Pharmacoepidemiology and Health in a Brazilian Older Population

Tassiane C. Morais, Mahmi Fujimori, Olegário R. Toledo, Claudemir Batalini, Eduardo Luzia França, Carlos K.B. Ferrari, Adenilda C. Honório-França*

Instituto Universitário do Araguaia, Federal University of Mato Grosso, Pontal do Araguaia, Mato Grosso, Brazil.

SUMMARY

Background: Many health concerns, such as cardiovascular diseases, metabolic disorders, falls and inadequate drug use, can affect the vulnerable older population. The objectives of this study were to verify the use of prescription drugs in an older population, as well as their morbidities and the occurrence of falls.

Methods: The study comprised 300 older people from the town of Barra do Garças, Mato Grosso State, Brazil. Data were collected during leisure sessions using a 23-item questionnaire. Statistical analysis was performed using Mantel-Haenszel Chi-squared test, Student's *t* test and odds ratio calculation. Drugs were classified according to the Anatomical Therapeutical Chemical Classification System, and diseases were classified following the 10th Review of the International Classification of Diseases and Health Problems.

Results: The majority of the subjects were women aged 60–70. Circulatory health problems were the most prevalent diseases. There was a significant positive association between bone and skeletal muscle diseases and falls (odds ratio, 2.27). Overall, 82.3% of the subjects had used at least one medicinal drug in the last 15 days. During this time interval, 554 drugs were consumed, leading to an average of 2.4 remedies per subject. Cardiovascular drugs were the most prevalent therapeutic indications (39%). Although 87% of drugs used by the subjects were prescribed by a physician, 56.7% of the subjects had not been examined by a physician in the last 30 days.

Conclusion: In this older population, the presence of morbidities and frequent use of drug use were commonly observed. Special care should be taken for older subjects with bone and skeletal muscle diseases to reduce the risk of falls. The high proportion of older people using drugs without a recent medical prescription indicated irrational medicinal drug use. [International Journal of Gerontology 2008; 2(3): 103–108]

Key Words: diseases, drug use, falls, older, pharmacoepidemiology

Introduction

Over the past few decades, significant growth of elderly populations has been observed around the world. This is a global phenomenon with multiple health and social policy implications[1]. Although increases in older populations have been associated with developed European and North American nations, more than half of older people live in developing countries[2–4]. In Brazil, the older population is also increasing and comprises around 17 million inhabitants. This population represents 9.3% of the total population and is responsible for 25% of the costs of the Brazilian Health System[5,6]. According to the Brazilian Institute of Geography and Statistics[7], older people will represent 11.4% of the population and comprise 25 million people by 2020. Despite the growing number of elderly people in Brazil, this population does not find adequate assistance in the public health and insurance systems, and develops many disabilities as a consequence of chronic non-transmissible diseases. Therefore, these people lose

Correspondence to: Professor Adenilda C. Honório-França, Instituto Universitário do Araguaia, Universidade Federal de Mato Grosso, Rodovia MT100, Km 3,5, Pontal do Araguaia, MT 78698-000, Brazil.
E-mail: adenilda@ufmt.br
Accepted: May 10, 2008

individual autonomy and quality of life[8], and consume more drugs than people at other life stages[9].

Aged people can suffer from multiple pathologies associated with concomitant use of various drugs. This concomitant use is commonly related to inadequate drug use, increasing adverse reactions, and potentially dangerous drug interactions[10]. Aged people are more sensitive to the effects of drugs than young people, and this phenomenon is associated with the physiologic changes of senescence[11]. These changes can affect drug pharmacokinetics and/or pharmacodynamics. The most important pharmacokinetic change in older adults is renal function decline, which affects drug urinary excretion[12].

There are many factors that strongly influence the adherence of the geriatric population to pharmacotherapy. Loss of hearing and cognitive decline can be involved in many therapeutic errors regarding dose, time of drug administration, inadequate drug changing, and other problems[13,14].

Rational drug use by the aged population is an important matter for health professionals[15]. The present study describes the health concerns and drug use of a sample of older people in a Brazilian city.

Patients and Methods

This study was a transversal epidemiologic study in an urban area of Central-Western Brazil covering the population of Barra do Garças (Mato Grosso), a town comprising 53,243 inhabitants[16]. The study population was composed of subjects aged ≥ 60 years, who were engaged in leisure activities offered by the Social Action Secretary of Barra do Garças from September 2007 to December 2007. The people were informed of the ethical aspects of the study. They were not obliged to join the study. It did not pose any risk to the participants, and their personal data obtained during individual interviews would always remain confidential. A total of 300 older people signed informed consent to participate in the study.

To improve reproducibility, a 23-item questionnaire mainly composed of short objective questions with a simple and adapted language for this population was used. This questionnaire consisted of questions regarding descriptive general epidemiology, health, and pharmacoepidemiologic concerns about the population. During the leisure sessions, the study was explained to the 300 subjects again. After obtaining firm consent, the subjects were interviewed by trained personnel because of their poor vision and low educational levels.

The diseases recorded by the subjects were classified according to the 10th Review of the International Classification of Diseases and Health Problems[17].

The drugs recorded by the subjects were grouped in accordance with the first level of classification of the Anatomical Therapeutical Chemical Classification System (ATC)[18], considering the drug indications and their chemical (generic) names. The Pharmaceutical Dictionary of Prescription Drugs was also used to identify the generic names of some drugs in order to subsequently use the ATC.

Statistical analysis of the data was performed using the Epi Info 6.04d program (Centers for Disease Control and Prevention, Atlanta, GA, USA). The Mantel-Haenszel Chi-squared test, Student's *t* test and odds ratios were calculated. The data were considered significant when the *p* value was less than 0.05.

Results

The mean age of the study subjects was 69.5 years (range, 60–92 years). The most numerous group were 60–69 years of age (51.33%). In the educational level, the most prevalent group had only 1–4 years of formal education (47.66%). Overall, 75.67% of the study population declared that they received a pension from the Ministry of Social Security and Assistance, while 9% of the study population did not receive a salary or pension. Sixty-eight percent of the subjects were classified as having a lower socioeconomic status, and 29.33% lived alone. In total, 83.7% of the older subjects declared that they had suffered from a disease in the last 30 days. These diseases are listed in Table 1.

There was a positive association between bone and skeletal muscle diseases and the risk of falls (odds ratio [OR], 2.27; 95% confidence interval [CI], 1.07–4.82). Among the older subjects, 14.7% had suffered at least one fall in the 30 days prior to the interview. The prevalence of falls was higher in older females (17.5%) than in older males (9.4%). Women exhibited a tendency for a twofold higher risk of falls compared with men, but this difference was not statistically significant (OR, 2.04; CI, 0.91–4.67).

Concerning drug consumption by this older population, 82.3% had used one or more prescribed drugs in the last 15 days. Overall, this population consumed 554

Table 1. *Prevalence of diseases in an elderly population from Barra do Garças, Brazil*

Diseases	*n* (%)
Circulatory system diseases	165 (65.7)
Bone, connective tissue and skeletal muscle diseases	93 (37.1)
Endocrine, nutritional and metabolic diseases	48 (19.1)
Abnormal symptoms and laboratory findings	25 (10.0)
Genitourinary tract diseases	23 (9.2)
Respiratory system diseases	22 (8.8)
Nervous system diseases	19 (7.6)
Digestive system diseases	18 (7.2)
Infectious and parasitic diseases	10 (4.0)
Eye and orbital diseases	8 (3.2)
Psychiatric and behavioral disorders	4 (1.6)
Other*	9 (3.6)

**Diseases with prevalences ≤3, including ear diseases, blood and hematopoietic disorders, neoplasms, and diseases and injuries of the skin and subcutaneous tissues.*

Table 2. *Medicinal drug use by the older subjects in the 15 days prior to the interview according to sex**

Quantity of use	Female	Male	Total
1	48 (29.6)†	39 (44.7)†	86 (34.8)
2	46 (28.4)	33 (38.8)	79 (32.0)
3	37 (22.8)	8 (9.4)	45 (18.2)
4	16 (9.9)	5 (5.9)	21 (8.5)
5	10 (6.2)	1 (1.2)	11 (4.5)
6 or more	5 (3.1)	0 (0.0)	5 (2.0)
Total	162 (62.6)	85 (34.4)	247 (100.0)

**Data are presented as n (%); †$p < 0.05$.*

medicinal drugs. The mean drug use by this population was 2.24 drugs per subject, but the majority of these older people used just one medicinal drug (34.8%). Table 2 presents the frequencies of drug use according to sex in this elderly population.

The drugs were distributed according to the ATC classes (Table 3). However, 3.2% of the drugs could not be classified, because some subjects did not record the drug names or their indications.

In this older population, no associations were observed between medicinal drug use and civil status, living alone, educational level, socioeconomic status, religion, and occurrence of falls. A mere 4.1% of the study population declared that they had suffered adverse drug effects in the last 15 days.

Table 3. *Medicinal drug use according to Anatomical Therapeutical Chemical Classification System (ATC) drug classes*

Medicinal drug classification	*n* (%)
Cardiovascular system	216 (39.0)
Digestive system and metabolism	78 (14.1)
Skeletal muscle system	73 (13.2)
Central nervous system	65 (11.7)
Blood and hematopoietic tissues	36 (6.5)
Respiratory system	20 (3.6)
Systemic and general anti-infectious drugs	12 (2.2)
Genitourinary system and sex hormones	11 (2.0)
Hormones of systemic use	9 (1.6)
Sense organs	6 (1.1)
Others*	3 (0.5)
Non-classified†	25 (4.5)
Total	554 (100.0)

**Drugs with frequencies of 1. This group included dermatologic drugs, antineoplastics and antiparasitic drugs; †when the older subject did not remember the name and/or drug indications. This group also included phytomedicinals, which have no classification according to the ATC.*

In this study population, 87% reported using drugs according to a physician's prescription, 9% reported self-medication, and 4% reported drug indications from a pharmacy employee. Furthermore, 56.7% of the subjects reported a lack of medical examination in the 30 days prior to the interview.

Discussion

One important pitfall of studies regarding medicinal drug use by older patients is that they have been carried out on hospitalized subjects, which can lead to overestimation of the results. The present study differed from previous studies, because we analyzed the subjects during leisure activities offered by the municipal government. From this aspect, it has been suggested that engagement in leisure activities, including physical exercises and an active sexual life, can positively influence the health of geriatrics[19–21].

The majority of the study subjects were 60–69 years of age. This probably reflects the fact that these subjects are more active than older subjects and are, therefore, more likely to participate in leisure activities. Advanced aging represents increased risks of morbidity and death[22],

and these older people are more likely to stay at home or even be confined to bed as a consequence of mobility problems. Participation of women in the leisure activities was most frequent (64.7%), confirming the feminization process of human aging[23].

In this older population, 83.7% of subjects reported suffering from a disease in the last 30 days. Aging cannot be considered a synonym for disease, but a process that can increase the risks of chronic morbidities reducing the quality of life of the geriatric population[24]. Working with an elderly population in Sao Paulo, Brazil, the authors found that the presence of morbidities strongly decreased the functional capacity of the subjects, thereby affecting their autonomy to realize their daily life activities[25]. In this regard, social support from families and nurses, especially high frequencies of family interactions plus physical function and daily life activities, were positively associated with quality of life in Southern Taiwan[26]. Another study in Turkey revealed that independence for activities of daily living and practice of physical exercises were strongly associated with quality of life in elderly home residents[27]. Therefore, autonomy is very important for guaranteeing life satisfaction and improving integration of the elderly in society[28].

A study in Miaoli County, Taiwan, comprising a sample from the "Successful Ageing for the Elderly in Taiwan", showed that health, autonomy, enjoyment of life, mastery over life and support from the family and community were the determinant factors for the quality of life of elderly subjects[29].

In our study, the most important morbidities found in the elderly population were circulatory diseases (65.7%) followed by bone and skeletal muscle diseases (37.1%), while mental and behavioral disorders were uncommon (1.6%).

This study reinforces the observation that cardiovascular diseases are the leading cause of death in elderly populations, including those in Brazil[30]. Heart failure is the most important disease of older adults. Its prevalence increases by fivefold from 40–70 years of age, and 70% of heart failure patients are aged over 65 years[31]. Similar results were found in an elderly population in Sweden. In that study, 66.3% of older men and 70.7% of older women had some cardiovascular disease[32].

Although bone and skeletal muscle diseases were not the leading cause of morbidity in this elderly population, they negatively affect the geriatric quality of life. Arthritis and other rheumatic diseases are responsible for chronic pain, which represents a public health problem in geriatric populations that deserves adequate treatment and management[33].

Another factor that negatively influences geriatric quality of life is falls. These accidents are associated with high incidences of physical injuries, hospitalization, bone fractures in previously osteoporotic bones, and deaths among the elderly[34]. In our study, 14.7% of the subjects fell at least once in the 30 days prior to the interview. In a US study, 21% of the elderly subjects were victims of falls during the past year, and more women were affected than men. In that study, the presence of bone and skeletal muscle diseases doubled the risk of falls in the elderly population[35].

Engagement in physical activities is important to avoid falls and prevent bone fractures due to osteoporosis[20,36]. Urban and architectural changes in facilities and environments for the elderly are also essential to prevent falls.

In this study, 82.3% of the subjects reported having consumed at least one prescription drug in the 15 days prior to the interview. Among the elderly subjects who used a medicinal drug, the majority (34.8%) used just one prescription drug. A total of 554 drugs were consumed, leading to a mean consumption of 2.24 prescription drugs per subject. This finding is similar to previous data from a cross-sectional study of 1,598 people in Belo Horizonte (Minas Gerais), Brazil, which reported a mean consumption of 2.18 prescription drugs per patient[37]. However, that study observed an association between drug consumption and educational level not observed in the present study. There are, though, different results in the literature. In Porto Alegre, Brazil, a mean use of 3.2 prescription drugs per patient was reported[38]. A study on internalized elderly subjects in Minas Gerais, Brazil, observed a mean use of 4.6 drugs per patient and 47.7% of that population had used five or more prescription drugs[39]. A study by Roth and Ivey[40] involving 100 elderly residents in Chapel Hill, North Carolina, USA, observed a mean of 9.6 prescription medications per patient and a mean of 2.6 medical examinations. The discrepancy found in our study probably reflects the fact that we worked with non-hospitalized subjects, who practiced leisure activities with a consequent positive influence on their quality of life.

The majority of consumed drugs in this study were cardiovascular medicinal drugs (39%), followed by drugs that act on the digestive system and metabolism. This drug use is in accordance with the morbidity patterns

of the older population. Flores and Mengue[38] also found higher use of cardiovascular drugs, followed by drugs for the nervous system and drugs with actions on the gastrointestinal tract and metabolism.

The majority of drug use in this study was prescribed by physicians (87.0%). This is in accordance with a previous Brazilian study, in which 80% of the elderly population had used drugs after a medical prescription[41]. This high prevalence of prescribed pharmaceuticals is related to free medical consultations and better facilities for obtaining free or price-reduced prescription drugs in basic public health units with medical prescriptions. Another factor that could favor the low prevalence of self-medication in this population is that they were engaged in leisure-time physical activities, including dance and aquatic gymnastics. Regular practice of physical activities has been associated with a reduction in self-medication, as observed in an aging population in the city of Salgueiro (Pernambuco), Brazil[42].

In our study, 56.7% of the elderly subjects confirmed that they had not received any medical consultations in the 30 days prior to the interview. Therefore, the prescription drugs have been used according to old prescriptions. This habit could lead to unnecessary drug use or even to incoherent therapy. The chances of inadequate drug use increase with the number of prescribed medicines and the amount of use of health services[13].

Health professionals should emphasize the rational use of prescription drugs, including adhesion to therapeutic schemes, as well as educate the older and general populations with respect to the adverse health risks related to inadequate drug consumption.

To conclude, the most prevalent diseases in this elderly population were circulatory system diseases, bone, connective tissue and skeletal muscle disorders, and endocrine, nutritional and metabolic diseases. The higher proportion of older people using drugs without a recent medical prescription indicates inadequate medicinal drug use.

References

1. Lloyd-Sherlock P. Population ageing in developed and developing regions: implications for health policy. Soc Sci Med 2000; 51: 887–95.
2. Kinsella K, Velkoff VA. US Census Bureau. An Aging World: 2001. Available at: http://www.census.gov/prod/2001pubs/p95-01-1.pdf [Date accessed: 10 March 2008]
3. Sagaza H. Population aging in the Asia-Oceania region. Geriatr Gerontol Int 2004; 4: S34–7.
4. Chalise HN, Brightman JD. Aging trends: population aging in Nepal. Geriatr Gerontol Int 2006; 6: 199–204.
5. Government of Brazil. Dispõe sobre a política nacional do idoso cria o Conselho Nacional do Idoso e dá outras providências. Brazilian Constitution, Law no. 8.842, January 4, 1994. Available at: http://www.planalto.gov.br [Date accessed: 14 August 2006]
6. Instituto Brasileiro de Geografia e Estatística. Perfil dos idosos responsáveis pelos domicílios no Brasil 2000. Estudos e Pesquisas Informação Demográfica e Socioeconômica, no. 9. Rio de Janeiro: IBGE, 2002.
7. Instituto Brasileiro de Geografia e Estatística. Population Count 2007. Available at: http://www.ibge.gov.br/english/estatistica/populacao/contagem2007/default.shtm [Date accessed: 10 March 2008]
8. Chaimowicz F. [Health of Brazilian elderly just before the 21st century: current problems, forecasts and alternatives.] Rev Saude Publica 1997; 31: 184–200. [In Portuguese]
9. Mosegui GBG, Rozenfeld S, Veras RP, Vianna CMM. [Quality assessment of drug use in the elderly.] Rev Saude Publica 1999; 33: 437–44. [In Portuguese]
10. Zagaria MAE. Polypharmacy and potentially inappropriate medication use in the elderly: across the practice-setting spectrum. US Pharm 2006; 31: 112–6.
11. Cornelius C. Drug use in the elderly: risk or protection? Curr Opin Psychiatry 2004; 17: 443–7.
12. Crooks J, Stevenson IH. Drug response in the elderly—sensitivity and pharmacokinetic considerations. Age Ageing 1981; 10: 73–80.
13. Galvão C. The polymedicated elderly—strategies for prescribing improvement. Rev Port Clin Geral 2006; 22: 47–52. [In Portuguese]
14. Soares MA. O medicamento e o idoso. Rev Pharm Bras 2000; III (18): 144–5. Available at: http://www.portaleducacao.com.br/farmacia/principal/conteudo.asp?id=144.
15. Gorin SH. Medicare and prescription drugs: prospects for reform. Health Soc Work 2001; 26: 115–8.
16. Instituto Brasileiro de Geografia e Estatística. Contagem da População, 2007 [Brazilian Census, state of Mato Grosso, 2007]. Available at: http://www.ibge.gov.br/home/estatistica/populacao/contagem2007/MT.pdf [Date accessed: 10 March 2008]
17. Décima Revisão da Classificação internacional de doenças. Available at: http://www.fsp.usp.br/~cbcd [Date accessed: 8 December 2006]
18. Anatomical Therapeutic Chemical Classification System (ATC). Available at: http://www.whocc.no/atcddd/index-database/index.php [Date accessed: 8 December 2006]

19. Almeida OP, Ratto L, Garrido R, Tamai S. [Risk factors and consequences of polypharmacy among elderly outpatients of a mental health service.] Rev Bras Psiquiatr 1999; 21: 152–7. [In Portuguese]
20. Ferrari CKB. Functional foods and physical activities in health promotion of aging people. Maturitas 2007; 58: 327–39.
21. Wang TF, Lu CH, Chen IJ, Yu S. Sexual knowledge, attitudes and activity of older people in Taipei, Taiwan. J Clin Nurs 2008; 17: 443–50.
22. Maia F de OM, Duarte YAO, Lebrão ML, Santos JLF. [Risk factors for mortality among elderly people.] Rev Saude Publica 2006; 40: 1049–56. [In Portuguese]
23. World Health Organization. Women, ageing and health. Fact sheet no. 252, June 2000. Available at: http://www.who.int/mediacentre/factsheets/fs252/en [Date accessed: 14 December 2006]
24. Matsushita S, Matsushita M, Itoh H, Hagiwara K, Takahashi R, Ozawa T, et al. Multiple pathology and tails of disability: space–time structure of disability in longevity. Geriatr Gerontol Int 2003; 3: 189–99.
25. Lebrão ML, Duarte YAO. SABE: Saúde, Bem-estar e Envelhecimento. In: Lebrão ML, Duarte YAO, eds. O Projeto Sabe no município de São Paulo: uma abordagem inicial. Brazil: Pan American Health Organization 2003: 255.
26. Tseng SZ, Wang RH. Quality of life and related factors among elderly nursing home residents in Southern Taiwan. Public Health Nurs 2001; 18: 304–11.
27. Luleci E, Hey W, Subasi F. Assessing selected quality of life factors of nursing home residents in Turkey. Arch Gerontol Geriatr 2008; 46: 57–66.
28. Ramos LR. [Determinant factors for healthy aging among senior citizens in a large city: the Epidoso Project in São Paulo.] Cad Saude Publica 2003; 19: 793–8. [In Portuguese]
29. Hsu HC. Exploring elderly people's perspectives on successful ageing in Taiwan. Ageing Soc 2007; 27: 87–102.
30. Lima-Costa MF, Guerra HL, Barreto SM, Guimarães RM. [Diagnosis of the health condition of the elderly population in Brazil: a study of mortality and admissions in public hospitals.] Inf Epidemiol Sus 2000; 9: 23–41. [In Portuguese]
31. Chiu CZ, Cheng JJ. Congestive heart failure in the elderly. Int J Gerontol 2007; 1: 143–52.
32. Gustafsson TM, Isacson DGL, Thorslund M. Mortality in elderly men and women in a Swedish municipality. Age Ageing 1998; 27: 585–93.
33. Andrade FA, Pereira LV, Sousa FA. [Pain measurement in the elderly: a review.] Rev Lat Am Enfermagem 2006; 14: 271–6. [In Portuguese]
34. Smith J, Lewin G. Home care clients' participation in fall prevention activities. Australas J Ageing 2008; 27: 38–42.
35. de Rekeneire N, Visser M, Peila R, Nevitt MC, Cauley JA, Tylavsky FA, et al. Is a fall just a fall: correlates of falling in healthy older persons. The Health, Aging and Body Composition Study. J Am Geriatr Soc 2003; 51: 841–6.
36. Kemmler W, Engelke K, Weineck J, Hensen J, Kalender WA. The Erlangen Fitness Osteoporosis Prevention Study: a controlled exercise trial in early postmenopausal women with low bone density—first-year results. Arch Phys Med Rehabil 2003; 84: 673–82.
37. de Loyola Filho AI, Uchoa E, Lima-Costa MF. [A population-based study on use of medication by the elderly in Greater Metropolitan Belo Horizonte, Minas Gerais, Brazil.] Cad Saude Publica 2006; 22: 2657–67. [In Portuguese]
38. Flores LM, Mengue SS. [Drug use by the elderly in Southern Brazil.] Rev Saude Publica 2005; 39: 924–9. [In Portuguese]
39. Silva AE, Menezes EAG, Coelho TOA, Moraes EN. Aspectos Bio-Psico-Sociais dos Idosos Institucionalizados na Casa do Ancião da Cidade Ozanan, no Ano de 2005. In: Congresso de Extensão da UFMG, 8. Belo Horizonte, 2005.
40. Roth MT, Ivey JL. Self-reported medication use in community-residing older adults: a pilot study. Am J Geriatr Pharmacother 2005; 3: 196–204.
41. Coelho Filho JM, Marcopito LF, Castelo A. [Medication use patterns among elderly people in urban area in Northeastern Brazil.] Rev Saude Publica 2004; 38: 557–64. [In Portuguese]
42. Barros e Sá M, de Barros JAC, de O Sá MPB. [Self-medication in the elderly of the city of Salgueiro, State of Pernambuco.] Rev Bras Epidemiol 2007; 10: 75–85. [In Portuguese]