Actas Urológicas Españolas. 2011;**35(1)**:4–8

Actas Urológicas Españolas

www.elsevier.es/actasuro

ORIGINAL ARTICLE

Nocturia is not associated with falls among the elderly: a population study in the city of São Paulo

J.S. Rustom[a], F. Lorenzetti[a,*], T. Tamanini[a], M.L. Lebrão[b], M. Dambros[a]

[a]*Departamento de Urología, Universidad Federal de São Paulo, Brazil*
[b]*Escuela Pública de Salut de la Universidad de São Paulo, Brazil*

Received March 25, 2010; accepted May 22, 2010

KEYWORDS
Aging;
Accidental falls;
Nocturia

Abstract
Introduction: The present study aims to evaluate the association between nocturia and falls in a group of community-living elderly men in the city of São Paulo (Brazil).
Material and methods: Under the coordination of the Pan American Health Organization and World Health Organization, a multicenter study named Health, Welfare and Aging (SABE Study) is being conducted to evaluate the living and health conditions of older people in Latin America and Caribbean. In Brazil, this study is evaluating the elderly population (60 years or more) in São Paulo since 2000. The presence of nocturia was taken as the response "yes" to the question *"Do you need to void three times or more at night?"* .The presence of falls was also taken as the response "yes" to the question *"Did you have any fall during the last 12 months?"* The intergroup analysis used was the logistic regression.
Results: Total of 865 men was interviewed, mean age 68 years. It was observed high prevalence of nocturia and falls in all groups, with higher prevalence of both in the eldest group ($p<0.001$), however, the association of nocturia and falls was not statistically significant in any of the groups ($p=0.45$).
Conclusion: This is one of the pioneering studies that assess only the male population, showing that nocturia was not significantly associated with falls. Nocturia and falls are highly prevalent conditions in the elderly, but no association was found between both, so that these variables may be correlated to age and other clinical conditions.
© 2010 AEU. Published by Elsevier España, S.L. All rights reserved.

*Corresponding author.
E-mail: fabio_lorenzetti@hotmail.com (F. Lorenzetti).

0210-4806/ $ - see front matter © 2010 AEU. Published by Elsevier España, S.L. All rights reserved.

PALABRAS CLAVE
Envejecimiento;
Caídas accidentales;
Nicturia

La nicturia no se asocia con las caídas del anciano: un estudio de población en la ciudad de São Paulo

Resumen

Introducción: El propósito de este estudio es evaluar la relación entre nictura y caídas en un grupo de hombres ancianos que viven en comunidad en la ciudad de São Paulo (Brasil).

Materiales y métodos: Bajo la coordinación de la Organización Panamericana de Salud y la Organización Mundial de la Salud, un estudio multicéntrico denominado Salud, Bienestar y Envejecimiento (Estudio SABE) se está llevando a cabo para evaluar las condiciones de vida y salud de los ancianos en América Latina y el Caribe. En Brasil este estudio evalúa la población anciana (60 años o más) en São Paulo desde 2000. La presencia de nicturia se tomó como la respuesta ''sí'' a la pregunta '' ¿Necesita orinar tres veces o más por la noche?'. La presencia de caídas también se tomó como la respuesta ''sí'' a la pregunta '' ¿Ha sufrido una caída en los últimos 12 meses?'. Se aplicó la regresión logística para el análisis intergrupal.

Resultados: Se entrevistó a un total de 865 hombres con una edad media de 68 años. Se identificó una alta prevalencia de nicturia y caídas en todos los grupos, con una mayor prevalencia de ambas en el grupo de los más mayores ($p < 0,001$); sin embargo, la asociación de nicturia y caídas no fue estadísticamente significativa en ninguno de los grupos ($p = 0,45$).

Conclusión: Éste es uno de los estudios pioneros que solamente evalúa la población masculina, demostrando que la nicturia no está asociada con caídas de manera significativa. La nicturia y las caídas son condiciones altamente prevalentes en los ancianos, pero no se encontró ninguna relación entre ambas, por lo tanto estas variables se podrían correlacionar con la edad y otras condiciones clínicas.

© 2010 AEU. Publicado por Elsevier España, S.L. Todos los derechos reservados.

Introduction

Nocturia is a lower urinary tract symptom with a negative influence on quality of life that is closely related to the aging process.[1] Coyne et al reported that the prevalence of nocturia among men over 48 years of age who got up two or more times to urinate was 14.2%[2] In a population study involving 6.517 individuals, Yoshimura et al found the prevalence of nocturia was 28.5%, with incidence increasing from 16 to 60%among people aged over 69 years.[3]

Balen et al reported that nocturia is the main cause of sleep interruption.[4] The consequences of fragmentation and deprivation of sleep are increased daytime fatigue, worsening of the individual's general state, depression and falls.[5,6] In a study that evaluated nocturia as a risk factor for falls among 520 elderly men, the occurrence of falls was greater among individuals who got up to urinate two or more times during the night.[7]. Besides, Parsons et al reported that nocturia was highly prevalent in cases of recurrent falls among men who presented more than four episodes of micturition at night.[8]

The present clinical study resulted from interviews conducted within the SABE study (Health, Wellbeing and Aging). It correlated nocturia and falls among elderly men in the municipality of São Paulo, and the sample for this study made it possible to characterize the real profile of this relationship within the population.[9] This study was expected to provide reflections upon which public healthcare decision-making could be based, and to stimulate acquisition of a better knowledge about the situation of the elderly population in São Paulo. Thus, the objective of this study was to analyze the direct relationship between nocturia and falls, and whether nocturia would be a triggering factor for falls among the elderly male population in the city of São Paulo.

Material and methods

The database for this study was the results from the SABE study (Health, Wellbeing and Aging), which was coordinated by the Pan-American Health Organization (PAHO). The overall objective of the SABE study was to evaluate the profile of living and health conditions among the elderly in Latin America and the Caribbean.

SABE Study

The SABE study was a longitudinal study that started in 2000. In addition to Brazil, it covered another seven countries in Latin America and the Caribbean (Argentina, Barbados, Chile, Cuba, México and Uruguay) and portrayed the stages of aging in urban centers in these nations. Evaluations were carried out by means of a questionnaire applied at the subjects' homes. There were eleven sections in the questionnaires: personal data, cognitive evaluation, health status, functional status, medications, use and access to services, family support network, employment and income source history, housing characteristics, anthropometric data and balance, flexibility and mobility tests.

The municipality of São Paulo was the location in Brazil chosen for collecting data for the SABE study. It was the only

capital among all the participating centers that had a sample of as many as 2.143 elderly people. To determine the size of the sample from the city of São Paulo, the population count conducted by the IBGE (Brazilian Institute for Geography and Statistics) in 1996 was used. The final representative sample was composed by summing a probabilistic sample (by means of a draw) and an intentional sample (freely composed for expanded groups to complement the sample of elderly people of advanced age).

The probabilistic sample used the permanent records of 72 census tracts held by the School of Public Health of the University of São Paulo and the criterion of proportional probability for the number of homes registered within the National Household Sampling Survey (PNAD) of 1995.

After conducting a systematic draw of households, the sample was supplemented using nearby households for elderly people over 75 years of age, in census tracts within the selected district, in cases of death or losses, with the aim of attaining the final number for the sample. The interview was conducted directly in 88% of the cases, and the remainder was conducted through a substitute informant, when the elderly individual was unable to provide responses because of physical or cognitive deficits.

The methodological structure of the data collected within the SABE study enabled descriptive analysis of the elderly population in the city of São Paulo. In the present study, the characteristics of elderly men with nocturia and its association with falls were analyzed.

Sample composition

Out of the total of 2.143 elderly people included in the Brazilian part of the SABE study, 865 were male. These individuals constituted the sample used in the present study, which aimed to evaluate the association between nocturia and falls.

To investigate the real association between nocturia and falls, the characteristics of the group of elderly people with nocturia were studied by means of descriptions of demographic and social factors and activities of daily living. The dependent variables for characterizing this group were extracted from the SABE study database and consisted of the responses to the questions expressed in table 1. Besides, subjects with nocturia and those who reported falls were asked the following questions: "*Have you had any episodes of falls over the last twelve months?*" and "*Do you get up more than three times a night to urinate?*"

The participants were divided into five groups, according to age group (60-64 years, 65-69 years, 70-74 years, 75-79 years and 80 years or over). Interviewees who answered, "I do not know" or did not answer the question that investigated occurrences of nocturia were not included in the analysis. All the interviewees answered the question about falls over the last 12 months. The tabulations were weighted in accordance with the sample design and the final data were weighted in a way that allows them to be expanded.

Statistical analysis

To analyze any associations between nocturia and falls, the multivariate analysis was used, through logistic regression.

Table 1 Questions asked in the SABE study

How old are you?
Would you say your health is excellent, very good, good, regular or poor?
Has a doctor or nurse ever told you that you have high blood pressure?
Has a doctor or nurse ever told you that you have asthma or bronchitis?
Has a doctor or nurse ever told you that you have arthritis, osteoarthritis or rheumatism?
Has a doctor or nurse ever told you that you have osteoporosis?
Have you ever accidentally lost urine?
Wearing glasses or lenses, how is your vision for faraway objects?
What kind of home do you have?
Do you have difficulty in crossing the bedroom walking?
Do you have difficulty in having a shower?
Do you have difficulty in getting up from or lying down on your bed?

Robust estimation was used, with sample weighting and correction for the design effect. The response variables of falls and nocturia were both taken to be binomial, in yes/no form. The covariable of age was used in continuous form. Through probabilistic evaluation, the result was considered statistically significant when $p < 0.05$, with a 95% confidence interval.[10]

Results

Sociodemographic characteristics

As shown in table 2, prevalence of nocturia in this study increased in men of a higher age, progressively rising from 28.4% in patients 60-64 to 55.8% in patients above 80 years (36.7% for all ages). Occurrence of nocturia was also classified according to ethnic group/race, presenting in 35% caucasian, 40% afroamerican and 30% asiatic males.

Regarding the type of housing, 35% of the men living in houses, 28% in apartments and 82% in shacks presented nocturia. Among the elderly men with nocturia, 39% had a self-perception that their income was insufficient for their daily needs. Regarding other chronic diseases coexisting in this group, the most prevalent variables were urinary

Table 2 Prevalence of nocturia according to age group among elderly men who participated in the SABE study

Age nocturia	Yes	No	total
60–64	28.4	71.6	170
65–69	34.8	65.2	139
70–74	41.7	58.3	124
75–79	45.5	54.5	208
80 +	55.8	44.2	224
Total	36.7	63.3	865

Table 3 Prevalence of nocturia and falls among elderly men living in the municipality of São Paulo

Age	Nocturia			Falls		
	No	Yes	n	No	Yes	n
60 to 64	71.6	28.4	170	83.1	16.9	170
65 to 69	65.2	34.8	139	75.3	24.7	140
70 to 74	58.3	41.7	124	80.4	19.6	127
75 to 79	54.5	45.5	208	74.9	25.1	211
80 and +	44.2	55.8	224	60.6	39.4	230
TOTAL	63.3	36.7	865	77.6	22.4	878

Table 4 Logistic regression between the dependent variable of nocturia and falls (n=865) among elderly men living in the municipality of São Paulo

	Odds Ratio	DP	Z	P
Nocturia	1.186	0.294	0.69	0.489
Age	1.034	0.013	2.75	0.006

incontinence and heart disease, respectively accounting for 52% and 48%. Nocturia was present in 67% of the men who reported poor health status and, regarding visual acuity, 63% of the men with nocturia reported their vision was very poor. Questions asked to evaluate activities of daily living showed that 68% had difficulty in crossing the bedroom walking, 56% had limitations 12.

Association between nocturia and falls

Table 3 shows the prevalence of nocturia and falls among elderly men living in the municipality of São Paulo. The evaluation of the association between nocturia and falls among the elderly men did not present a statistically significant relationship through logistic regression (table 4). We found that the correlation between nocturia and falls presented was not statistically significant for falls (p=0.489). However, patient age definitely associated with falls (p=0.006).

Discussion

The prevalence of nocturia increases with age.[11] In a prevalence study, 3.4% of the men under the age of 30 years presented nocturia, whereas in the age group 30-59 this prevalence increased to 5.7%, and among those aged over 60 it reached rates between 32.4% and 40%.[12] The etiology of nocturia is multifactorial, encompassing situations that cause decreased bladder capacity, nocturnal polyuria, or both.[13] Nocturia is detrimental to health and quality of life, and for elderly people, it increases mortality rates.[1,3]

An epidemiological study conducted in northern Sweden among more than 6.000 men aged over 65 years who were followed up for five years showed that the mortality rate among the elderly men who presented three or more episodes of nocturnal micturition was twice the rate of the whole sample.[14] The impact of nocturia on the elderly is extremely negative, especially because it causes sleep abnormalities and impairments to physical, mental and emotional wellbeing.[15] Sleep fragmentation associated with nocturia causes changes in perception and balance, and it increases the risk of injuries due to falls.[2]

When analyzing studies on elderly people with LUTS (lower urinary tract symptoms) and falls, it was found that there was no gender-related symptom stratification. Thus, there are reports that urinary incontinence and nocturia are related to falls among elderly people, but there is no specific differentiation regarding the gender of elderly people.[14,16,17]

Since women predominate in practically all studies performed on the relationship between LUTS and falls, it can be stated that the extrapolation of these results to the male population is questionable. Hypothetically, the possible higher prevalence of nocturia among women could favor an association between nocturia and falls when gender is not stated. Likewise, assuming greater predisposition among women towards occurrences of falls, these studies may suggest a false association between nocturia and falls among men, when the participants' genders are not differentiated. The present study was designed to evaluate the association between nocturia and falls among elderly men. The supposed association between these two conditions is not confirmed in the literature.

A study on 1500 elderly individuals seen as outpatients, with a mean age of 80 years and more than two episodes of nocturnal micturition, showed that these individuals had a higher incidence of falls than individuals who did not present nocturia.[18] Although there was a relationship between falls and abnormalities of mobility among the elderly men participating in the present study, such as difficulty in lying down on and getting up from the bed (41%), the presence of nocturia was not associated as a predisposing factor for falls.

The need for visits to the toilet during the night, according to this study, implies a higher risk of falls for many elderly people, especially when there is another condition, such as cardiovascular diseases, balance and muscle abnormalities, neurological diseases, low physical activity, osteoporosis or mental state abnormalities.

In the SABE study, 67.2% of the elderly people with nocturia reported having the perception that their current health status was poor and also 63.1% that their visual acuity was characterized as very poor. This shows the negative impact of nocturia on the quality of life of this population and the possible risk of falls. It was also found that 68.3% had difficulty in crossing the bedroom walking, 55.9% presented limitations when having a shower and 62.5% had difficulty in lying down on and getting up from their beds.

In a study conducted by Stewart et al the risk of falls was 10% for elderly people without nocturia, and 21% for elderly people with three or more episodes of nocturnal micturition. In this population the prevalence of falls among these individuals living in houses was 8 to 37.5%, and for institutionalized elderly people 50%. Although nocturia was a risk factor related to falls, it did not result in significantly increased risk when correlated with bone fracture over the observed period.[16]

Parson et al demonstrated an association between nocturia and falls when the frequency of nocturia was 4-5 episodes per night, thereby probably giving rise to greater number of visits to the toilet and greater sleep deprivation.[8] Comparing this with the findings from the present study, the participants were asked about the habit of getting up more than three times during the night, thus not allowing us to stratify the number of micturitions with reports of falls. Hendrich et al[19] and Ozcan et al[20] concluded that the main factors related to the risk of falls were postural hypotension, diabetes, balance abnormalities, Parkinson's disease, stroke, diarrhea and urinary incontinence. The most prevalent clinical diseases in the SABE study found among elderly people with nocturia were arterial hypertension (39.9%), diabetes mellitus (38%), pulmonary diseases (44.8%), osteoporosis (39.7%), urinary incontinence (52.5%) and heart diseases (49%).

In view of the above, it can be concluded that most clinical studies have correlated falls with nocturia indiscriminately with regards to age and gender variables, and have found associations between nocturia and falls when there were more than four nocturia episodes per night. It may be inferred that the lack of association between nocturia and falls observed in our study can be explained, at least partially, by the exclusively male sample and the number of visits to the toilet, which was probably lower than what is shown in studies described in the literature. Moreover, the prevalence of falls among elderly people may be associated with other chronic diseases, which were not taken into consideration in the present study.

In summary, nocturia and falls are highly prevalent conditions in the elderly but no association was found between them in this study, so that these variables may be correlated to age and other clinical conditions. With the aim of achieving greater understanding of the relationship between nocturia and falls, we suggest that a cohort study should be conducted, with a significant sample of the elderly population from a community, stratifying gender, age, chronic diseases and visits to the toilet, so as to obtain a greater volume of data and thereby make it possible to draw up care programs for community-living elderly people.

Conflict of interest

The authors declare that they have no conflict of interest.

References

1. Weatherall M, Arnold T. Nocturia in adults: draft New Zealand guidelines for its assessment and management in primary care. N Z Med J. 2006;119:U1976.
2. Coyne KS, Zhou Z, Bhattacharyya SK, Thompson CL, Dhawan R, Versi E. The prevalence of nocturia and its effect on healthrelated quality of life and sleep in a community sample in the USA. BJU Int. 2003;92:948-54.
3. Yoshimura K, Terada N, Matsui Y, Terai A, Kinukawa N, Arai Y. Prevalence of and risk factors for nocturia: Analysis of a health screening program. Int J Urol. 2004;11:282-7.
4. van Balen R, Steyerberg EW, Polder JJ, Ribbers TL, Habbema JD, Cools HJ. Hip fracture in elderly patients: outcomes for function, quality of life, and type of residence. Clin Orthop Relat Res. 2001;390:232-43.
5. Tinetti ME, Williams TF, Mayewski R. Fall risk index for elderly patients based on number of chronic disabilities. Am J Med. 1986;80:429-34.
6. Abrams P, Quince C. The impact of mortality on predator population size and stability in systems with stage-structured prey. Theor Popul Biol. 2005;68:253-66.
7. Morris V, Wagg A. Lower urinary tract symptoms, incontinence and falls in the ederly people: time for an intervention study. In J Clin Pract. 2007;61:320-3.
8. Parsons JK, Mougey J, Lambert L, Wilt TJ, Fink HA, Garzotto M, Barret-Connor E, Marshall LM. Lower urinary tract symptoms increase the risk of falla in older men. BJU Int. 2009;104: 63-8.
9. Lebrão MLD, YAO. SABE: Saúde, bem estar e envelhecimento. O Projeto SABE no município de São Paulo. uma abordagem inicial. 2003.
10. Afifi A, Clark VA, May S. Computer aided multivariate analysis. 4th ed. Washington, DC: Chapman & Hall/CRC; 2004.
11. Asplund R. Pharmacotherapy for nocturia in the elderly patient. Drugs Aging. 2007;24:325-43.
12. Weiss JP, Blaivas JG, Stember DS, Chaikin DC. Evaluation of the etiology of nocturia in men: the nocturia and nocturnal bladder capacity indices. Neurourol Urodyn. 1999;18:559-65.
13. Asplund R. Nocturia, nocturnal polyuria, and sleep quality in the elderly. J Psychosom Res. 2004;56:517-25.
14. Tromp AM, Pluijm SM, Smit JH, Deeg DJ, Bouter LM, Lips P. Fall-risk screening test: a prospective study on predictors for falls in community-dwelling elderly. J Clin Epidemiol. 2001;54: 837-44.
15. Asplund R, Marnetoft SU, Selander J, Akerström B. Nocturia in relation to somatic health, mental health and pain in adult men and women. BJU Int. 2005;95:816-9.
16. Stewart RB, Moore MT, May FE, Marks RG, Hale WE. Nocturia: a risk factor for falls in the elderly. J Am Geriatr Soc. 1992;40: 1217-20.
17. Morris V, Woff A. Lower urinary tract symptoms, incontinence and falls in the ederly people:time for an intervention study. In J Clin Pract. 2007;61:320-3.
18. Parsons JK, Parsons JK, Bergstrom J, Silberstein J, Barrett-Connor E. Prevalence and characteristics of lower urinary tract symptoms in men aged > or = 80 years. Urology. 2008;72: 318-21.
19. Hendrich AL, Bender PS, Nyhuis A. Validation of the Hendrich II Fall Risk Model: a large concurrent case/control study of hospitalized patients. Appl Nurs Res. 2003;16:9-21.
20. Ozcan A, Donat H, Gelecek N, Ozdirenc M, Karadibak D. The relationship between risk factors for falling and the quality of life in older adults. BMC Public Health. 2005;5:90.