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Incidence, seasonality and comorbidity in vestibular neuritis

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Abstract

Aims of the present study were: 1) to assess the incidence of vestibular neuritis (VN) in the adult population in two cities in Croatia, 2) to identify distribution of new VN cases in the different months and seasons by years, and 3) to identify comorbidities associated with VN. This is a prospective, population-based study conducted in the cities of Zagreb and Velika Gorica, Croatia in the 2011–2012 period. All diagnoses were confirmed either with caloric test or vestibular evoked myogenic potentials within 7 days of symptom onset. Following clinical parameters were collected from all patients: age, gender, side of the lesion, month and season of symptoms onset and comorbidities. We identified 79 new cases of VN (34 in 2011, 45 in 2012). The male to female ratio was 1.1:1. The mean age at the onset of the disease was 52.3 (range 20–86) years. The average annual incidence was 11.7 per 100,000 (95% CI 7,8 - 15,6) in the 2011 period and 15.5 per 100,000 (95% CI 11,0 - 20,0) in the 2012 period. For both years there was no statistically significant uneven distribution in the different months or seasons by years. The most frequent comorbidities present in VN patients were hypertension (30.4%), diabetes mellitus (8.9%), hyperlipidemia (7.5%) and hypothyreosis (6.3%). Our study has shown higher incidence of VN than previously reported. We have found no evidence of seasonality of VN and significant proportion of VN patients older than 50 years who had vascular risk factors present.

Key words: vestibular neuritis, incidence, seasonality, comorbidities

Introduction

Vestibular neuritis (VN) is one of the most common causes of peripheral vertigo. The vertigo in VN typically develops acutely, is severe for a few days, and then gradually subsides over the course of a few weeks.[1] Vestibular vertigo defined according to the following criteria: 1) rotational vertigo, 2) positional vertigo, or 3) recurrent dizziness with nausea *and* either oscillopsia or episodic imbalance, has an incidence of 15 per 100,000 persons per year.[2] An annual incidence of vestibular neuritis approximating 3.5 cases per 100,000 persons was reported by Sekitani and colleagues, but further literature on the subject is lacking.[3]

Several facts are supporting the viral cause of VN: 1) disorder often has a viral prodrome, 3) it occurs in epidemics, 3) it may affect several members of the same family, and 4) it occurs more commonly in spring and early summer.[4] However studies investigating seasonality of VN are scarce and often conflicting. [5-7]

Comorbidities associate with vestibular vertigo include self-reported depression in the past year, bothering tinnitus in the past 7 days, hypertension, hyperlipidemia and diabetes mellitus.[2] This association of vestibular vertigo with strong stroke risk factors suggest a different etiology in selected (older) populations.

Aims of the present study were: 1) to assess the incidence of VN in the adult population in cities Zagreb and Velika Gorica, Croatia, 2) to identify distribution of new VN cases in the different months and seasons by years, and 3) to identify comorbidities associated with VN.

Patients and methods

This is a prospective, population-based study conducted in the cities of Zagreb and Velika Gorica in Croatia. According to the 2011 census an average population of these tow cities is 853.534 inhabitants. The emergency neurological service is provided by four hospitals in this region according to the place of residence, and University Hospital Center Zagreb cares for 290.306 inhabitants (34% of the

population) in the following communities: Medveščak, Maksimir, Novi Zagreb, Pešćenica, Trnje and Velika Gorica. The emergency neurological service can be reached in three ways: 1) patients are referred by general practitioner, 2) patients are brought to the emergency room by an ambulance, or 3) patients can come by themselves. In all three cases neurologist or neurological resident who is on call in the Emergency department of the University Hospital Center Zagreb examines the patient.

All VN cases examined in the Emergency department were prospectively collected from the period 2011–2012.

Patients with vestibular neuritis nearly always report true vertigo, which is characteristically described as visualized spinning of the environment and the symptoms are typically severe for 1-2 days with gradual resolution over weeks to months.[8] Based on symptoms severity of VN and specificity of emergency medicine service in Croatia, it can be assumed that all VN patients will be examined in the emergency department in the first couple of days of clinical presentation.

Patients older than 20 years fulfilling criteria for VN were included. The following criteria were applied: 1) vertigo attack lasting no more than 48 hours, 2) spontaneous horizontal-torsional nystagmus with the fast phase towards one side, 3) positive head-thrust test to the other side, 4) absence of skew deviation (assessed by Maddox rod), 5) a normal brain CT scan.[9] Patients were excluded if they had any other neurologic deficit; experienced hearing loss or tinnitus. If the patient met inclusion criteria one of the 4 neurologists with detailed knowledge and expertise in neuro-otology, who were on call for that day, would come to the emergency department and personally examine the patient within 6 hours, confirming the diagnosis of VN.

Following clinical parameters were collected from all patients: age, gender, side of the lesion, month and season of symptoms onset. Comorbidities of all patients were registered, as well.

All diagnoses were confirmed either with caloric test or vestibular evoked myogenic potentials (VEMP) within 7 days of symptom onset. All patients underwent brain MRI, during the first three months from initial presentation, to exclude any brainstem and cerebellar lesions.

The study was approved by the Ethical Committee of the University Hospital Center Zagreb and all patients signed an informed consent prior to their inclusion in the study.

Statistical Analysis. When data collection was completed, statistical calculations were made for annual incidence, and adjusted for gender and age on January 15th, 2013. The incidence rates are provided in 10-year age groups, ranging from 20 up to ≥90 years of age, for 2011 and 2012 year periods. Population denominator data were obtained from the 2011 national census.[10] Chi-Square test was used to test if there is non-random distribution and Rayleigh test was used to achieve information about the seasonality. To examine the association of comorbidities with VN, Pearson Chi-Square test and Fisher's Exact test were used to determine the relationship between two categorical variables. Statistical analysis was performed with software IBM SPSS Statistics 20.

Results

Incidence. During the study period, we identified 79 new cases of VN (34 in 2011, 45 in 2012) living in the area of Zagreb and Velika Gorica. The male to female ratio was 1.1:1. The mean age at the onset of the disease was 52.3 (range 20–86) years. Altogether 66 patients performed VEMP. The VEMP results are shown in Table 1. Of significance is that there was a statistically significant lower amplitudes level in both superior (assessed with the oVEMP) and inferior (assessed with the cVEMP) branches of the vestibular nerve on affected side compared to the healthy side. As well 57 patients had performed standard caloric testing confirming the diagnosis of VN.

The average annual incidence was 11.7 per 100,000 in the 2011 period, with a gender-specific incidence of 13.6 per 100,000 in men and of 10.1 per 100,000 in women. The average annual incidence was 15.5 per 100,000 in the 2012 period, with a gender-specific incidence of 17.4 per 100,000 in men and of 13.9 per 100,000 in women. The annual incidence adjusted for gender and age for both years is presented in Tables 2 and 3. The highest incidence of VN was in the 50-69 age groups, 18 cases (52.9%) in 2011 period and 24 cases (53.3%) in 2012 period.

Seasonality. Distribution of new VN cases in the different months by years is presented in Figure 1 and seasons by year in Figure 2. For both years there was no statistically significant uneven distribution in the different months (Chi-Square 7,647, p=0.745 and Chi-Square 7,533, p=0.754 for 2011 and 2012 periods, respectively) or seasons (Chi-Square 2,235, p=0.525 and Chi-Square 1,133, p=0.769 for 2011 and 2012 periods, respectively) by years. The same was evident by using Rayleigh test: there was no evidence of seasonality for both years (Z= 0.837, p= 0.436 and Z=0.167, p= 0.847 for 2011 and 2012 periods, respectively).

When we divided patient into under (48 patients) or over 50 years old (31 patients) groups, we found no statistically significant difference in distribution of patients in the different months (Chi-Square 5,000, p=0.931 and Chi-Square 9,000, p=0.622 for under 50 years old group and over 50 years old group, respectively) or seasons (Chi-Square 1,645, p=0.649 and Chi-Square 3,167, p=0.367 for under 50 years old group and over 50 years old group, respectively). Rayleigh test showed similar distribution with no statistically significant evidence of seasonality (Z= 0.725, p= 0.486 and Z=0.099, p= 0.907 for under 50 years old group and over 50 years old group, respectively).

Comorbidities. The most frequent comorbidities present in VN patients were hypertension (30.4%), diabetes mellitus (8.9%), hyperlipidemia (7.5%) and hypothyreosis (6.3%). The detailed list of all comorbidities present in the studied population is presented in Table 4 and 36/79 (45.5%) patients did not have any comorbidities.

As more than half of the cases of VN occurred after the age of 50 (48 cases, 60.8%), we correlated the occurrence of four most frequent comorbidities (hypertension, diabetes mellitus, hyperlipidemia and hypothyreosis) with this age limit. The results have shown that hypertension and diabetes mellitus were statistically significant associated with the age limit of 50 years (Pearson Chi-Square 22.264, p<0.001 and Fisher's Exact Test 4.960, p=0.038, respectively), while there was no statistically significant association between hyperlipidemia and hyperthyreosis with the age limit of 50 years (Fisher's Exact Test 4.193, p=0.076 and Fisher's Exact Test 0.001, p=1, respectively).

Discussion

Our study has shown that the incidence of VN in the study population varies from 11.7 to 15.5 per 100000 per year. This relatively high incidence of VN is in contrast to the only incidence study performed in Japan, which was contrary to our study conducted by means of a questionnaire filled in by major neuro-otology clinics (by otolaryngologists) during 3 year period.[3] Contrary to this study, our study has several advantages: 1) this was a prospective, population-based study, 2) all cases were examined by one of 4 neurologists with detailed knowledge and expertise in neuro-otology, 3) all cases were confirmed either with caloric testing or VEMP, and 4) stroke was excluded by MRI as a possible etiology. As well, our data are more in concordance with the a population survey by validated neurotologic interviews carried out in Germany, which showed the 1-year incidence 14 per 100000.[2] The same study has also shown that of all participants with vestibular vertigo, 70% had consulted a doctor for their vertigo, and 80% reported severe vestibular vertigo (defined as vertigo leading to a medical consultation, interruption of daily activities, or sick leave). Although it is possible that we missed some of the cases of VN, this is unlikely due to before mentioned data in combination with specificities of Croatian emergency medicine system.

Our study has also shown no evidence of seasonality for VN. It has been suggested that seasonal variability in VN argues viral hypothesis of VN. Several studies have suggested that a viral agent may be the underlying cause of VN, either by demonstrating the presence of herpes simplex virus DNA within vestibular nerve fibers and “Scarpa’s” ganglion or by demonstrating histologic changes within the vestibular nerve suggestive of viral-induced atrophy and inflammation.[11-15] On the other hand, an uncertain proportion of acute peripheral vestibular disorders are likely due to a vascular lesion of the nerve, and patients with such lesions may be at increased risk for future vascular events. [16] One study has suggested that age difference (50 years) plays an important role in differentiating between these two possible pathologies, however we were not able to confirm these results. [7]

Contrary to this we have confirmed that patients with VN older than 50 years have comorbid conditions that are now vascular risk factors, possibly supporting vascular etiology of VN, at least in a subset of patients. Some studies have even suggested that vertebral artery hypoplasia may predispose

to severe VN at acute stage, through presumed regional malperfusion.[17] We have also recently reported that chronic white matter supratentorial lesions present on brain MRI were more frequent in patients with worse outcome on VEMP.[18]

In conclusion, our study has shown higher incidence of VN than previously reported. We have found no evidence of seasonality of VN and significant proportion of VN patients older than 50 years who had vascular risk factors present. Further studies addressing possible vascular etiology of VN, in patients older than 50 years, are warranted.

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Figures

Figure 1. Distribution of new VN cases in the different months by years.

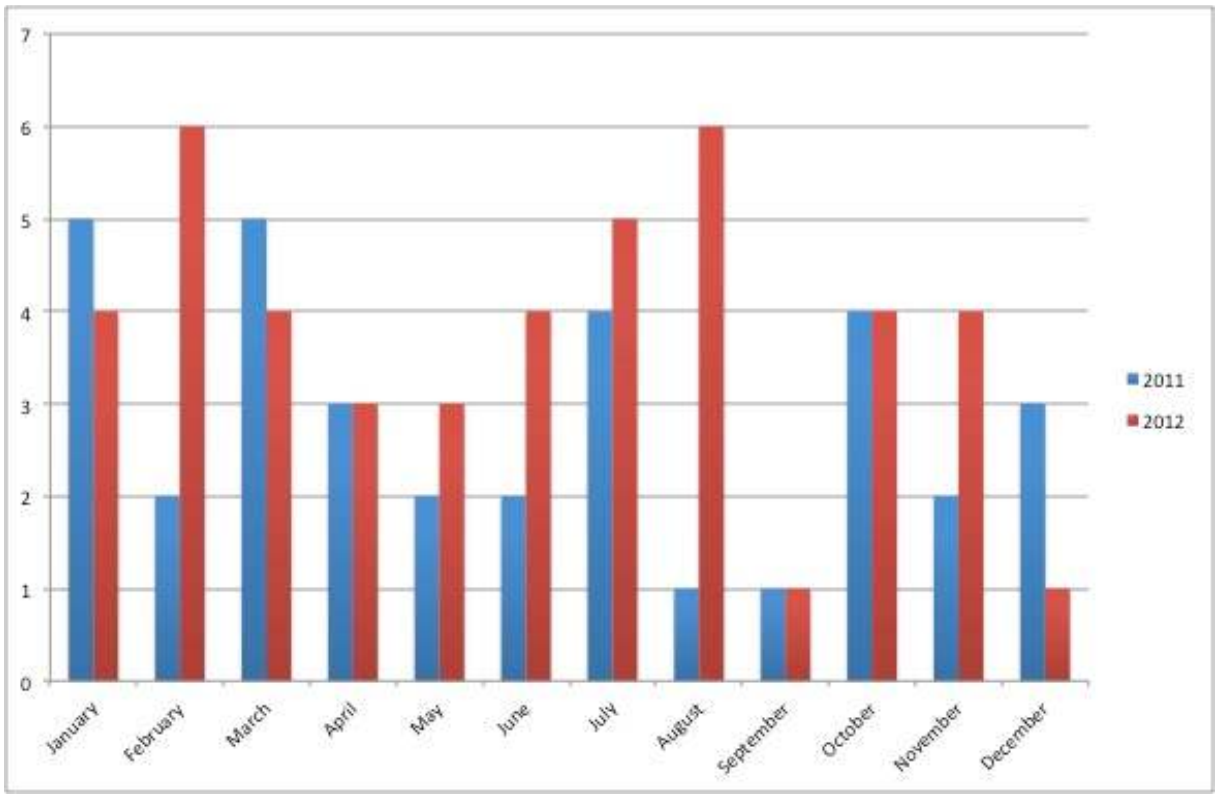
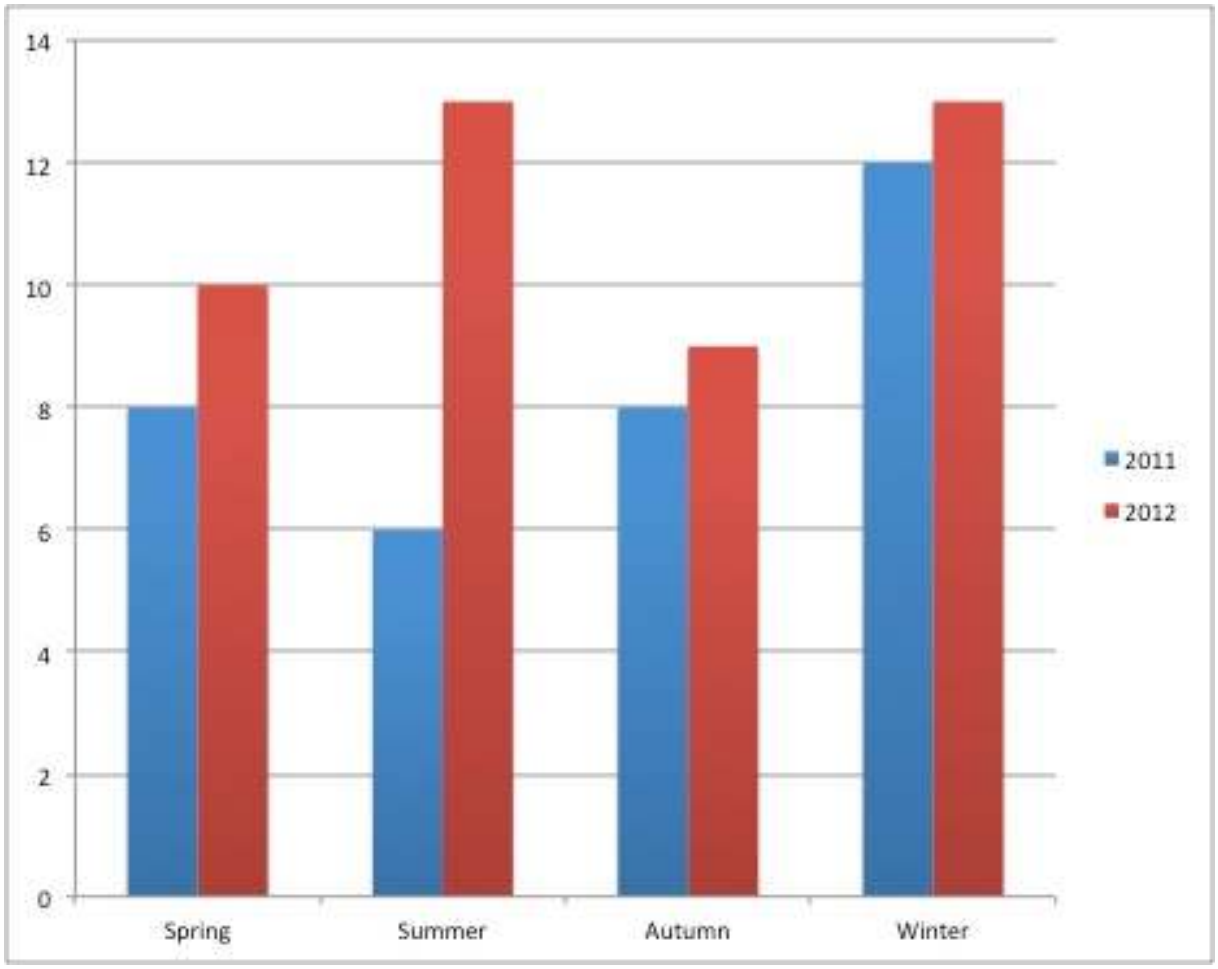


Figure 2. Distribution of new VN cases in the different seasons by year.



Tables

Table 1. Differences in amplitudes of oVEMP and cVEMP between affected and healthy vestibular nerve.

Variable	Median	N	p-value
O_H N10-P13 amp [μV]	6,030	66	0,000
O_A N10-P13 amp [μV]	3,600	66	
Variable	Mean	N	p-value
SCM_H CorAmp [μV]	1,5347	66	0,000
SCM_AcorAmp [μV]	1,1745	66	

O – ocular muscle, SCM – sternocleidomastoid muscle, A – affected side, H – healthy side, CorAmp – corrected amplitude

Table 2.

Incidence of vestibular neuritis in 2011.

Age groups	Patients			Population			Incidence/100000			SE/100000; 95% CI		
Age	M	F	All	M	F	All	M	F	All	M	F	All
20-29	2	0	2	23604	23963	47567	8,5	0,0	4,2	6,0; -3,3 - 20,2	0,0	3,0; -1,6 - 10,0
30-39	1	3	4	26423	27513	54136	3,8	10,9	7,4	3,8; -3,6 - 11,2	6,3; -2,4 - 23,2	3,7; 0,1 - 14,6
40-49	4	2	6	23249	25169	48418	17,2	7,9	12,4	8,6; 0,3 - 34,1	5,6; -3,1 - 19,0	5,1; 2,5 - 22,3
50-59	5	4	9	23196	28014	51210	21,6	14,3	17,6	9,6; 2,7 - 40,4	7,1; 0,3 - 28,3	5,9; 6,1 - 29,1
60-69	5	4	9	18201	24047	42248	27,5	16,6	21,3	12,3; 3,4 - 51,6	8,3; 0,3 - 32,9	7,1; 7,4 - 35,2
70-79	1	3	4	12656	18657	31313	7,9	16,1	12,8	7,9; -7,6 - 23,4	9,3; -2,1 - 34,3	6,4; 0,3 - 25,3
80-89	0	0	0	4603	9684	14287	0,0	0,0	0,0	0,0	0,0	0,0
90+	0	0	0	351	976	1327	0,0	0,0	0,0	0,0	0,0	0,0
TOTAL	18	16	34	132283	158023	290306	13,6	10,1	11,7	3,2; 7,3 - 19,9	2,5; 5,2 - 15,1	2,0; 7,8 - 15,6

Table 3. Incidence of vestibular neuritis in 2012.

Age groups	Patients			Population			Incidence/100000			SE/100000; 95% CI		
Age	M	F	All	M	F	All	M	F	All	M	F	All
20-29	2	2	4	23604	23963	47567	8,5	8,3	8,4	6,0; -3,3 - 20,2	5,9; -3,2 - 19,9	4,2; 0,2 - 16,7
30-39	2	3	5	26423	27513	54136	7,6	10,9	9,2	5,4; -2,9 - 18,1	6,3; -1,4 - 23,2	4,1; 1,1 - 17,3
40-49	4	4	8	23249	25169	48418	17,2	15,9	16,5	8,6; 0,3 - 34,1	7,9; 0,3 - 31,5	5,8; 5,1 - 28,0
50-59	12	6	18	23196	28014	51210	51,7	21,4	35,1	14,9; 22,5 - 81,0	8,7; 4,3 - 38,6	8,3; 18,9 - 51,4
60-69	1	5	6	18201	24047	42248	5,5	20,8	14,2	5,5; -5,3 - 16,3	9,3; 2,6 - 39,0	5,8; 2,8 - 25,6
70-79	1	2	3	12656	18657	31313	7,9	10,7	9,6	7,9; -4,1 - 23,4	7,6; -4,1 - 25,6	5,5; -1,3 - 20,4
80-89	1	0	1	4603	9684	14287	21,7	0,0	7,0	21,7; 20,9 - 64,3	0,0	7,0; -6,7 - 20,7
90+	0	0	0	351	976	1327	0,0	0,0	0,0	0,0	0,0	0,0
TOTAL	23	22	45	132283	158023	290306	17,4	13,9	15,5	3,6; 10,3 - 24,5	3,0; 8,1 - 19,7	2,3; 11,0 - 20,0

Table 4. Comorbidities of patients with vestibular neuritis

Disease	Number of patients	Percentage
Hypertension	24	30.4%
Diabetes mellitus	7	8.9%
Hyperlipidemia	6	7.5%
Hypothyreosis	5	6.3%
Coronary heart disease	4	5.1%
Peptic ulcer	3	3.8%
Nephrolithiasis	3	3.8%
Glaucoma	2	2.5%
Alcoholism	2	2.5%
Prostate hypertrophy	2	2.5%
Chronic sinusitis	2	2.5%
Thalassemia	1	1.3%
Polycitemia rubra vera	1	1.3%
Breast cancer	1	1.3%
Gonarthrosis	1	1.3%
Chronic obstructive lung disease	1	1.3%
Angina pectoris	1	1.3%
Chronic pancreatitis	1	1.3%
Hyperuricemia	1	1.3%
Mitral valve prolapse	1	1.3%
Post traumatic stress disorder	1	1.3%
Gastritis	1	1.3%
Thyroid carcinoma	1	1.3%
Headache	1	1.3%
Seizures	1	1.3%
Stroke	1	1.3%

Hepatitis C1	1	1.3%
Sinus tachycarida	1	1.3%