



## Risk Factors of Dizziness among Institutionalized Elderly Persons: A Case Control Study

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### Abstract

**Introduction:** Institutionalized elderly people suffer from balance disorders, such as dizziness, that may result in falls and health debilitation. The aims of this study were to describe the institutionalized elderly population with dizziness and to determine the risk factors for dizziness related to the institution, lifestyle and health status of the elderly.

**Method:** A case control study was performed in 12 Nursing Homes regulated by the Health Surveillance department. A hundred and twenty-three elderly persons who possessed a satisfactory cognitive level measured by the Pfeiffer test and the ability to walk were eligible. Of these, 102 elderly persons were selected half of whom (n=51) had suffered dizziness in the previous year. The other half (n = 51) were used as controls, and the two groups were matched for sex and age. Variables relating to the characteristics of the facility, lifestyle and health status of the elderly were analyzed. The Chi-squared and Fisher's Exact tests were used for statistical analysis, with a significance level set at 5%, and multivariate model by logistic regression, with magnitude of the association calculated between variables measured by Odds Ratio.

**Results:** The risk factors for dizziness were the presence of three or more pathologies per elderly person and the use of a gastro-protective drug, as a proxy of polypharmacy adjusted by systemic arterial hypertension and smoking.

**Conclusion:** Risk factors associated with dizziness were the number of comorbidities higher than three and a gastro-protective drug adjusted in the multivariate model by hypertension and smoking.

**Keywords:** Aged; Dizziness; Nursing homes

### Introduction

Due to a reduction in the birth rate and a proportional increasing in the number of elderly people, Brazil has experienced population aging in recent decades. The family structures are also changing, which means the elderly are frequently lead to live alone or in Nursing Homes, resulting in the risk of health problems. Living in such institutions can result in social isolation, with the elderly person feeling deprived of his or her previous activities, thus decreasing their independence and functionality. Currently, most elderly persons living in Nursing Homes are affected by a disabling disease, dementia or terminal illness [1].

Institutionalized elderly persons tend to become frail due to frequent immobility [2]. A sedentary lifestyle, which is relatively common among this group, is directly related to the number of falls [3]. Dizziness and imbalance in elderly are a growing public health concern, because older individuals who suffer from dizziness have a significantly higher risk of accidental falls and consequent injuries, such as hospital admission and accidental death [4,5].

Dizziness is an extremely common symptom among the elderly, and the literature presents a prevalence of 20% [6,7]. Brazilian studies reveal higher percentages, nearly 45% [8,9] among elderly persons living in the community, and 74% among elderly patients of geriatric outpatient clinics [10].

Cardiovascular disease [11] (including hypertension and strokes) and metabolic changes are the most common causes of dizziness (40% each) [12]. Other important risk factors are the presence of cognitive disorders such as dementia, anxiety and depression; locomotor deficits; visual, vestibular and proprioceptive disorders [6,13-15].

Polypharmacy [16] (the use of more than 5 medications) among the elderly is another possible cause of dizziness among this group. This is associated with a high risk of side effects, inappropriate use

of medications, geriatric syndromes and mortality among the elderly [6,17]. It is estimated that the causes of 1 in 4 cases of dizziness are attributable to the use of medication, even if as an associated cause [6].

The aims of this study were to describe the institutionalized elderly population with dizziness and to determine the risk factors for dizziness related to the institution, lifestyle and health status of the elderly.

### Method

#### Participants

A population-based case control study was performed with 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 non-profit, which resulted in a total of 386 elderly persons.

The study included elderly persons who were present in the Nursing Homes at the time of examination, able to walk with or without assistance and scored up to 9 in the Pfeiffer questionnaire [18,19]. The Pfeiffer questionnaire measures the cognitive impairment and a score of 10 means maximum cognitive impairment. The exclusion criteria were:

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wheelchair users and bedridden elderly persons, and those with serious memory, attention, temporal and spatial orientation, and communication problems. Only 123 elderly persons met the criteria of the study.

The formation of groups for the case-control study was performed based on the following question: "Have you experienced dizziness in the last 12 months?"

### Variables

Risk factors related to dizziness were evaluated using a questionnaire aimed at the elderly persons themselves, together with an analysis of medical records. The data collection form included general information about the institution (type of institution, time spent living in the institution), the health (number of diseases, use of medication) and lifestyle habits (physical exercise, alcohol consumption and whether the patient smoked or not) of the patient. After the data collection, the main researcher asked the elderly persons about the presence of any

	Cases	Controls	Total	p	OR (CI 95%)
<b>Type of care facility</b>					
Non-profit	37 (53.6%)	32 (46.4%)	69(100%)	0.397	1.57 (0.68-3.62)
For profit	14 (42.4%)	19 (57.6%)	33(100%)		
<b>Time of institutionalization</b>					
Four years or more	16 (40%)	24 (60%)	40(100%)	0.156	0.51 (0.23-1.15)
Less than 4 years	35 (56.5%)	27 (43.5%)	62(100%)		

**Table 1:** Absolute and relative values, statistical significance, OR and confidence interval for variables related to the care facilities.

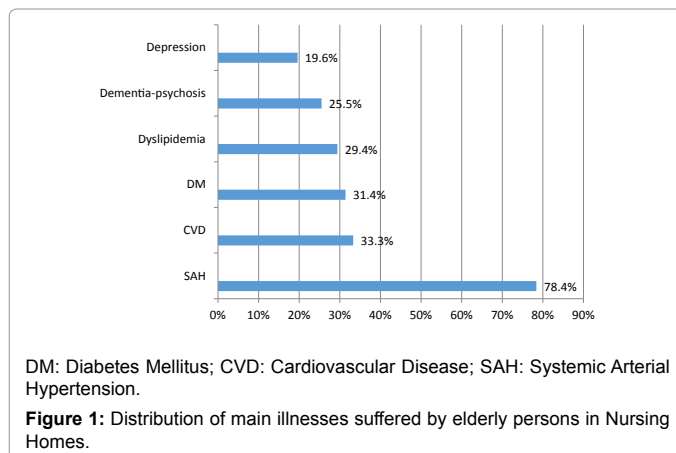
	n	Minimum	Maximum	Median	Q25-Q75
<b>Age (in years)</b>	51	64	94	83.00	76.00-86.00
<b>Men</b>	18	64	94	78.50	69.50-84.25
<b>Women</b>	33	70	92	84.00	78.00-88.00
<b>Time spent living in Nursing Homes (in years)</b>		1	27	3.00	2.00-6.00
<b>Total number of medications used</b>		1	14	5.00	3.00-9.00
<b>Total number of diseases</b>		0	6	3.00	2.00-4.00

**Table 2:** 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.

	Cases	Controls	Total	p*	OR (CI 95%)	p**	Adjusted OR (CI 95%)
Presence of 3 or more disease	24 (70.6%)	10 (29.4%)	34 (100%)	0.003*	3.64 (1.51-8.81)	0.045**	2.91 (1.02-8.27)
Presence of less than 3 diseases	27 (39.7%)	41 (60.3%)	68 (100%)				
HAS							
Yes	40 (60.6%)	26 (39.4%)	66(100%)	0.004*	3.50 (1.47-8.30)	0.236	1.84 (0.67-5.06)
No	11(30.6%)	25 (69.4%)	36(100%)				
CVD							
Yes	17 (73.9%)	6 (26.1%)	23(100%)	0.009*	3.75 (1.34-10.52)	-	
No	34 (43%)	45 (57%)	79(100%)				
Osteoarthritis							
Yes	8 (100%)	0 (0%)	8(100%)	0.003*	2.19 (1.75-2.72)	-	
No	43 (45.7%)	51 (54.3%)	94(100%)				
PBI							
Yes	20 (71.4%)	8 (28.6%)	28 (100%)	0.008*	3.47 (1.35-8.89)	0.042**	2.84 (1.04-7.78)
No	31 (41.9%)	43 (58.1%)	74 (100%)				
Smoker							
Yes	7 (70%)	3 (30%)	10 (100%)	0.183	2.54 (0.62-10.46)	0.097	3.64 (0.79-16.70)
No	44 (47.8%)	48 (52.2%)	92 (100%)				

Legend: †: Only the variables that show statistical significance in bivariate and/or multiple analysis were included in the table. OR: Odds Ratio; CI: Confidence Interval; SAH: Systemic Arterial Hypertension; CVD: Cardiovascular Disease; PBI: Proton Pump Inhibitor. \*: p<0.05. Qui-squared and Fisher exact tests. \*\*: p<0.05. Logistic Regression

**Table 3:** Absolute and percentage values, statistical significance, OR and confidence interval for variables related to health of patients with dizziness.



dizziness episodes in the last year.

### Statistical analysis

After data was collected, a descriptive analysis was performed to describe the groups, a bivariate analysis was carried out using the Chi-squared or Fisher's Exact test and multivariate model by logistic regression. A significance level was set at 5%. The magnitude of the association between the variables was calculated through the Odds Ratio measurement.

### Ethics

The study complied with the criteria and requirements established by Resolution No. 466/2012 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 Informed Consent form.

### Results

The elderly persons in the case group were characterized as predominantly long-lived. Women were both more numerous and older than men in this group (64.7%). There was no different between groups when comparing data about care facility (type of financing and

time of institutionalization) (Table 1) and most of the elderly had more than one disease and were polymedicated (Table 2).

In terms of the distribution of illnesses, systemic arterial hypertension was the most frequent, followed by cardiovascular illness (Figure 1).

In relation to lifestyle, most institutionalized elderly persons with dizziness did not consume alcoholic beverages (92.2%), smoke (86.3%) or perform physical exercise (68.6%).

When seeking risk factors for dizziness among this group of elderly persons, no association was found between the variables relating to the care facility (type of care facility and length of time spent living there) or with lifestyle (smoking, alcohol consumption and physical inactivity).

Regarding factors related to the health status of the person, there was a significant association between the total number of diseases of the elderly person and dizziness. Those who had three or more associated diseases showed a 2.91 fold higher risk to present dizziness than those who had less than three diseases.

The use of a gastro-protective drug revealed a 2.84 fold higher risk to present dizziness, as a proxy of polypharmacy. The values of Odds Ratio and the confidence interval in multivariate model are presented in Table 3. Hasmer and Lemeshow value for the model was 0.91 (Table 3).

## Discussion

Dizziness is a very common symptom among the geriatric population and may indicate a number of health problems in various organs and systems. It is important not just because of the physical discomfort it causes, but especially because of the consequences that it may generate, such as falls and resulting complications. The presence of dizziness in the elderly is a strong predictor of falls, which is the leading cause of accidental death in people older than 65 years [20].

As they are weaker, frailer and more prone to illness than those who live in the community, elderly persons who reside in long-term institutions are more likely to suffer from dizziness as a result of the various health problems associated with the large number of medications they take and physical inactivity, all of which may generate balance disorders.

The characterization of dizziness in this study revealed a higher prevalence of women with dizziness (64.7%). Several studies have confirmed a tendency of longevity among elderly persons with dizziness, possibly because elderly people are living longer, and therefore present this symptom more frequently. This variation ranges from 72.3 to 78.5 years [8,12,21].

Other studies [8,17] have also noted that suffering from three or more combined diseases and the use of five drugs by an elderly person are the main factors responsible for dizziness occurring.

Among elderly persons, the physiological changes that result from aging cannot be dissociated from diseases that arise over time, and this combination of factors leads to the emergence of symptoms. Dizziness can be the result of various diseases acting on a body already weakened by natural wear, causing injuries as maintaining body balance becomes more difficult. The most common diseases in this study were hypertension, cardiovascular disease, diabetes and dyslipidemia, confirming the influence of microcirculatory and metabolic changes in the cerebral and vestibular blood flow. Moreira Bittar [22] found that 32.3% of patients with dizziness had undergone vascular changes,

29.9% had experienced dyslipidemia and 13.8% had suffered changes to their sugar metabolism. There was association between dizziness and hypertension, dizziness and CVD and dizziness and osteoarthritis in the bivariate analysis, but no significant association in the multivariate model was found. However, its theoretical importance should be considered as dizziness symptom genesis. Circulatory system diseases may act as an important contributing factor for dizziness. Therefore, pressure control, dietary intake recommendations and physical activity may prevent this symptom from occurring and help to avoid falls and their damaging consequences to elderly persons. Osteoarthritis was also a risk factor for dizziness in bivariate analysis, which may be associated to dizziness from proprioceptive etiology, cervical spine alterations and/or imbalance due to muscle weakness.

In the search for a multivariate model between dizziness and elderly health status, data from the present study showed that the number of comorbidities of the elderly is an important risk factor for dizziness, revealing a 2.91 fold higher risk of dizziness for the elderly who have three or more comorbidities. A higher number of associated diseases leads to a greater risk of dizziness, especially if the number of diseases is greater than three [23,24], due to the risks arising from the interaction of the drugs or their side effects.

The number of different types of medication used by the elderly patient is relevant, as these may be vestibulotoxic or have side effects relating to balance disorders [17]. Different types of medication can interact with each other and, depending on the concentration of the drug, the treatment period and the specific conditions of the patient's body (such as poor liver or kidney function), may lead to drowsiness, postural hypotension, arrhythmias or other situations that lead to dizziness [13]. It has been found [21] that the side effects of medications represent 23% of the causes of dizziness, and that these can trigger dizziness in 18.7% of cases [25]. The use of a larger number of drugs leads to a greater chance of deleterious effect due to their association, mainly in the geriatric population, for which the prevalence of inappropriate medication intake can reach 28% [26]. The use of more than four combined medications is related to an onset of dizziness among the elderly [23,24], and it was found that the use of five or more medications resulted in a 1.31-fold higher risk of dizziness [7]. In the present study, polypharmacy [17] was detected among the elderly (median of 5 medications per elderly). The gastro-protective drug revealed statistical significant in bivariate and multiple analysis, which may be considered as a proxy variable for the use of several medications. In most of the cases, the use of proton pump inhibitor drugs protect gastric mucosa against the injuries caused by the association of the other medications taken and not only as a treatment for peptic disease. Furthermore, the median number of diseases per elderly was significantly related to the presence of dizziness, which may suggest that the higher the number of diseases, the higher the number of medications taken.

In terms of factors related to the care facility, it was discussed whether the type of institution financing (private or non-profit) influenced the onset of dizziness in any way, but the study data revealed no such association. Likewise, the length of time spent living in the facility did not significantly affect the onset of symptoms. However, it is known that institutionalization weakens and undermines the health of older people, and their reduced mobility is one of the most frequent causes of disability. In such a scenario, balance disorders occur [14]. In the present study, this association was not observed, perhaps because of the small size of the sample group.

Some lifestyle habits were assessed as possible risk factors for

dizziness occurring, but only smoking joined in the multivariate model to the adjustment variables. It has been reported that smoking is associated with vestibular disease, with a 1.1-fold higher risk among those who have smoked for more than 20 years [27], probably due to the effect on labyrinthine microcirculation. However, in the present study the number of elderly smokers was low, and it was not possible to demonstrate this association.

The literature indicates that physical inactivity is an important risk factor for the onset of dizziness, as elderly persons who move less and spend much of their time in bed are more likely to experience dizziness due to the inhibition of vestibular reflexes. Thus, sedentary elderly persons experience dizziness more than those who perform some physical activity [28]. As institutionalized elderly persons are generally more sedentary and move less than those who live in the community, it would be expected that there would be an association between a sedentary lifestyle and the presence of dizziness in this sample. It is possible that no statistical association was found in the present study due to the small sample size evaluated.

We suggest the participation of care managers for future improvements of aged care protocols. The care manager is a sort of bridge between patients, general practitioners and other specialists. He assists the patient individually, helping him to adopt behaviors and lifestyles suitable to his health condition, and encouraging greater self-sufficiency in the monitoring of clinical parameters [29,30]. It is feasible to incorporate care managers into the health care system to support general practitioners and specialists in the management of patients with chronic illnesses such as CVD, diabetes, heart failure, or CVD risk [29,30].

## Conclusion

The majority of elderly patients with dizziness complaints living in Nursing Homes were female and long-lived, the most prevalent disease was hypertension and they were generally polymedicated. There was no difference between elderly with or without dizziness complaints in care facility (type of care facility regarding financing type and time of institutionalization).

Risk factors associated with dizziness were the number of comorbidities higher than three and gastro-protective drug adjustment in the multivariate model hypertension and smoking. There was no association with the factors related to the care facility. These findings provide an important insight into the conditions of health care that are offered to the elderly, mainly in terms of the effectiveness of prevention programs adopted for this age group. Dizziness is multifactorial, and chronic diseases are common at this age, but if they cannot be avoided, they should at least be controlled, thereby reducing costs for the public health system, and causing less harm to the body and less negative impact on quality of life.

## Highlights

- Dizziness among institutionalized elderly persons is more prevalent in long-lived women;
- There was no difference regarding the variables related to care facility between elderly with and without dizziness
- Dizziness in the institutionalized elderly person is associated with chronic systemic illnesses common to this age group.

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