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Factors associated with chronic diseases among the elderly receiving treatment under the Family Health Strategy

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Abstract *The profile of a sample population of elderly receiving treatment under the Family Health Strategy in the municipality of Teófilo Otoni, State of Minas Gerais, Brazil, is described, and the factors associated with diseases prevalence examined. Using simple random sampling, 385 elderly were interviewed using Form A and Elderly Form from the Primary Health Care Information System. The majority of the sample (83.1%) self-reported at least one disease, 69.9% had hypertension, and 17.7% had diabetes. Poisson regression analysis showed that the main factors associated with hypertension and other diseases were being non-white, having a low level of education, medication use, dental prosthesis use, and lack of a private health plan. The prevalence of diabetes was greater among women and individuals who depended on other people to live. It can be concluded that this sample population of elderly has a generally low socioeconomic status and are more susceptible to developing diseases, particularly hypertension. Diabetes should be controlled although had relatively low prevalence. It is suggested investments in structuring the health system network to provide adequate care for the elderly and in training health professionals to play an effective role in improving the quality of life of the elderly in Brazil.*

Key words *Health services for the elderly, Health Profile, Family Health*

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Introduction

Population aging, today a global phenomenon, results from declining fertility and death rates and rising life expectancy[1]. Defining the onset of old age is relatively complex and involves a series of factors. However, for practical purposes, the threshold for older age in Brazil is 60 years, according to the National Policy for the Elderly (Law 8.842, 4th January 1994)[2].

Although population aging has resulted in a number of benefits related to greater longevity, it has led to changes in morbidity and a mortality profile characterized by an increase in the prevalence of several chronic degenerative diseases[1]. A number of studies on human ageing have been carried out in response to concerns over elderly health. This type research is essential to guide public policies which target the elderly, especially since the Brazilian health system still needs to be reorganised to meet the demands of changing demographic and epidemiological profiles arising from an increase in life expectancy[3]. Improvements to private health care are also necessary to provide effective care for this segment of the population, given that prevention of disease and costly treatment avoids future costs for the government[4].

At municipal level, primary health care for the elderly is delivered through multidisciplinary Family Health Teams, as part of the Family Health Strategy (ESF, acronym in Portuguese), which develop health promotion, protection and recovery activities[5]. Community Health Agents (ACS, acronym in Portuguese) monitor the dynamics of families, filling in a number of forms provided by the Primary Health Care Information System (SIAB, acronym in Portuguese)[6], including Form A[7,8], which registers socioeconomic characteristics, living conditions and information on the health (morbidity) of the family and its individual members, and the Form for the Elderly[7]. These forms register not only the health status of the elderly, but also the determinants of the health-disease process, thus guiding the planning, assessment and inspection of healthcare services in a given health service coverage area[8].

The purpose of this study was to provide inputs to shape local planning of health actions by assessing the profile of the elderly population receiving care under the ESF in the municipality of Teófilo Otoni in the State of Minas Gerais. In this way, the study aims to gain a greater understanding of the health status of the elderly and the determinants of the health-disease process.

Methodology

Study area

This study was conducted in the municipality of Teófilo Otoni in the Mucuri Valley, in the northeast of the State of Minas Gerais. The municipality has an area of 3,243 **Km²** and the climate of the region is tropical**. According to the 2010 Census, the municipality has a population of approximately** 134,067 inhabitants, 80% of which live in urban areas[8]. The municipality is one of the State of Minas Gerais' 75 micro health regions**, and provides medium to high complexity health care services**. **According to the Municipality's Department of Health (SMS, acronym in Portuguese), at the time this study was undertaken,** 30 Family Health Teams **provided coverage across the e**ntire municipality, 23 of which were operating in urban areas and seven in rural areas.

Outline of the study and sample

This investigation comprises a cross-sectional study using a quantitative approach. A list of elderly living in the urban area of Teófilo Otoni and registered in the in the ESF was obtained from the SMS together with authorisation to consult the Family Health Teams and ESF coordinator. Initially, the Family Health Teams provided information on the elderly and ACSs which was used to define a strategy to contact these individuals. The Forms for the Elderly were sorted using simple random sampling to form the study sample.

The adequate sample size (n = 449 elderly) was calculated using the software DIMAM 1.0, considering the following parameters: 1) estimated prevalence of health problems among the elderly population of 50%; 2) a population of 10,569 elderly residents in the urban area of Teófilo Otoni covered by the ESF; 3) a 95% confidence level; and 4) a margin of error of 5%, together with an estimated non-response rate of 20%. The participant was excluded from the sample if he/she was not at home after three consecutive visits due to different reasons, including hospitalisation and death.

This study was carried out in accordance with the National Health Council resolution 196/96[9] which sets out the rules and regulations for research involving human beings, and was approved by the Ethics Committee of UNIMON-

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TES (*Universidade Estadual de Montes Claros*). Participants signed an informed consent form and participated in the study anonymously and of their own free will, and had the right to withdraw from the study at any time.

Interviews

The elderly were interviewed at home between March and June 2011 by an appropriately trained and calibrated researcher accompanied by the Family Health Team. Each interview lasted an average of 30 minutes, allowing for the presentation of the study, reading of the informed consent form and questions.

The SIAB Form A, which includes information on living conditions, housing and sanitation, and the Form for the Elderly[7], which includes personal details and information about the elderly person's health problems, were also filled out during the home visit.

Assessment of the elderly

The study assessed sociodemographic characteristics (place of birth, sex, skin colour, age, marital status, level of education, source of income, existence of private health plans and whether the elderly individual lived alone), behavioural characteristics (physical activity, visits to the dentist in the last year, and whether the vaccination card was up to date), housing and dwelling characteristics (presence of electricity supply, water supply, waste disposal and sanitation) and health conditions (release of urine, control of bowel movements, daily use of five or more medications, more than five diagnosed illnesses, progressive memory loss, falls in the last six months, hospitalisation in last six months, bedridden, degree of dependence for carrying out daily activities, use of removable dentures, arterial hypertension, diabetes, osteoporosis, arthritis/arthrosis, heart problems, stroke, Parkinson's disease, chronic obstructive pulmonary disease, glaucoma, cataracts, back problems, tumour, fracture, pneumonia, Alzheimer's, rheumatism, allergies and use of medication).

Each item was analysed using the absolute (n) and relative (%) frequency distribution. Bivariate and multivariate Poisson regression was performed using presence/absence of hypertension and diabetes mellitus, and the presence of disease (none/at least one disease), as dependent variables, and the remaining characteristics as independent variables. The diseases were chosen due to their epidemiological importance. The magnitude of association between the dependent and independent variables was estimated by calculating the prevalence ratios (PR) with a 95% confidence interval.

After bivariate analysis, multivariate analysis was performed with statistically significant variables using the Backward LR method. The final model included the factors where the association with dependent variables remained statistically significant at the 5% error level. The goodness of fit of the final model was tested using the Hosmer-Lemeshow test. All analyses were performed using the PASW Statistics software package (SPSS Inc., Chicago).

Results

The final sample was 385 after taking account of a sample loss rate of 14.3% caused by the following factors: individual not found (7.1%), change of address (6.0%), death (0.9%), and refusal (0.4%).

The majority of the sample (68.8%) were women, 70.1% were non-white, 51.6% were born in urban areas, 45.7% were aged between 60 and 69 years, and 38.2% were aged between 70 and 79 years. With respect to level of education, 124 were illiterate (32%). The main source of income for 70.1% of the sample was a government pension, while 62.9% used the public health service. The majority of the elderly (86.2%) did not live alone, 44.9% lived with a partner, and 34.5% were widowed.

Only 23.9% of the elderly did some form of physical activity, 12.2% had visited the dentist in the last year and 77.1% has an updated vaccination card. With respect to physical environment, 97.7% lived in urban areas. The housing conditions of the large majority of the sample (99.7%) were good and included running water and electricity, while 94.5% of dwellings were connected to the sewerage network and 99.0% were provided with a household waste collection service.

Table 1 outlines the health status of the elderly in the sample. It was observed that 69.9% had hypertension and therefore used medications to treat or reduce the symptoms of this disease. Furthermore, 221 individuals (57.4%) used a dental prosthesis. Over 20% of the interviewees mentioned that they had joint problems, over 15% had diabetes mellitus and cataracts, and over 10% had osteoporosis and heart problems.

The bivariate and multivariate analyses showed associations between hypertension and a

Table 1. Health status of the sample population of elderly in Teófilo Otoni in the State of Minas Gerais, 2011 (N = 384)*.

Variable	No		Yes	
	n	%	n	%
Release of urine*	323	84.1	61	15.9
Control of bowel movements	78	20.3	307	79.7
Use of more than five types of medication	326	84.7	59	15.9
At least one disease	69	16.9	320	83.1
More than five diseases	371	96.4	14	3.6
Progressive memory loss	309	80.3	76	19.7
Falls in the last six months	339	88.1	46	11.9
Hospitalisation in last six months	362	94.0	23	6.0
Bedridden	370	96.1	15	3.9
Depends on other people to carry out daily activities	334	86.8	51	13.2
Use of a removable dental prosthesis	164	42.6	221	57.4
Arterial hypertension	116	30.1	269	69.9
Diabetes	317	82.3	68	17.7
Osteoporosis	334	86.8	51	13.2
Arthritis/ arthrosis	343	89.1	42	10.9
Heart problems	343	89.1	42	10.9
Stroke	371	96.4	14	3.6
Parkinson's disease	378	98.2	7	1.8
Chronic obstructive pulmonary disease	382	99.2	3	0.8
Glaucoma	363	94.3	22	5.7
Cataracts	319	82.9	66	17.1
Back problems	289	75.1	96	24.9
Tumour (cancer)	375	97.4	10	2.6
Fractures	363	94.3	22	5.7
Pneumonia	373	96.9	12	3.1
Alzheimer's	378	98.2	07	1.8
Rheumatism	350	90.9	35	9.1
Allergy	318	82.6	67	17.4
Use of medication	92	23.9	293	76.1

* N = 384 because one individual did not answer this question.

number of other variables (Table 2). The bivariate analysis showed that the prevalence of hypertension was greater in non-white individuals, in the 70 to 79 years age group, in individuals who only had "informal education", and in individuals who used medication and a removable dental prosthesis (P-value < 0.05). There was also an association between hypertension and being from a rural area, being over 79 years of age, and being illiterate, and not having an up-to-date vaccination card (P-value < 0.20). After multiple regression, the only associations that remained statistically significant were those between arterial hypertension and skin colour and the use of medication, where it was shown that prevalence of arterial hypertension was 1.12 times greater among non-white elderly than in white individuals, and 6.14 times greater among those people that used medication than in individuals who did not use medication. The Hosmer-Lemeshow test showed that the model provided an adequate (χ^2 = 6.965; p = 0.223) and statistically significant (G^2 = 178.79; p = 0.000) fit to the data.

The diabetes prevalence rate was 17.7% (Table 1). Table 3 shows that prevalence of diabetes was greater among women, in individuals who had been admitted to hospital in the last six months, and in people who depended on other people to carry out their daily activities (P-value < 0.05). There was also an association between diabetes and being aged between 70 and 79 years, being illiterate, lack of physical activity and the use of a dental prosthesis (P-value < 0.20) (Table 3). The increased prevalence of diabetes among women (1.73 times greater than in men) and in people who depended on other people to carry

Table 2. Variables associated with hypertension among the elderly receiving care through the ESF in Teófilo Otoni, the State of Minas Gerais, 2011. (N = 385)

Variable	Hypertension		Bivariate analysis		Multiple analysis	
	No	Yes	RP_{br}(IC/95%)	P	PR_{adj} (CI/95%)	P
Place of birth						
Urban	67	131	1,00			
Rural	49	137	1,11(0,98-1,27)	**0,110***		
Skin colour						
White	44	71	1,00		1,00	
Non-white	72	198	1,19(1,01-1,40)	**0,036****	1,12(1,02-0,26)	**0,049****
Age						
60 to 69 years	63	113	1,00			
70 a 79 years	36	111	1,18(1,02-1,36)	**0,027****		
> 80 years	16	45	1,15(0,95-1,38)	**0,143***		
Education level						
Primary school and above	32	47	1,00			
Primary school	35	59	1,06(0,83-1,34)	0,661		
Read and write (informal)	15	73	1,39(1,14-1,71)	**0,001****		
Illiterate	34	90	1,22(0,99-1,51)	**0,066***		
Vaccination card updated						
Yes	84	213	1,00			
No	32	56	0,89(0,75-1,06)	**0,176***		
Use of medication						
No	79	13	1,00		1,00	
Yes	37	256	6,18(3,73-10,25)	**0,000****	6,14(3,70-10,18)	**0,000****
Removable dental prosthesis						
No	67	97	1,00			
Yes	49	172	1,32(1,14-1,52)	**0,000****		

RP_{br} and RP_{adj} (CI/95%) = Gross and adjusted prevalence ratio with 95% confidence interval.
* =P < 0,20; ** =P < 0,05.

out their daily activities (1.84 times greater than in independent individuals) remained significant after multivariate analysis. The Hosmer-Lemeshow test showed that the model provided an adequate ($\chi^2 = 22.81$; p = 0.597) and statistically significant ($G^2 = 7.66$; p = 0.022) fit to the data.

The large majority of the elderly (83.1%) stated that they had at least one illness. This characteristic was associated with a number of variables (Table 4) including being female, being from a rural area, having only "informal education", living alone, not having a private health plan, inadequate waste disposal, being admitted to hospital in the last six months, and using a removable dental prosthesis (P-value < 0.05). After increasing the level of probability of error (P-value < 0.20), having at least one illness was associated with being over 70 years of age, being from a rural area, living in a household where domestic sewage is discharged into cesspits/the open, and being dependent on other people to carry out daily activities. Multiple regression confirmed an association between prevalence of illness and being born in a rural area, living alone, the use of medication and using a removable dental prosthesis. The Hosmer-Lemeshow test showed that the model provided an adequate ($\chi 2 = 8.68$; p = 0.223) and statistically significant (G2 = 33.64; p = 0.000) fit to the data.

Discussion

The first phase of this study described the profile of the elderly population in the municipality of Teófilo Otoni receiving health care from Family Health Teams using easy-to-use forms provided to ESF health centres by the SIAB. This stage highlighted the important role that primary health care professionals play in gathering information which, together with government data, is a useful input into the assessment of the health status of the elderly and definition of their care demands[10]. After characterising the population

Table 3. Variables associated with diabetes among the elderly receiving care through the ESF in Teófilo Otoni, the State of Minas Gerais, 2011. (N = 385)

Variable	Diabetes		Bivariate analysis		Multiple analysis	
	No	Yes	PR_{br} (IC/95%)	P	PR_{adj} (IC/95%)	P
Sex						
Male	106	14	1,00		1,00	
Female	211	54	1,75(1,01-3,02)	**0,046****	1,73(1,01-2,98)	**0,047****
Age						
60 to 69 years	150	26	1,00			
70 a 79 years	115	32	1,47(0,92-2,36)	**0,1058***		
> 79 years	51	10	1,11(0,57-2,17)	0,760		
Education level						
Primary school and above	67	12	1,00			
Primary school	81	13	0,91(0,44-1,89)	0,800		
Read and write (informal)	74	14	1,05(0,52-2,13)	0,898		
Illiterate	95	29	1,5(0,84-2,84)4	0,166*		
Physical activity						
Yes	38	3	1,00			
No	279	65	2,58(0,85-7,85)	**0,094***		
Brushes own teeth						
Yes	309	66	1,00			
No	08	2	1,14(0,32-4,00)	**0,842**		
Hospitalisation (last 6 months)						
No	302	60	1,00			
Yes	15	8	2,10(1,15-3,85)	**0,016****		
Depends on other people to carry out daily activities						
No	281	53	1,00		1,00	
Yes	36	15	1,85(1,13-3,03)	**0,014****	1,84(1,12-3,01)	**0,016****
Removable dental prosthesis						
No	141	23	1,00			
Yes	176	45	1,45(0,92-2,30)	**0,112***		

RP_{br} and RP_{adj} (CI/95%) = Gross and adjusted prevalence ratio with 95% confidence interval.
* = P < 0,20; ** = P < 0,05.

sample, we analysed the association between a number of factors related to sociodemographic, behavioural, and housing and dwelling characteristics and the prevalence of mainly chronic, noncommunicable coexisting diseases and comorbidities. Our findings serve to help guide the planning of health services targeting this age group.

The analysis of the sociodemographic aspects showed that over 70% of the sample were women. Furthermore, the majority of the elderly were non-white and were illiterate or had not completed primary school, suggesting an unfavourable socioeconomic status. Furthermore, the majority did not live alone and depended upon a government pension as their main source of income, reflecting the reality of many developing countries where a large portion of elderly people live with their children, despite an increase in longevity[11].

Despite these social problems, practically all the elderly live in dwellings with electricity and water supply, connected to the sewage network and provided with a household waste disposal service, the latter of which are provided by the town council in urban areas. On the whole, the elderly did not practice any physical activity and had not been to the dentist recently. The low prevalence of dentist visits and high prevalence of individuals using a removable dental prosthesis suggest a lack of access to dental care services among this segment of the population.

The majority of the elderly kept their vaccination card up to date, which suggests that they

Table 4. Variables associated with at least one self-reported disease among the elderly receiving care through the ESF in Teófilo Otoni, the State of Minas Gerais, 2011. (N = 385).

Variable	Disease		Bivariate analysis		Multiple analysis	
	No	Yes	PR_{br} (IC/95%)	P	PR_{adj} (IC/95%)	P
Sex						
Male	27	93	1,00			
Female	38	227	1,11(0,99-1,23)	**0,070****		
Place of birth						
Urban	42	156	1,00		1,00	
Rural	23	163	1,11(1,02-1,22)	**0,021****	1,09(1,02-1,17)	**0,015****
Age						
60 to 69 years	36	140	1,00			
70 a 79 years	21	126	1,08(0,98-1,19)	**0,143***		
> 79 years	8	53	1,09(0,97-1,24)	**0,159***		
Education level						
Primary school and above	18	61	1,00			
Primary school	19	75	1,03(0,88-1,21)	0,683		
Read and write (informal)	05	83	1,22(1,07-1,33)	**0,003****		
Illiterate	23	101	1,06( ) 0,91-1,22	0,474		
Lives alone						
No	61	271	1,00		1,00	
Yes	4	49	1,13(1,03-1,24)	**0,008****	1,11(1,01-1,21)	**0,024****
Private health plan						
Yes	55	37	1,00		1,00	
No	10	283	2,40(1,87-3,08)	**0,000****	2,31(1,81-2,95)	**0,000****
Domestic sewage						
Sewage network	58	306	1,00			
Cesspit/open	7	14	0,79(0,58-1,88)	**0,137***		
Waste disposal						
Waste disposal service	65	316	1,00			
Burned/open air	0	4	1,21(1,15-1,26)	**0,000****		
Hospitalisation (last 6 months)						
No	64	298	1,00			
Yes	01	22	1,16(1,05-1,28)	**0,003****		
Depends on other people to carry out daily activities						
No	60	274	1,00			
Yes	05	46	1,10(0,99-1,22)	**0,072***		
Removable dental prosthesis						
No	48	116	1,00		1,00	
Yes	17	204	1,31(1,17-1,45)	**0,000***	1,14(1,05-1,24)	**0,001****

RP_{br} and RP_{adj}(CI/95%) = Gross and adjusted prevalence ratio with 95% confidence interval.
* = P < 0,20; ** = P < 0,05.

have access to primary health care and probably participated in vaccination campaigns. The elderly are in particular need of this public service, given that over 80% stated that they had at least one chronic noncommunicable disease (cardiovascular disease, diabetes, cancer and chronic respiratory disease), 15.3% said that they used more than five types of medication on a continuous basis, and 76.15% used at least one type of medication. It has in fact been shown that the elderly are the greatest users of medication and that 80% of this segment of the population take at least one medication on a daily basis[12].

Although the diseases mentioned were self-reported and therefore do not necessarily reflect the real prevalence rate, self-reported morbidity is much used by epidemiological studies as an indicator of health status, especially among the elderly. The most commonly mentioned illness in the present study, and the one

which stands out from other diseases due to its high prevalence compared to other illnesses, was hypertension, which was mentioned by approximately 70% of the sample. Arterial hypertension is a major public health problem in Brazil and worldwide. During the last decade, the prevalence of self-reported hypertension increased from 43.9% to 53.3%[13]. Despite this and the fact that it is partly responsible for reducing quality of life and life expectancy[14], hypertension is not necessarily considered a natural consequence of aging. It is one of the main risk factors for degenerative[15], cardiovascular, cerebrovascular and chronic kidney disease and is the cause of strokes and coronary artery disease[14].

The results show a consistent association between prevalence of hypertension (Table 2) and other diseases (Table 4) which are characteristic of an unfavourable socioeconomic status. Although to a lesser degree, there was also an association between prevalence of diabetes and indicators of poverty such as a low level of education (Table 3). In Brazil, health disparities are still clearly linked to socioeconomic status, and the present study shows that self-reported health status is worse among lower-income individuals who mention impaired mobility and inability to perform activities of daily living[16].

Various factors contribute to health disparities among the elderly, such as life style, socioeconomic factors (including education and economic opportunities, skin colour and working conditions) and access to health care services. This study's findings indicate that some of these factors influence elderly health, such as lack of a private health plan, living alone, being born in a rural area, being non-white, low level of education and using a removable dental prosthesis, showing that this segment of the population have urgent health needs which compromises their quality of life and threatens survival. This situation highlights a real need to strengthen health promotion and prevention policies especially targeting the most vulnerable groups of society in order to improve health indicators in face of the challenges of population aging.

The results found regarding diabetes are also particularly relevant, since advancing age increases the risk of this disease which has a significant negative impact on quality of life among the elderly: apart from leading to other health problems, such as kidney failure, amputation, blindness and cardiovascular disease, diabetes is one of the leading causes of mortality among this group[14]. The prevalence of diabetes among the sample was under 20%, corroborating the findings of studies that show that the prevalence of diabetes increased from 10.3% to 16.1% in the last decade[13] (Table 3).

The higher prevalence of diabetes in women in this study may be related to life expectancy, since women generally live longer than men and therefore are more likely to develop physical and mental health problems[17]. This is particularly relevant for the design of health policies[17]. However, this result may also reflect the fact that women tend to have a greater perception of health problems and are more likely to practice self-care and seek medical assistance, therefore increasing the chances of diagnosing certain diseases[18].

As expected, certain characteristics were intimately linked. For example, understandably, elderly individuals with high blood pressure and other diseases made greater use of medication. Lower prevalence of diabetes is also to be expected in individuals who do not depend on family members to carry out daily activities and those that practice physical activity, since it is well-known that having a sedentary lifestyle facilitates the development of diabetes[19]. Another expected association is that between illness and advancing age, because increasing life expectancy increases the risk of chronic diseases.

Acute diseases, which are resolved relatively rapidly through either cure or death, have given way to chronic diseases and associated complications. The provision of adequate care for the elderly with these diseases generally implies decades of costly treatment and the use of complex technology. In this context of epidemiological transition, the findings of the present study contribute towards a better understanding and treatment of this population sample of the elderly. The results show that the elderly require specialised public health care, which focuses on the treatment of arterial hypertension. Given that this and other diseases in the elderly were associated with disparities in access to health services, Family Health Teams should give priority treatment to the most vulnerable groups. Since the majority of the elderly are women living with their family, these health professionals should seek to understand the type of relationship that exists between the family members and the degree of family support and respect for individuality, in order to be able to help the carer provide adequate care and thus reduce complications[20].

This study's findings show that, apart from investing in the structuring of the health system network to provide adequate care for the elderly,

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health professionals should receive the necessary training to enable them to adapt care to the socioeconomic, behavioural and educational challenges faced by these patients and their families. Apart from being well placed to gather important health data, health professionals have the potential to help transform the reality of the elderly in Brazil.

Collaborators

FB Pimenta participated in study conception, planning and implementation, data analysis and interpretation, and the drafting and revision of this article. MF Silveira participated in data analysis and interpretation, and in the drafting and revision of this article. L Pinho collaborated with the drafting and revision of this article. ACC Botelho participated in study conception, planning and supervision, data analysis and interpretation and in the drafting and revision of this article.

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