

## Original articles

# Association between continuous use drugs and dizziness in institutionalized elderly people

## *Associação entre medicamentos de uso contínuo e tontura em idosos institucionalizados*

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### ABSTRACT

**Purpose:** to associate continuous use drugs with the presence of dizziness in institutionalized elderly people.

**Methods:** a cross-sectional study performed in 10 nursing homes. People aged 60 years or older, able to walk and who presented good cognitive level were included in this study. Data on medications for continuous treatment and data referring to the Institution were collected. The elderly were asked if they had experienced dizziness in the previous year. The Chi-squared and Fisher exact tests were used for bivariate analysis and stepwise forward logistic regression to perform multiple analysis, with a significance level of 5%.

**Results:** out of 92 elderly, 35 reported dizziness in the previous year (23.8%). The anti-epileptics ( $p=0.034$ ,  $RR=2.26$ ,  $CI95\%$  1.06-4.78), antithrombotics ( $p=0.008$ ,  $RR=0.21$ ,  $CI95\%$  0.07-0.67) and diuretics ( $p=0.024$ ,  $RR=2.29$ ,  $CI95\%$  1.11-4.70) were associated to dizziness, adjusted by psycholeptics.

**Conclusion:** dizziness in these institutionalized elderly people was associated with the chronic use of anti-epileptics and diuretic drugs.

**Keywords:** Aged; Dizziness; Homes for the Aged; Drug Interactions

### RESUMO

**Objetivo:** associar medicamentos de uso contínuo com a presença de tontura em idosos institucionalizados.

**Métodos:** trata-se de um estudo transversal realizado em 10 Instituições de longa permanência para idosos. Foram incluídos todos os idosos a partir de 60 anos que fossem capazes de deambular e que apresentassem bom nível cognitivo. Foram coletadas as medicações de uso contínuo e dados referentes à Instituição. Ao idoso, foi questionado se apresentou tontura no último ano. Para análise estatística, utilizou-se os testes do Qui-quadrado e Exato de Fisher para análise bivariada e regressão logística para análise múltipla stepwise forward, com nível de significância de 5%.

**Resultados:** dos 92 idosos avaliados, 35 afirmaram terem apresentado tontura nos últimos 12 meses (23,8%). Foram associados à tontura os antiepilépticos ( $p=0,034$ ,  $RR= 2,26$ ,  $IC95\%$  1,06-4,78), anti-trombóticos ( $p=0,008$ ,  $RR= 0,21$ ,  $IC95\%$  0,07-0,67) e diuréticos ( $p=0,024$ ,  $RR= 2,29$ ,  $IC95\%$  1,11-4,70), ajustados pelos psicolepticos.

**Conclusão:** a tontura nos idosos institucionalizados esteve associada ao uso crônico de anti-epilépticos e diuréticos.

**Descritores:** Idoso; Tontura; Instituição de Longa Permanência para Idosos; Interações Medicamentosas

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## INTRODUCTION

Dizziness is a commonly observed symptom in geriatric patients and has multicausal factors implicated in its genesis, since older adults typically are affected by several diseases, have sensorial alterations and use several medications.

Polypharmacy (the use of more than 5 medications) is common in older adults, and should be considered as an important cause for the dizziness presented by them. Polypharmacy is associated with a high risk of side effects, inappropriate use of drugs, non-adherence to treatment, geriatric syndromes and mortality in the elderly<sup>1,2</sup>. It is estimated that 1 in each 4 cases of dizziness can be attributed to the use of medication, although as an associated cause<sup>1,3</sup>.

The main side effects of medication that cause dizziness are identified as: vestibulotoxicity of some components, leading to changes in balance; neurological effects such as drowsiness; cardiovascular effects with the onset of postural hypotension and arrhythmias, among others. Furthermore, the interaction between various medications, depending on the concentration of the drug, the time of treatment and the patient's own conditions, such as poor hepatic or renal function, may potentiate or suppress effects and create situations that lead to the onset of dizziness<sup>4</sup>.

Dizziness is listed among the criteria of adverse effects determined by the Liverpool Adverse Events Profile (AEP), used to quantify the side effects of anti-epileptic drugs. It has been reported that between 36 and 53% of anti-epileptic users experience dizziness<sup>5</sup>. Likewise, when more than one central action drug is associated, the chances of dizziness occurring as a result of accumulated side effects is increased, such as when anti-epileptics and anti-depressants are used simultaneously<sup>6</sup>. Cardiovascular medications such as antihypertensives can cause orthostatic hypotension and dizziness in older adults when used in excess, especially diuretic medications which, in addition, can also cause dehydration and ionic imbalance<sup>7</sup>.

As institutionalized elderly are more fragile and affected by numerous diseases, they make use of a range of medicines which possibly generate dizziness. Thus, the importance of studying this symptom in this population, as well as associating which drugs are mainly involved in the onset of dizziness in institutionalized older adults is evident. This study aims to associate drugs for continuous treatment with the presence of dizziness in institutionalized elderly in the city of Natal-RN-Brazil.

## METHODS

This research was approved by the Research Ethics Committee (CEP) of the Federal University of Rio Grande do Norte (UFRN) with report numbers 308/2012 and 013/2014.

This is a cross-sectional study in which 10 of the 13 Nursing homes (NH) (76.92%) registered by the health surveillance in Natal-RN – Brazil were evaluated. Of the 10 institutions that agreed to participate, 5 were private and 5 were philanthropic, totaling 364 older adults. The participants consisting of older adults were aged 60 years and older who were present at the NH at the time of data collection. The evaluation was conducted in October 2015.

As inclusion criteria, the older adults had to be able to walk with or without assistance and score between 8 to 9 on the Short Portable Mental Status Questionnaire (SPMSQ or Pfeiffer Questionnaire). Exclusion criteria were: older adults with severe motor, speech or affectivity impairments; serious hearing or vision deficits, making communication considerably more difficult; older adults in the terminal stage; or older adults from other nationalities who did not speak Portuguese.

Of the 364 older adults living in the NH at the initial time of the research, 201 (55.21%) were able to walk with or without assistance. Of these, 20 (9.95%) refused to participate in the study, and 5 (2.48%) had communication or orientation problems, which impeded data collection. Thus 176 remained, and after being submitted to the Pfeiffer Questionnaire<sup>8</sup>, 92 older adults were included.

Data were collected through a questionnaire on socio-demographic data involving gender, color, age, education level and marital status. These data were collected from the Institution's medical record admission form, usually filled out by the NH Social Worker. Also, the questionnaire included a question regarding the reason for institutionalization, which was also taken from the medical record admission sheet and confirmed by directly asking the older adult.

During the interview, the elderly were questioned about the presence of any episodes of dizziness in the previous year. Commemorative dates were mentioned with the intention of stimulating their temporal orientation in relation to the moment in which the dizziness occurred. In some cases, this data was confirmed with reports of the symptom's occurrence in the medical notes of the medical records, or by the caregivers' description; however, when these records were

missing, only report by the older adult was taken into account.

Regarding the documentary analysis of the medical records, the registration of Drugs for Continuous Treatment, meaning those used daily for at least 30 days, was classified according to the ATC Classification (Anatomical Therapeutic Chemical)<sup>9</sup>. Medical prescriptions were checked to confirm whether such medications were in fact being administered, and only those that had actually been administered for at least 30 consecutive days were included, not taking into account their doses. Likewise, diagnoses of the diseases were collected from the medical records, from the notes performed by the attending physicians.

For statistical analysis, Chi-square and Fisher's exact tests were used for bivariate analysis and stepwise forward logistic regression for multiple analysis, with a significance level of 5%.

## RESULTS

Of the 92 older adults evaluated, 35 reported having experienced dizziness in the past 12 months (23.8%).

Most of the older adults in the study belonged to non-profitable NH; they were white, females, between 80 and 89 years old, single, with a low level of education, had gone to the NH because they did not have a caregiver at home, they were polymedicated and had up to three diseases (Table 1).

Regarding the association of drugs for continuous treatment with dizziness, the groups of anti-epileptic, anti-thrombotic, psycholeptic, diuretic, mineral supplements, antihypertensive and vasoprotective medication were included in the regression model. Anti-epileptic medications were associated with dizziness with a risk of 2.26 times increased dizziness, and diuretic medications with a risk of 2.29 times increased dizziness, in addition to antithrombotics which were identified as a protective factor, adjusted by the psycholeptics (Table 2).

The parameters used to adjust the model were Hosmer and Lemeshow of 0.994, Cox Snell R Square and Nagelkerke R Square variation between 0.177 and 0.241, Omnibus = 0.001 and a 62% and 72.8% final correction percentage of the initial model.

**Table 1.** General characterization of the sample according to sociodemographic, institutional and health data. Absolute and relative values. Natal-Brazil, 2016

<b>Sociodemographic Variable</b>	<b>Categories</b>	<b>n (%)</b>
Gender	Female	65 (70.7%)
	Male	27 (29.3%)
Color	White	49 (53.3%)
	Black	12 (13.0%)
	Brown	29 (31.5%)
	Yellow	01 (1.1%)
	Indigenous	01 (1.1%)
Age	60 to 69 years	11 (12.0%)
	70 to 79 years	34 (36.9%)
	80 to 89 years	37 (40.2%)
	90 to 99 years	9 (9.8%)
	Over 100 years old	1 (1.1%)
Education	Illiterate	23 (25.0%)
	Elementary School	23 (25.0%)
	Middle school	10 (10.9%)
	High school	13 (14.1%)
	Higher education	12 (13.0%)
	Literate	5 (5.4%)
	Not aware/not reported	6 (6.5%)
Marital status	Single	43 (46.7%)
	Married	6 (6.5%)
	Divorced	12 (13.0%)
	Widower	30 (32.6%)
	Not aware/not reported	1 (1.1%)
<b>Institutional data</b>		
Type of institution	For-profit	31 (33.7%)
	Non-profit organization	61 (66.3%)
Reason for institutionalization	No caregiver	38 (41.3%)
	Living alone	15 (16.3%)
	Homeless	3 (3.3%)
	Disease	10 (10.9%)
	Choice	4 (4.3%)
	No work	1 (1.1%)
	Other reasons	11 (12.0%)
	Several reasons	9 (9.8%)
	Not reported	1 (1.1%)
<b>Health data</b>		
Number of medications	6 or more	50 (54.3%)
	0 to 5	42 (45.7%)
Number of diseases	4 or more	33 (35.9%)
	0 to 3	59 (64.1%)

**Table 2.** Multivariate analysis for dizziness and medications in institutionalized older adults. Natal-Brazil, 2016

Variable	Categories	Dizziness yes	Dizziness no	p*	RR	p**	RR (95% CI) adjusted**
Anti-epileptics	Yes	11 (61.1%)	7 (38.9%)	0.025	3.73	0.034 <sup>‡</sup>	2.26 (1.06-4.78)
	No	24 (32.4%)	50 (67.6%)				
Antithrombotics	Yes	4 (19.0%)	17 (81.0%)	0.041	0.16	0.008 <sup>‡</sup>	0.21 (0.07-0.67)
	No	31 (43.7%)	40 (56.3%)				
Diuretics	Yes	12 (50.0%)	12 (50.0%)	0.161	3.72	0.024 <sup>‡</sup>	2.29 (1.11-4.70)
	No	23 (33.8%)	45 (66.2%)				
Psycholeptics	Yes	25 (45.4%)	30 (54.6%)	0.074	2.06	0.151	1.86 (0.80-4.34)
	No	10 (27.0%)	27 (73.0%)				

RR: Relative Risk; \*: Chi-square; \*\*: Logistic regression; <sup>‡</sup>:  $p < 0.05$ .

## DISCUSSION

In the present study, 23.8% of the older adults reported dizziness with a higher occurrence among those using anti-epileptics and diuretics. An association was identified among those who used antithrombotics, but with fewer reports. Understanding these drugs and the involved pharmacological mechanisms is especially important among elderly in NH who are often polymedicated, which can lead to increased risk of drug interactions and adverse reactions such as dizziness and falls<sup>10,11</sup>.

The greater vulnerability of older adults to drug-related adverse events may be justified in part by the physiological changes inherent to aging that may have an impact on pharmacodynamic and pharmacokinetic processes<sup>10,12</sup>. From a pharmacodynamic point of view, higher drug-related sensitivity may occur, especially for benzodiazepines, antipsychotics and opioid analgesics. Pharmacokinetic modifications may occur by modifying all the steps in the pharmacokinetic process: absorption, metabolism, distribution, hepatic elimination and renal excretion<sup>12,13</sup>. However, it impacts more strongly on reducing hepatic metabolism and renal<sup>14</sup> clearance, thus predisposing older adults to greater toxicity due to accumulation of medications<sup>10</sup>.

The present study identified the use of anticonvulsants as a factor associated with the occurrence of dizziness (RR 2.3), which is one of the most common adverse reactions to using this class of medications<sup>1,2,15</sup>. In another study<sup>16</sup>, half of the reports of adverse dizziness reactions related to medications had the use of anti-epileptic drugs as a source, used in partial and generalized seizures, including tonic-clonic seizures, focal convulsions and those of combined forms, either alone or in combination with

other drugs. Among the anticonvulsants related to the increased risk of dizziness, we can highlight those that inhibit the function of voltage-dependent sodium channels such as lamotrigine, oxcarbazepine, carbamazepine; those that potentiate the action of GABA<sub>A</sub> (Gamma-AminoButyric acid) such as benzodiazepines (clonazepam), phenobarbital and have orthostatic hypotension and cerebellar dysfunction as probable mechanisms for adverse reactions<sup>2,16</sup>. Older adults can also present exacerbation to the effects of benzodiazepines as a result of the greater bioavailability due to reduced hepatic metabolism (phase I) and increased receptor sensitivity<sup>13</sup>.

The greater occurrence of dizziness among older adults who use diuretics has been observed in several studies, and such effects may occur due to volume depletion and vasodilation causing dizziness and orthostatic hypotension<sup>1,2,15</sup>.

The lower occurrence of dizziness among older adults who used antithrombotic drugs may be related to the drug's activity which improves cerebral perfusion, thereby reducing hypoperfusion which is a frequent cause of persistent dizziness and vertigo<sup>17</sup>.

It is important to highlight that some methodological aspects support the validity of the present study data. Among these aspects, it is worth noting that collection was conducted by an experienced otorhinolaryngologist which reduces calibration bias, and consultation of the medication records to verify whether the drugs were effectively administered, thus minimizing memory bias. However, given the cross-sectional design of the study, we cannot affirm that the association detected between the use of anticonvulsants and diuretics with dizziness has a causal nature.

## CONCLUSION

From our investigation, it was possible to identify a greater occurrence of dizziness among older adults who used anticonvulsants and diuretics, and a lower occurrence among those who use antithrombotics.

In face of identifying the association of medications with the dizziness symptom, we suggest greater vigilance regarding the number of medications given to older adults and their interaction. The possibility of replacing or even weaning these medicinal products should be encouraged in order to diminish the polypharmacy effect and to prevent associated symptoms, with dizziness among them. Non-pharmacological measures, depending on the case, could also be instituted to relieve symptoms and avoid over-medicating older adults.

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