

INTRODUCTION

According to the 1995 American Academy of Otolaryngology Head and Neck Surgery guideline, vertigo is characterized as “the sensation of motion when no motion is occurring relative to earth’s gravity”.¹ Vertigo may arise from the dysfunction of peripheral or central balance organs. Around 80% of the vertigo (such as benign paroxysmal positional vertigo - BPPV, vestibular neuritis, and Meniere’s disease...etc.) are resulted from peripheral causes; central type vertigo contains severer diseases including migrainous vertigo, brainstem ischemia, cerebellar infarction, or intra-cranial hemorrhage.² Vertigo can disrupt a patient’s daily activities to incur profound negative impact on his/her quality-of-life.^{3,4}

Vertigo is a disease prevalent in the population; to improve clinical care and to allocate medical resources appropriately, it is important to understand the prevalence of vertigo. Unfortunately there are limited epidemiology data currently available in the literatures. The community health questionnaire surveys show that 20-30% of the population might have experienced symptoms of “vertigo” or “dizziness” in their life time.⁵⁻⁷ A national telephone survey of Germany reveals that the lifetime prevalence of vertigo in adults is 7.4%, with 1-year prevalence of 4.9%, 1-year incidence of 1.4%, and with female and the elderly predominant.⁴ Other retrospective medical records review studies on the community population shows prevalence of vertigo of specific

types with great variation.^{8,9} The accuracy of extrapolation of these studies might have been restricted by the sampling methodology and the inconsistency in establishing diagnoses.^{10,11}

Taiwan implemented its universal National Health Insurance (NHI) program in 1995. So far the NHI has covered more than 97% of the population.^{12,13} The NHI has collected millions of healthcare claims that can be used for healthcare study. The NHI claims databases are now managed by Taiwan's National Healthcare Research Institute (NHRI) and are opened for academic researches. NHI databases are thus a useful data research data sources for epidemiology and medical utilization studies.

Currently, there are limited domestic data regarding the occurrences of vertigo in Taiwan. Using the 2006 NHI claim database, aims of this study are to investigate the epidemiology and risk factors of vertigo in Taiwan. The prevalence and medical resource utilization for vertigo are analyzed and reported.

METHODS

Data Sources

Data for this study were obtained from the Bureau of National Health Insurance claim databases. Claim data from January to December 2006 were used. The database contains "outpatient health expenditure file", "outpatient order file", "admission health expenditure file", and "admission order file". The database uses the

International Classification of Diseases, Ninth Clinical Modification (ICD-9-CM) as diagnostic codes. The population data was retrieved from registry for beneficiaries of the Bureau of National Health Insurance (BNHI).¹⁴ The study was approved by the IRB of the Cathay General Hospital.

Definition of Terminology

The following criteria are used for data management:

Patients: age \geq 18 years-old.

Prevalence: defined as the proportion of population with existing disease during a period of 1 year.

Vertigo: ICD code 386.XX or 078.81.

Index attack: defined as the first attack of vertigo occurred during year 2006.

Visit: defined as the times of outpatient clinic office visit for a patient.

Episode: office visits with same diagnosis occurred within 28 days period are defined as within one episode of vertigo. Two episodes have to be at least 28 days apart without any vertigo-related visit within the observed interval.

Recurrence: defined as numbers of vertigo episodes following index attack within at least 12 months' follow-up.

Study Population

Adult patients with ICD-9-CM codes 38600 to 3869, and 078.81 were recruited,

excluding those co-morbid with cerebro-vascular diseases (ICD-9-CM codes 43300 to 43391, 43400 to 43491, 4358 to 4359, 436, 4378 to 4379, or 99702) during index attack.

Statistical Analyses

We used descriptive statistical analyses (frequency, percentage, mean, and standard deviation) to describe the medical utilization, prevalence, and characteristics of vertigo population. We compared the frequency of prevalence and recurrence using χ^2 test. Continuous variables were compared using unpaired Student's t-test or ANOVA. We used logistic regression model to assess the independent effect of age, sex, level of care, specialty, and season on prevalence and recurrence of vertigo. All *p* values used in these tests were two-tailed, with a level of 0.05 accepted as statistically significant.

RESULTS

General Demographics of Vertigo Patients

The NHI beneficiary population aged ≥ 18 in Taiwan was 16,838,659 in 2006 (96% of the total population was covered).¹⁴ A total of 527,807 patients suffered from at least one episode of vertigo, with male vs. female ratio of 1: 1.96 (M:F=178,192:349,615). The mean age of the patients was 55.1 ± 17.3 years-old (range 18-113). There were 931,238 episodes of vertigo that generated 1,873,040 vertigo-related visits; 6,761 episodes generated 7,070 admissions nation-wide.

Estimated Prevalence

The 527,807 vertigo patients accounted for 3.13% (527,807/16,838,659) of the general adult population. The prevalence in general was equivalent to 3.13 per 100 adults.

Recurrence

Within 1 year of index attack, 199,210 patients (37.7% of all vertigo patients) had at least 1 recurrence episode; in which 96,215 (48.3%) had 1, 42,950 (21.6%) had 2, 28,252 (14.2%) had 3, and 31,793 (15.9%) had more than 3 recurrent episodes.

Influence of Age

Patients were categorized into 18-29, 30-39, 40-49, 50-59, 60-69, ≥ 70 age groups. The prevalence of vertigo significantly increased with age (χ^2 test, $P < 0.0001$)

(table 1, figure 1). The recurrence rates as well significantly increased with age (χ^2 test, $P<0.0001$) (table 1).

Influence of Gender

Female comprised 66.2% of the vertigo patient population. The prevalence were 2.2% in male, and 4.0% in female adult populations. There were female predominance in all age groups (Figure 1). The recurrence rates were significantly higher in female patients. (χ^2 test, $P<0.0001$) (Table 1).

Seasonal Variation

The monthly occurrences are shown in figure 2. Winter (27.1%) and spring (26.3%) had higher occurrences. January had highest occurrence rate (12.9%) among all months in a year.

Diagnosis

The ICD-9 codes analyses show that 386.1 (other and unspecified peripheral vertigo), 386.9 (unspecified vertiginous syndromes and labyrinthine disorders) and 386.0 (Meniere's disease) are the most common used codes (38.5%, 25.7%, and 21.6% respectively), followed by 386.2 (vertigo of central origin, 10.1%), 386.5 (labyrinthine dysfunction, 3.2%), 386.3 (labyrinthitis, 0.8%), 386.8 (other disorders of labyrinth, 0.1%), and 386.4 (labyrinthine fistula, 0.01%).

Utilization Review

Most of the vertigo were cared at primary care level (817,534 visits, 43.7%), followed by at community hospital (789,541 visits, 42.2%), and medical center (265,915 visits, 14.2%) levels. The patients were treated by otolaryngology (452,324 visits, 24.2%), internal medicine (359,223 visits, 19.2%), neurology (246,512 visits, 13.2%), and general practitioner (208,046 visits, 11.1%). In general, the length of medication for every episode was 26.9 ± 28.0 days. The per episode lengths of medication were different among different levels of care institutions (clinics 19.0 ± 21.5 days, community hospital 32.2 ± 30.7 days, medical center 38.3 ± 31.8 days, ANOVA, $P < 0.0001$), among different subspecialties (internal medicine 23.6 ± 26.6 days, otolaryngology 27.6 ± 25.8 days, general practitioner 23.4 ± 26.1 days, neurology 42.7 ± 32.7 days, ANOVA, $P < 0.0001$).

Each episode would take 2.0 ± 1.4 visits to treat in general. The treatment visits per episode were different among different levels of care institutions (clinics 1.9 ± 1.5 visits, community hospital 2.1 ± 1.4 visits, medical center 2.1 ± 1.3 visits, ANOVA, $P < 0.0001$).

For the 7,070 vertigo-related admissions, the length of stay was 5.3 ± 9.6 days in general. The length of stay significantly differed among different levels of care institutes (community hospital 5.0 ± 8.1 days, medical center 6.8 ± 14.3 days, t-test, $P < 0.0001$), among different subspecialties (internal medicine 5.0 ± 9.0 days,

otolaryngology 5.0 ± 3.1 days, general practitioner 4.1 ± 3.3 days, neurology 4.8 ± 8.3 days, $P < 0.0001$), and among different age groups as well (Table 2).

Risk Factors for Recurrence

Logistic regression model revealed that age, sex, level of care, specialty, and season had various impacts on risk of vertigo recurrence. Female patients had significantly higher odd ratio (OR) of recurrence than male patients (OR=1.10, 95% CI 1.08 to 1.11). Compared to those aged 18-29 years, the patients aged 30-39 years (OR=1.64, 95% CI 1.59 to 1.69), 40-49 years (OR=2.24, 95% CI 2.18 to 2.30), 50-59 years (OR=2.87, 95% CI 2.79 to 2.94), 60-69 years (OR=3.66, 95% CI 3.56 to 3.76), and 70 years or older (OR=4.49, 95% CI 4.37 to 4.61) all had significantly increased OR of recurrence.

As compared to level of care at clinics, the patients cared in community hospital (OR=0.91, 95% CI 0.90 to 0.92) and in medical centers (OR=0.89, 95% CI 0.87 to 0.90) both had significantly reduced OR of recurrence.

As compared to non-categorized physicians (others), patients cared by neurologist (OR=1.20, 95% CI 1.18 to 1.23), general practitioner (OR=1.09, 95% CI 1.06 to 1.11), otolaryngologists (OR=1.07, 95% CI 1.05 to 1.08), and internist (OR=1.06, 95% CI 1.04 to 1.08) were associated with a significantly increased OR of recurrence.

As compared to spring attack, the patients had significantly reduced OR of recurrence when their initial attack occurred in summer (OR=0.83, 95% CI 0.81 to 0.84) and in fall (OR=0.75, 95% CI 0.74 to 0.77). Patients with initial attack in winter had a significantly higher OR of recurrence than those in spring (OR=1.60, 95% CI 1.58 to 1.63) (Table 3).

DISCUSSION

Vertigo Epidemiology in General

Dizziness, vertigo, and imbalance are common patient complaints. Hannaford et al. reported that nearly 21% of ear, nose, throat patients had “spinning dizziness” problem in the previous year.⁷ Yardley L et al.⁶ by studying 4 London local practices, reported that dizziness may account for 23.3% of the patient complaints (Table 4). As an important disease entity in neurology and otolaryngology clinical practice, accurate prevalence is however hard to estimate due to the difficulty in making differential diagnoses.² There are currently limited information on the epidemiology of vertigo in general (Table 4), and the data are hardly comparable owing to the variability of study designs.^{4,6,15,16} In this claim database study, we estimated that during year 2006, the prevalence of vertigo was 3.13% in Taiwan. The data was close to the 4.8%-5.2% 1-year prevalence estimated by Neuhauser’s national telephone questionnaire surveys.^{4,16}

Recurrence

Recurrence is commonly seen in vertigo patients; the nature course of vertigo is a topic of interest in several studies.¹⁷⁻²⁰ Neuhauser et al.⁴ showed life-long recurrent vestibular vertigo in 89% of patients. In a 10-year follow-up study of patients with BPPV, the recurrence rate was 50%; 80% of these recurred in the 1st year.²⁰ Tokumasu et al. reported 51.7% of Meniere's disease recurrence in a 16-year observation study; 78.6% recurred in the 1st year following initial attack.¹⁸ The mean vertigo frequency was 4.5 episodes per year.¹⁹ In this study, we estimated that the 1-year vertigo recurrence rate was 37.7% in general; 15.9% of them had more than 3 recurrent episodes in 1 year. Patients cared by specialists (otolaryngologist, internal medicine, and neurologist) had higher recurrence rates, probably attributed to the severity or patterns of diseases.

Risk Factor

Most of the epidemiological studies on vertigo dealt with age and gender. It is generally agreed that vertigo prevalence may increase with age, especially in female. A cross-sectional, nation-wide neurological survey in Germany showed the mean age of vertigo onset was 49.4 years; and the prevalence was higher in women.²¹ Dieterich et al.²² reported 1.5 times higher prevalence rate for migrainous vertigo in female. As for Meniere's disease, Watanabe et al.²³ showed the average Meniere's disease onset

age was 42 in men and 41 in women. In this study, our data attest that prevalence and recurrence both increased with age, and with female predominance (Table 3, Figure 2).

Season of vertigo onset is another interesting issue. Wladislavosky-Waserman et al.²⁴ found that patients with Meniere's disease were evenly distributed throughout the year, except for a slight increase at the end of the winter and beginning of the spring. Similar findings were reported by Mizukoshi et al.⁸ Our data are compatible with others by showing relatively higher vertigo occurrences in winter and spring (Figure 1).

Healthcare Utilization

Vertigo ranks among the most frequent complaints in neurology and otolaryngology practices, as so it is important to understand the medical resource consumption resulted from vertigo treatment. Neuhauser et al.¹⁶ reported that 58% of patients with dizziness would have at least 1 medical consultation in their life time. Half of the patients were seen by primary care physicians, and the other half frequently went to neurologists or otolaryngologists. Our data show most of vertigo patients were taken care by otolaryngologists, internal medicine doctors, or neurologists at primary care level (Table 2). The admission rate of 1.2% (6,311/527,807) in Taiwan was less than the 1.9% reported by Neuhauser et al.¹⁶

It is note-worthy to find that recurrence rates were lower in patients treated in hospital level care institutions. We speculate that this may attribute to the longer and complete medication prescribed by these institutions (Table 2).

Methodology and Study Limitation

The NHI data base proves to be useful to provide epidemiological data of vertigo. However, there is no clinical and severity information in the dataset. The accuracy of diagnosis coding from healthcare provider may affect the validity of data, fortunately the BNHI has enforced several measures to cross-check and to monitor the accuracy of diagnostic coding. We found most of the providers were not able to further differentiate actual diagnoses of vertigo at index visits. The prevalence of Meniere's disease, BPPV, or vestibular neuritis can not be estimated from this study. And, since we defined "2 vertigo episodes have to be a least 28 days apart" to overcome the arbitrary NHI prescription days restriction (3 days for clinics, 7 days for hospitals, 28 days for chronic condition), this may cause under-estimation of actual prevalence and recurrences of vertigo.

CONCLUSION

There are limited epidemiological data currently available in the literatures. In this study we found vertigo is a major health burden in general adult population. During 2006 in Taiwan, 527,807 adults sought health care service because of vertigo,

representing an annual prevalence of 3.13 per 100 adults; the overall recurrence rate was 37.7%. We found elder female patients had higher vertigo occurrence rates.

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FIGURE LEGEND

Figure 1. Gender and Age Distribution of Vertigo

Figure 2. Seasonal Variation of Vertigo

TABLES AND FIGURES

Table 1. Prevalence and Recurrence of Vertigo

Variable	*Prevalence		Recurrence	
	N (%)	<i>p</i> value	N (%)	<i>p</i> value
Sex		<0.0001		<0.0001
Male	178,192(2.2)		67,278(33.8)	
Female	349,615(4.0)		131,932(66.2)	
Age group		<0.0001		<0.0001
18-29	48,781(1.2)		8,474(4.3)	
30-39	60,034(1.7)		15,471(7.8)	
40-49	90,591(2.5)		29,451(14.8)	
50-59	107,023(4.2)		40,880(20.5)	
60-69	92,597(6.4)		41,126(20.6)	
≥ 70	128,781(9.2)		63,808(32.0)	

*Prevalence=(number of vertigo patient/age-matched NHI beneficiary population) × 100%

Table 2. Medical Resource Utilization (per Episode of Vertigo)

Variable	Visit number		Days of medications		Length of stay	
	N (%)	<i>p</i> value	Mean±SD	<i>p</i> value	Mean±SD	<i>p</i> value
Level of Care		<0.0001		<0.0001		<0.0001
Medical center	265,915(14.2)		38.3±31.8		6.8±14.3	
Community hospital	789,541(42.1)		32.2±30.7		5.0±8.1	
Clinic	817,584(43.7)		19.0±21.5		-	
Specialty		<0.0001		<0.0001		<0.0001
Internal medicine	359,223(19.2)		23.6±26.6		5.0±9.0	
Otolaryngology	452,324(24.2)		27.6±25.8		5.0±3.1	
Neurology	246,512(13.2)		42.7±32.7		4.8±8.3	
Family medicine	208,046(11.1)		23.4±26.1		4.1±3.3	
Others	606,935(32.4)		24.5±27.6		7.3±14.4	
Total	1,873,040(100)		26.9±28.0		5.3±9.6	

Table 3. Predictors for Vertigo Recurrence

Variable	OR (95% CI)	<i>p</i> value
Sex		
Male	-	-
Female	1.10(1.08-1.11)	<0.001
Age		
18-29	-	-
30-39	1.64(1.59-1.69)	<0.001
40-49	2.24(2.18-2.30)	<0.001
50-59	2.87(2.79-2.94)	<0.001
60-69	3.66(3.56-3.76)	<0.001
≥70	4.49(4.37-4.61)	<0.001
Level of Care		
Medical center	0.89(0.87-0.90)	<0.001
Community hospital	0.91(0.90-0.92)	<0.001
Clinic	-	-
Specialty		
Internal medicine	1.06(1.04-1.08)	<0.001
Otolaryngology	1.07(1.05-1.08)	<0.001
Neurology	1.20(1.18-1.23)	<0.001
Family medicine	1.09(1.06-1.11)	<0.001
Others	-	-
Season		
Spring	-	-
Summer	0.83(0.81-0.84)	<0.001
Fall	0.75(0.74-0.77)	<0.001
Winter	1.60(1.58-1.63)	<0.001

Table 4. Summary of Vertigo Epidemiology Literatures

Year	Author	Disease Entity	Methodology	Study Population	Important finding
1998	Yardley L, et al	dizziness	postal questionnaires	2,064 people (aged 18-64 years) randomly sampled from the patient lists of 4 London practices	23.3% reported symptoms of dizziness in past month
2004	Guilemany JM, et al	vertigo	prospective study, medical report	3,283 patients treated at ENT service of the Hospital Clinic in Barcelona	18% (591/3283) suffered from vertigo between 1 January and 31 December, 2001
2005	Neuhauser HK, et al	1. vestibular vertigo 2. dizziness 3. imbalance	1. cross-sectional neurotologic survey, population in Germany 2. computer-assisted telephone interviews	•non-institutionalized adult •nationwide modified random digit dial sampling	•life time prevalence of vestibular vertigo 7.8% •1-year prevalence 5.2% •1-year incidence 1.5% •vestibular vertigo, affect > 5% of adults in 1 year
2008	Neuhauser HK, et al	1. dizziness 2. vertigo	1. cross-sectional neurotologic survey, population in Germany 2. computer-assisted telephone interviews	•non-institutionalized adult •nationwide modified random digit dial sampling	•vestibular vertigo prevalence 4.8% •vestibular vertigo incidence 1.4%

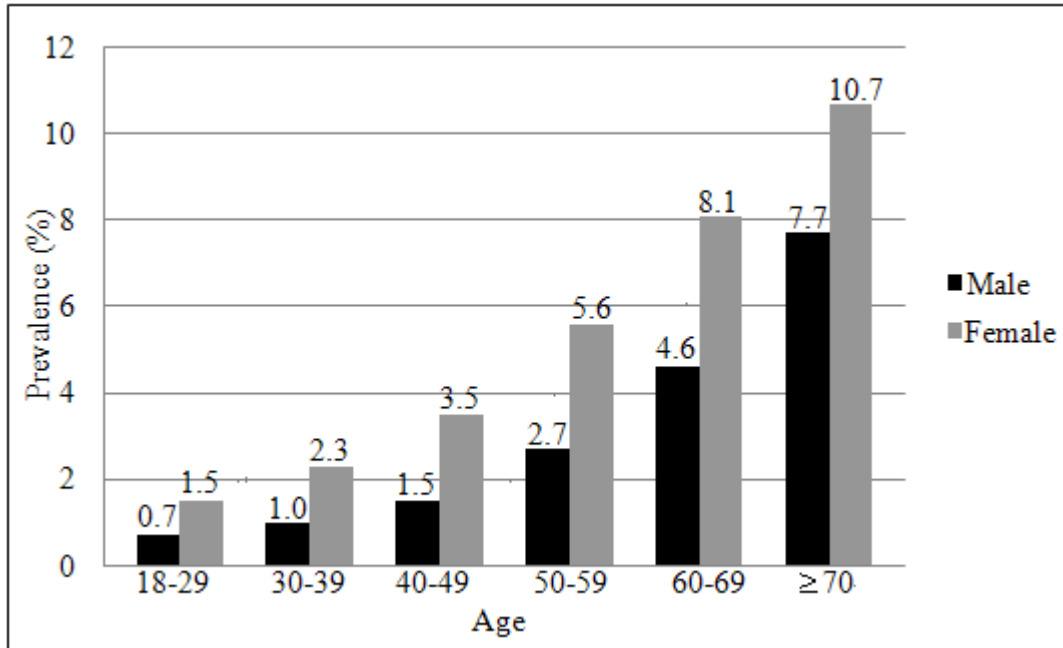


Figure 1. Gender and Age Distribution of Vertigo

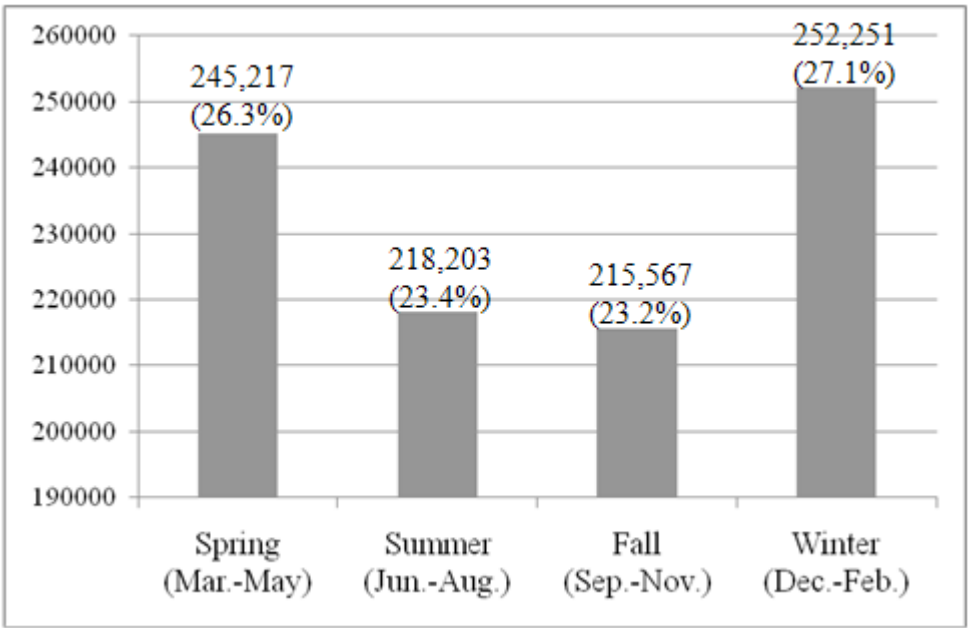


Figure 2. Seasonal Variation of Vertigo

