PREVALENCE OF VESTIBULOPATHY IN INSTITUTIONALIZED ELDERLY PERSONS IN NATAL-RN-BRAZIL

Prevalência de vestibulopatia em idosos institucionalizados de Natal - RN - Brasil

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ABSTRACT

Purpose: to assess the prevalence of vestibulopathy and associated factors in institutionalized elderly persons through bedside clinical examination. **Methods:** a cross-sectional study was performed in 12 homes for aged in Natal, Brazil, regulated by the Health Surveillance Department. Elderly persons who possessed a good cognitive level and were able to walk were selected, resulting in a total sample of 115 persons. They were asked whether they had experienced dizziness in the past year, and when the answer was positive, responded to a questionnaire and underwent physical examinations for the diagnosis of vestibulopathy, in accordance with the protocol established by Johnson and Lalwani (2004). The Chi-squared or Fisher's Exact tests were used for statistical analysis, with a significance level of 5%, and the Prevalence Ratio was calculated. **Results:** the prevalence of vestibulopathy was 10.56%, and the condition was associated with osteoarthritis and alcohol consumption. **Conclusion:** there is a low prevalence of vestibulopathy among institutionalized elderly persons in Natal, Brazil.

KEYWORDS: Aged; Dizziness; Homes for the Aged; Vestibular Diseases

INTRODUCTION

Body balance depends on the proper functioning of three systems, which act synergistically: vision, proprioceptive sensitivity and the vestibular apparatus. The latter consists of the labyrinth, pathways and vestibular nuclei, which interrelate in the region of the brain stem with other nuclei and neuronal pathways[1,2]. Changes in body balance may result from dysfunction at any of these levels, whether related to vestibular disorders or not. When the dysfunction occurs in the vestibular system, this is known as vestibulopathy.

The main symptom of vestibulopathy is vertigo, which usually lasts from seconds to minutes, but can also last for hours or days, and is associated in most cases with neurovegetative symptoms. Other otoneurological symptoms, such as hearing loss, tinnitus and aural fullness, may also occur[3,4].

Vestibular dysfunction is a major cause of dizziness in the elderly [5]. It represents 40-50% of cases involving elderly persons referred to otolaryngologists. It is also an important differential diagnosis when an elderly person suffers unexplained falls[6,7].

The main type of vestibulopathy among elderly persons is benign paroxysmal positional vertigo (BPPV), which represents 40% of vestibular disorders in elderly persons aged over 70[7-9]. Vestibular neuronitis, labyrinthitis, Meniere's disease and brain disorders are also common[6].

The diagnosis of vestibular disease is based on clinical history, disease history, medication use and detailed physical examination[5]. Records confirm that medical history, evaluation for nystagmus and the Dix-Hallpike Test[10] are the most important tools for the diagnosis of dizziness, especially of vestibular origin, during primary assessment[8]. Such tests allow the screening of patients who require more

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Conflict of interest: non-existent

extensive examination or assessment at secondary and tertiary care levels.

Clinical examination[1,11], as the initial clinical evaluation of a patient is known, can also be used to distinguish peripheral or central vestibular problems, the degree of injury and whether the condition of the patient is acute or chronic[10,12-15]. There are several tests included in this assessment which, depending on the author in question, vary in number and type. All, however, propose a battery of tests through physical examination only, without additional diagnostic tests[2,16]. This definition is useful for epidemiological evaluation, as minimal resources are necessary for the diagnosis of the maximum possible number of patients. This type of diagnosis uses simple equipment and can be performed quickly.

The aim of this study was to assess the prevalence of vestibulopathy and associated factors in institutionalized elderly persons by clinical bedside examination.

METHODS

The study complied with the criteria and requirements established by Resolution No. 466/12 of the National Health Council (CNS) and followed the recommendations of the Federal University of Rio Grande do Norte (UFRN) Research Ethics Committee (CEP), and was approved under protocol number 309/2012. All the elderly persons voluntarily agreed to participate and signed Letters of Free and Informed Consent.

A population-based cross-sectional study was performed of elderly residents of both private and non-profit Nursing Homes, registered by the Health Surveillance Department, in the city of Natal, Brazil. The municipality has 12 Nursing Homes, six of which are private and six of which are nonprofit, which resulted in a total of 386 elderly persons.

Included in the study were elderly persons who were present in the Nursing Homes at the time of examination and who were able to walk and maintain a focused, conscious dialogue with the examiner. The screening of the elderly persons was performed by caregivers. For the criteria of ability to walk, elderly persons who could walk even with the help of another person or equipment such as a walker or cane were included. Elderly persons with communication problems (for example, those who were deaf or did not speak Portuguese), as well as those with serious memory problems were also excluded. These individuals were identified during the application of the questionnaire, in which some questions were repeated at different times to allow the interviewer to ascertain the attention and memory levels of the elderly person. In the event of inconsistency in the answers, the elderly person was excluded from the study. In the same way, elderly persons who were unable to complete all the physical tests were excluded. A total of 123 elderly persons met the inclusion criteria, and of these, eight refused to participate in at least one stage of the study, giving a total of 115 subjects

To identify vestibulopathy, a questionnaire of neurotological history, initially with the question about the presence of dizziness in the last year was applied. If the answer was affirmative, a further questionnaire was subsequently applied, which consisted of questions regarding type of dizziness, classified in accordance with Drachman and Hart (1972) [17] as vertigo, presyncope, imbalance and psychogenic (or atypical) dizziness; the duration of the dizziness; the presence of hearing loss, tinnitus, aural fullness, neurovegetative symptoms, decreased visual acuity, and the use of a hearing aid, glasses or a cane. Other questions referred to general data regarding the facility, the health of the patient and his or her general life habits. This data was collected directly from the medical records of the patients.

Of the initial 115 elderly persons, only 51 complained of at least one bout of dizziness in the final year.

The physical diagnostic exam for vestibulopathy of these 51 elderly persons was therefore performed, in accordance with the procedures proposed by Johnson and Lalwani[18]. This consists of 11 physical examination tests of the patient with suspected vestibulopathy (Figure 1). In the event that a disorder was identified in one of the tests, a finding suggestive of vestibular injury, the patient was diagnosed as having vestibulopathy.

Exams	Description of vestibulopathy findings
Head and neck exam	Consists of otoscopy, rhinoscopy, nasal endoscopy, cervical examination and examination of cranial nerves. In general, in patients with vestibular disorders, this examination stage remains unchanged[19]
Test for spontaneous and evoked nystagmus using Frenzel Lenses	Spontaneous nystagmus consists of eye movements even when the eyes are stationary, without changes in the direction of gaze. Evoked nystagmus is that which arises only for certain directions of gaze. Spontaneous nystagmus can be present in central and peripheral vestibular disorders, while evoked nystagmus in general is associated with lesions of the cerebellum, or brain stem, or by the use of anticonvulsant, hypnotic and tranquillizing drugs[13,14].
Pursuit – semi-spontaneous nystagmus	Semi-spontaneous nystagmus is observed in one or more cardinal positions of gaze. The patient is asked to shift his or her eyes to the right, left, up and down, being careful to avoid deviations of more than 30º in relation to forward gaze, as beyond this limit adaptation occurs. Normal individuals do not display semi-spontaneous nystagmus with their eyes open. The main type of semi-spontaneous nystagmus appears in more than one direction of gaze with the eyes open (more rarely with eyes closed) [20].
Saccades	Consists of rapid changes in eye position. To test for saccades, the patient is asked to stare at the examiner's nose. Then, the patient has to follow the examiner's finger as it moves repeatedly from right and left and left to right. This test determines the amplitude, rate and latency of the saccades. Changes in these parameters imply cerebellar injury, injury of the brainstem, extraocular muscles or neuro-muscular problems[12,13].
Head impulse	The patient's head is tilted by 30° and he or she is asked to fix on a target. The eyes are observed after the patient lifts his or her head quickly to the horizontal position and stops abruptly. A subsequent refixation saccade indicates peripheral vestibular alteration. A corrective saccade occurs to the affected side[3,12,13,21].
Headshake	The patient is asked to close his or her eyes and tilt the head downwards 30°, and then shake his or head 20 to 30 times horizontally. The presence of nystagmus after shaking of the head indicates a vestibular disorder[12,22,23].
Dynamic visual acuity	This test compares static visual acuity with acuity when the head is moving. Visual acuity is measured from the Snellen Chart. If the patient can identify the letters up to two lines above those identified when the head is still, his or her vestibular system is healthy. If he or she cannot identify letters three levels above or more, he or she is probably suffering from a vestibular lesion[3,12,13,21].
Fixation suppression	The patient is asked to follow a small target moving the head slowly horizontally and vertically. If he or she experiences saccades or nystagmus, as well as blurred vision, he or she may be suffering from cerebellar, brain stem or cortex injury[12,13].
Dix-Hallpike Positional Test	The patient is placed in a sitting position and then quickly lies down, with his head bowed 30-40° over the edge of the stretcher, in subsequent right-left movements. After a few seconds of latency, if the movement triggers a paroxysm of vertigo, with or without nystagmus, BPPV (benign paroxysmal positional vertigo) can be diagnosed[14,15,20,24].
Cerebellar Tests	These are a set of tests aimed at evaluating the coordination of the patient. If there is cerebellar impairment, there will be dysmetria in the movements. In general, the index-nose test or index-index tests, where the patient puts the tip of his or her index finger on the tip of the nose, or the tip of the examiner's index finger, first with the eyes open, then with the eyes closed, are used, as well as evaluation of diadochokinesia, which consists of alternating pronation and supination movements[25].
Romberg Test	The patient remains standing, motionless, with eyes open and then closed with the feet together. Swaying or toppling to one side may indicate acute peripheral vestibular syndrome or uncompensated vestibulopathy, while the side of the movement indicates the side of the lesion[19,21].

Figure 1 - Description of the physical examination bedside with the possible findings.

For the evaluation of visual acuity in the elderly, a screening test was performed with a Snellen Chart[26] positioned five meters from the individual, with normal vision identified as being able to read the 20/20 line with both eyes, corresponding to a visual acuity of 0.8. The test was performed with correction for those elderly persons who used glasses

After data was collected, descriptive analysis was performed to identify the elderly persons with vestibulopathy, as well as bivariate analysis using the Chi-squared or Fisher's Exact tests for a significance level of 5%. The Prevalence Ratio (PR) was calculated and the confidence interval was 95%.

RESULTS

Elderly persons who complained of dizziness in the last year underwent physical examination for the diagnosis of vestibulopathy. Among those where disorders were detected, an epidemiological diagnosis of vestibulopathy was confirmed. Exceptions were made for those elderly persons who only displayed disorders in ocular-motor tests, but who had greatly reduced bilateral visual acuity, identified by the Snellen Chart screening exam, with detection of visual acuity lower than 0.1. In these cases the disorders identified were due to deficiency in the visual, rather than the vestibular, system. As there was no other alteration in the vestibular test, the hypothesis of an injury associated with both systems was excluded. These persons, in spite of testing positive in some aspects of the physical examination, were not considered to have vestibulopathy.

According to these criteria, 13 elderly persons had an epidemiological diagnosis of vestibulopathy, representing a prevalence of 10.56%.

Of the thirteen patients with vestibulopathy, the majority were female (61.5%) and were considered to be very old, or in other words, older than 75 years, with female patients more than a decade older than male patients. With respect to the characteristics of the institution, 76.9% of the patients were residents of non-profit nursing homes and the median length of time for which they had lived at the residence was short. The elderly persons had few associated pathologies and were treated using a polypharmacy program (Table 1).

Table 1 – Median, quartiles, minimum and maximum age, length of time spent living in Nursing homes, total number of medications and total number of pathologies presented by all elderly patients with dizziness from Nursing homes in Natal. Natal-Brazil, 2013.

	N	Minimum	Maximum	Median	Q25-Q75
Age (in years)	13	64	86	78.00	68.50-80.50
Men	5	64	78	67.00	65.00-77.50
Women	8	70	86	79.00	72.75-83.25
Time spent living in nursing homes (in years)	13	1	17	3.00	2.00-9.00
Total number of medications used	13	0	14	5.00	1.50-9.00
Total number of illnesses	13	1	6	2.00	1.50-5.00

The results of the physical exam confirming the presence of vestibulopathy are described in Figure 2.

Of these disorders, ten patients had Peripheral Vestibular Syndrome (76.92%) and three were diagnosed with Mixed Vestibular Syndrome (23.07%). The disorders that suggested the elderly persons had suffered a central lesion with mixed disorders were identified by the Romberg Test, where there was backward toppling, the presence of visual acuity in the fixation suppression test, and the presence of miosis with dizziness in the Dix-Hallpike Test in a patient with migraines. A diagnosis of BPPV (benign paroxysmal positional vertigo), identified through positivity in the Dix-Hallpike Test, was found for eight patients, representing a prevalence of 61.53%.

egarding the distribution of the diseases which elderly persons with vestibulopathy suffered from, it was observed that most had Systemic Arterial Hypertension, according to information collected from medical records, all with the use of antihypertensive medication (Figure 3).

Exam	Patient												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Examination of the head and neck	-	-	-	-	-	-	-	-	-	-	-	-	-
Test for spontaneous and gaze evoked nystagmus using Frenzel goggles	-	-	-	-	-	-	-	-	-	-	-	-	-
Pursuit (semi-spontaneous nystagmus)	-	-	-	-	-	-	-	-	-	-	-	-	-
Saccades	+	+	-	-	-	-	-	-	-	+	-	-	-
Head impulse	-	-	+	+	-	+	-	+	-	-	+	-	-
Headshake	-	-	-	+	-	-	-	-	-	-	-	+	-
Dynamic visual acuity	-	-	-	-	-	-	-	+	-	-	+	-	+
Fixation Suppression	-	-	-	-	-	-	-	+	-	-	-	-	-
Dix-Hallpike Positional Test	-	+	+	+	+	+	+	-	+	+	-	-	-
Cerebellar tests	-	-	-	-	-	-	-	-	-	-	-	-	-
Romberg test	+	-	-	+	+	-	-	+	-	-	+	-	-

Key: +: results showing disorders; -: normal results

Figure 2 – Results of the evaluation of vestibulopathy in elderly persons with dizziness, in accordance with the criteria of Johnson and Lalwani (2004). Only elderly persons considered to have vestibulopathy are shown.

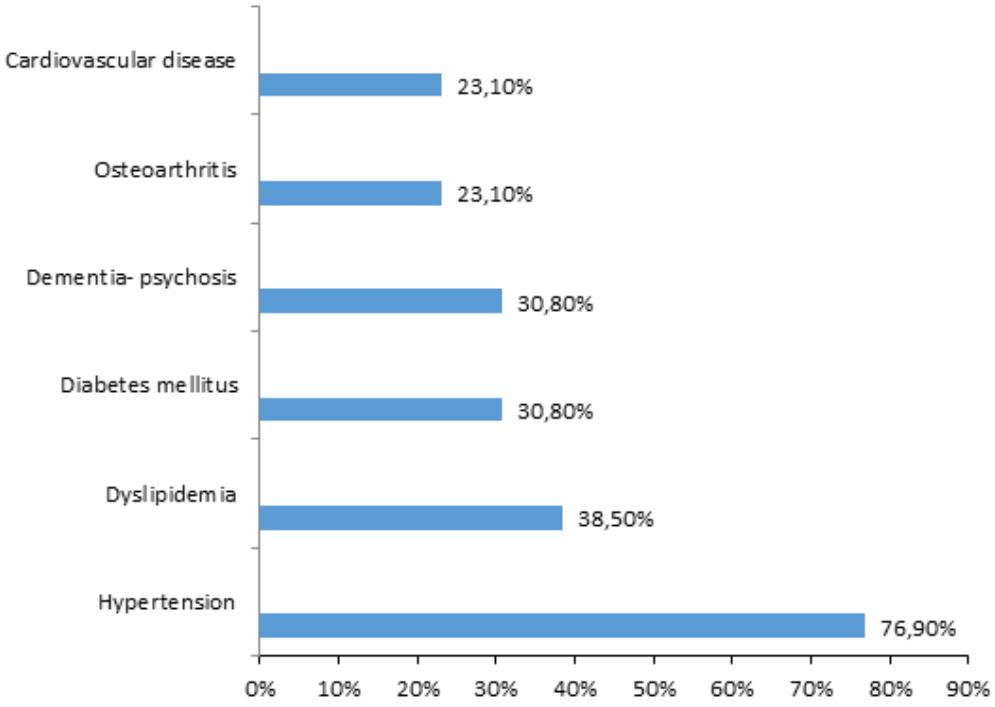

Figure 3 – Distribution of main illnesses suffered by elderly persons in Nursing homes in Natal. Natal, Brazil, 2013.

In relation to lifestyle, only 23.1% of institutionalized elderly persons consumed alcoholic beverages the period in which the data were collected. The same percentage smoked, while 76.9% did not perform any type of physical activity. All of those that did exercise, walked.

The main characteristics of dizziness among elderly persons with vestibulopathy were as follows. Imbalance was the most common type of dizziness, generally lasting seconds, and the majority of persons did not have associated neurovegetative symptoms. In terms of otoneurological symptoms,

most did not complain of tinnitus, hearing loss or aural fullness. Most of the elderly persons had good visual acuity (detected by self-reporting and the screening test performed with the Snellen Chart), despite the fact that many of them used glasses. None of the subjects with vestibulopathy used hearing aid amplification and only two elderly persons needed a cane or walker to walk (Table 2).

Bivariate analysis identified an association between osteoarthritis and alcohol consumption (Table 3).

Table 2 – Characteristics of dizziness, symptoms and associated physical conditions in elderly persons with vestibulopathy in Nursing homes in Natal. Natal, Brazil, 2013.

	N	%
Type of dizziness		
Vertigo	3	23.1
Imbalance	6	46.2
Floating sensation	2	15.4
Floating sensation + Presyncope	1	7.7
Floating Sensation + Vertigo	1	7.7
Duration of dizziness		
Seconds	6	46.2
Minutes	5	38.5
Hours	1	7.7
Days	1	7.7
Presence of neurovegetative symptoms		
No	10	76.9
Yes	3	23.1
Presence of tinnitus		
No	7	53.8
Yes unilateral	3	23.1
Yes bilateral	3	23.1
Presence of hearing loss		
No	9	69.2
Yes unilateral	1	7.7
Yes bilateral	3	23.1
Presence of aural fullness		
No	10	76.9
Yes unilateral	2	15.4
Yes bilateral	1	7.7
Significant reduction in visual acuity		
No	12	92.3
Yes	1	7.7
Use of glasses		
No	5	38.5
Yes	8	61.5
Use of hearing aid		
No	13	100
Use of cane/walker		
No	11	84.6
Yes	2	15.4

Table 3 – Statistical significance (*p*), Prevalence Ratio (PR) and Confidence Interval (CI) of variables related to vestibulopathy in Nursing homes in Natal. Natal, Brazil, 2013.

	With Vestibulopathy	Without Vestibulopathy	p	PR (CI)
Type of facility				
Non-profit	10 (13%)	67 (87%)	0.540	1.645 (0.481-5.630)
Private	3 (7.9%)	35 (92.1%)		
With SAH	10 (13.3%)	65 (86.7%)	0.538	1.778 (0.519-6.093)
Without SAH	3 (7.5%)	37 (92.5%)		
With DM	4 (12.1%)	29 (87.9%)	1.000	1.104 (0.365-3.339)
Without DM	9 (11%)	73 (89%)		
With dyslipidemia	5 (13.9%)	31 (86.1%)	0.541	1.372 (0.482-3.902)
Without dyslipidemia	8 (10.1%)	71 (89.9%)		
With D/P	4 (10.3%)	35 (89.7%)	1.000	0.866 (0.285-2.635)
Without D/P	9 (11.8%)	67 (88.2%)		
With osteoarthritis	3 (37.5%)	5 (62.5%)	0.046*	4.013 (1.374-11.718)
Without osteoarthritis	10 (9.3%)	97 (90.7%)		
With CVD	3 (12.5%)	21 (87.5%)	0.733	1.138 (0.339-3.812)
Without CVD	10 (11%)	81 (89%)		
Alcohol Consumption	3 (50%)	3 (50%)	0.019*	5.450 (2.016-14.734)
Did not consume alcohol	10 (9.2%)	99 (90.8%)		
Sedentary	10 (12%)	73 (88%)	1.000	1.285 (0.378-4.371)
Not sedentary	3 (9.4%)	29 (90.6%)		
Smoker	3 (25%)	9 (75%)	0.136	2.575 (0.821-8.078)
Non-smoker	10 (9.7%)	93 (90.3%)		
Number of years spent living in facility			1.000	1.086 (0.380-3.107)
4 or more	5 (11.9%)	37 (88.1%)		
less than 4	8 (11%)	65 (89%)		
Total number of illnesses			0.765	1.172 (0.410-3.347)
3 or more	5 (12.5%)	35 (87.5%)		
Less than 3	8 (10.7%)	67 (89.3%)		
Total number of medications taken			1.000	1.155 (0.414-3.221)
6 or more	6 (12.2%)	43 (87.8%)		
Less than 6	7 (10.6%)	59 (89.4%)		

Legend: SAH: systemic arterial hypertension, DM: diabetes mellitus D/P: dementia or psychosis, CVD: cardiovascular disease. *: $p<0.05$, Chi-squared or Fisher's Exact tests.

DISCUSSION

The prevalence of vestibulopathy among the general population is between 10 and 30%, rising to 35% among those aged over 40 years[27-29]. In the present study, the prevalence of vestibulopathy among the total population of seniors eligible for the study was 10.56%, which is consistent with the findings for diagnosis at the population level.

Among the causes of vestibulopathy, BPPV has been described as the most common cause among elderly persons[9]. In the present study, the prevalence of BPPV, diagnosed using the Dix-Hallpike Test, was 61.53%, a value slightly higher than previously available information. It is likely that this higher prevalence is due to the age range in this sample, as it is known that the prevalence of BPPV increases with age[6].

The elderly persons who suffered from vestibulopathy were mostly female and had a median age of 78 years. These results are similar to a Brazilian study which found that 76.6% of elderly people with vestibulopathy were women, with a mean age of 73.62 years[30], and another which identified that 68.3% were women, with a mean age of 73.40 years[31]. An American study identified a lower proportion of women with vestibular

disorders (51%)[27]. In all studies involving the elderly population, the presence of a higher percentage of women than men is a striking feature. This is due to the greater presence of older women in the general population, as they have a higher life expectancy.

The number of diseases which elderly persons with vestibulopathy suffered from, as well as the number of medications used, were comparable to data in existing literature, which shows the mean number of diseases per person to be between 1.25 and 3.98 (in the present study the median was two diseases per person) and the mean number of medications to be between 3.86 and 4.08 (in the present study a slightly higher number was found, with a median of five types of medication per elderly person)[11,30-32]. In this aspect, the institutionalized elderly person with vestibular disorders has a similar profile to the elderly patient living in the community.

Existing literature shows that cardiovascular, metabolic and osteoarticular diseases are most associated with vestibulopathy, and may also be related to the genesis of the condition[11,30-32]. In the present study, SAH was the most frequently observed associated disease among the group of elderly patients with vestibular disease, while dyslipidemia and diabetes also represented significant metabolic changes. However, no statistical association was found between these conditions and the emergence of vestibulopathy. A high number of comorbidities and the effect of individual diseases cannot, however, be eliminated as associated factors, as the present study is limited by the small the sample size used.

Similarly, the number of medications taken was not found to be statistically significant in the present study, but the absence of statistical significance does not rule out the effects of polypharmacy. This just was not identified statistically.

The most common type of dizziness associated with vestibulopathy in the present study was imbalance, followed by vertigo. In general, it is known that vertigo is the main classification of dizziness related to vestibular disorders. However, as the elderly person presents degeneration in various systems related to body balance[6], it is common for elderly patients with vestibular disorders to suffer from different types of dizziness, and perhaps even from a combination of types.

The presence of associated neurotological symptoms was also evident among elderly persons with vestibulopathy, as almost half had tinnitus, approximately 30% reported hearing loss, and 23.1% aural fullness. These symptoms are usually present due to lesions involving the cochlear portion of the VIII nerve. Autors[31] found slightly higher values (70.8% tinnitus, 60% hearing loss and 54.2% aural fullness), but this was based on a sample of outpatients, who tend to suffer from a greater number of health complaints than the general population.

Alcohol consumption was found to be associated with vestibulopathy in the present study, as elderly persons who consumed alcohol were 5.45 times more vestibular disorders than those who did not consume alcoholic beverages. There was also an association between osteoarthritis and vestibulopathy, with elderly patients with this disease presenting four times more likely to suffer from vestibulopathy that those who did not. The literature presents studies where alcohol was identified as a risk factor for dizziness in idosos [33,34], confirming the above data. This data confirms that proprioception is involved in maintaining body balance and that alterations in its homeostasis may reflect disorders in the vestibular system. A chronic alcoholic patient would therefore suffer from proprioception and consequent vestibular damage

CONCLUSIONS

Vestibular disease was found in 10.56% of institutionalized elderly persons in Natal, Brazil, with BPPV identified as the most common cause. Vestibulopathy was more prevalent among elderly persons who consumed alcohol, and those with osteoarthritis.

RESUMO

Objetivo: aferir a prevalência de vestibulopatia e seus fatores associadosem idosos institucionalizados por meio do exame clínico de cabeceira. **Métodos:** trata-se de um estudo transversal realizado nas 12 Instituições de longa permanência para idosos de Natal-Brasil, regulamentadas pela Vigilância Sanitária. Foram eleitos os idosos com bom nível cognitivo e capazes de deambular, totalizando 115 indivíduos. Os idosos foram questionados sobre a presença de tontura no último ano, e quando a resposta era positiva, eram submetidos a questionário e exame físico específico para diagnóstico de vestibulopatia, segundo o protocolo de Johnson e Lalwani (2004). Para a análise estatística, utilizou-se o teste do Qui-quadrado ou exato de Fisher para um nível de significância de 5% e cálculo da razão de prevalência. **Resultados:** a prevalência de vestibulopatia foi de 10,56%e foram associados a osteoartrose e o etilismo. **Conclusão:** a vestibulopatia apresenta baixa prevalência nos idosos institucionalizados de Natal-Brasil.

DESCRITORES: Idoso; Tontura; Instituição de Longa Permanência para Idosos; Doenças Vestibulares

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