Prevalence and factors associated to polypharmacy in older adults from a rural area

Midiã Vanessa dos Santos Spekalski[1]
Luciane Patrícia Andreani Cabral[1]
Clóris Regina Blanski Grden[1]
Danielle Bordin[1]
Geiza Rafaela Bobato[2]
Everson Augusto Krum[3]

Abstract

Objective: Evaluate the prevalence and factors associated to polypharmacy in older adults from a rural area. *Method:* Cross-sectional, quantitative study carried out with older adults residents from a rural area in Ponta Grossa city, Paraná, Brazil (n = 80). For data collection, a structured questionnaire was used. Polypharmacy was considered as a dependent variable and sociodemographic, lifestyle characteristics, presence of chronic diseases, self-perceived health, falls in the last year, suggestive of cognitive impairment and level of fragility were considered as independent variables. Chi-Square and Logistic Regression tests were performed. *Results:* The prevalence of polypharmacy was 40.0%. Most were female (52.5%), aged between 60 and 74 years old (61.2%), white (76.2%), married (62.5%), and incomplete Elementary School (66,2%). Polypharmacy was associated to level of frailty (OR=3.73; CI95$_{\%}$=1.09-12.74; p=0.036), indicative for sarcopenia (OR=5.02; CI95%=1.39-18.13; *p*=0.014) and diabetes (OR=9.20; CI95%=2.37-36.05; *p*=0.001). *Conclusion:* There was a high prevalence of polypharmacy in rural older adults, and this condition is linked to factors inherent to a greater degree of frailty, indicative of sarcopenia and diabetics.

Keywords: Elerly; Polypharmacy; Rural Health; Rural Areas.

[1] Universidade Estadual de Ponta Grossa, Departamento de Enfermagem e Saúde Pública. Ponta Grossa, Paraná, Brasil.

[2] Universidade Estadual de Campinas, Instituto de Biologia, Programa de Biologia Funcional e Molecular, Campinas, SP, Brasil.

[3] Universidade Estadual de Ponta Grossa, Departamento de Análises Clínicas e Toxicológicas, Ponta Grossa, PR, Brasil.

The authors declare that there is no conflict in the design of this work.

There was no funding for the execution of this work.

Correspondence
Danielle Bordin
daniellebordin@hotmail.com

Received: July 21, 2021
Approved: January 24, 2022

https://doi.org/10.1590/1981-22562021024.210151

INTRODUCTION

The epidemiological transition associated with the increase in life expectancy has contributed to an increase in the burden of Chronic Non-Communicable Diseases (NCDs) present in the population[1]. This fact corroborates the occurrence of polypharmacy, a condition defined by the World Health Organization (WHO) and by recent studies as the simultaneous use of five or more medications, with or without prescription[1-3]. The use of medications is extremely important in the treatment of various diseases, but their excessive use is a serious public health problem, and may be associated with a large number of adverse drug reactions (ADRs), drug interactions (DI) and iatrogenic events[4].

Polypharmacy is an increasingly frequent condition among older adults, since they have a large number of diseases[4]. A cross-sectional study carried out in six capitals in the Northeast, South and Southeast regions showed that 28.6% of the older adults used more than five medications[5].

Thus, age is one of the main risk factors for the use of polypharmacy. When submitted to the use of five or more medications, older people may be more exposed to the risk of developing geriatric syndromes, mental confusion, incontinence and falls, increasing the number of hospitalizations[6].

In addition to the high morbidity rate, people over 60 years of age are more susceptible to missed doses or medication administration errors, which can compromise treatment adherence, since the greater the number of problems, the greater the possibilities of prescriptions[2,7].

When it comes to older people living in rural areas, it is worth considering the difficulties that these individuals experience in accessing health care, considering geographic barriers, location of health services, as well as low availability of public or private transport[8], which can lead to changes in medication use patterns.

In view of the above, it is important to identify the characteristics and factors associated with the excessive use of medicines by this age group, with a view to contributing to the creation of action planning for the rational use of medicines and, consequently, an improvement in quality of life of this population, which resides in rural areas. Thus, the objective of the study was to evaluate the prevalence and factors associated with polypharmacy in older people in a rural area in the city of Ponta Grossa (PR).

METHOD

This is a cross-sectional, quantitative, exploratory, descriptive study, developed with older people living in the rural area of the municipality of Ponta Grossa (PR). The municipality occupies the 4th place in the state of Paraná in population size, with an estimated population of 358,838 inhabitants for the year 2021, distributed in a territorial area of 2,054,732 km^2, with the population density of the last census of 150.72 inhab/ km^2 [9]. The population is predominantly urban (97.8%) and adults (47.3%)[9]. The rural population represents 2.2% of the total population, of which 10.8% are older people[9]. The Municipal Human Development Index in 2010 was 0.763. Regarding the provision of health services at the primary level, it has 41 basic health units, two in rural areas and 39 in urban areas[10].

The territory belonging to the family health unit (FHU) of the present study has an estimated population of 3,102 inhabitants, with a density of 3.81 inhabitants per km^2 [8]. The access roads are dirt roads, the distances between residents and health services and other services are large. The family health team is itinerant among the small health units implemented in the territory to meet the health demands of the population and minimize geographical barriers.

The data of the present study are the result of an extension project developed in the territory belonging to the FHU[8], which has a partnership with the State University of Ponta Grossa, hosting several extension projects.

Sampling was by convenience, considering the totality of individuals residing in the territory ascribed to the aforementioned FHU, who were 60 years of age or older (n=131). Individuals who were not at home at the time of the consultation and who did not respond to the questionnaire that gave rise to the dependent variable of the study were excluded.

Resulting in a final sample of 80 older people.

Data collection was carried out, in the interstice of 2018-2019, between the months of February and December, at home, individually, directly with the older person, caregiver or family member who lived with the older person. It was conducted by trained and calibrated researchers, with a view to explaining the object of the research, its voluntary and non-identifying nature, as well as the form of data collection, analysis and destination. Those who agreed with their participation did so, initially, by completing a Free and Informed Consent Term and then were evaluated using four instruments, which will be elucidated below, composed of questions that should be answered by the older person or companion, with self-reported information.

To collect sociodemographic and health characteristics, an instrument was developed with variables related to sex, age, color, marital status, income for the year 2018 (minimum wage BRL 954.00), education, lifestyle (alcoholic, smoker, physical activity) and previous history (hypertension, obesity, diabetes, surgery and previous hospitalization).

Another instrument used was the Mini-Mental State Examination (MMSE), which is used and validated worldwide to assess cognitive function[11]. The instrument works with a scale, whose maximum score to be reached by the patient is 30 points, and its interpretation takes education into account. For the illiterate, the standard cutoff (no suggestion of impaired cognition) is 20 points; for individuals with one to four years of education, the cut-off score is 25 points; for older people with five to eight years of education, it is 26.5 points; for others with 9 to 11 years of education, it is 28 points; and for those with more than 11 years of education, the standard cut-off score (no suggestion of impaired cognition) is 29 points.

The Clinical-Functional Vulnerability Index (IVCF 20)[12] was also used, an instrument validated and recommended by the health care network for older people in Paraná to assess frailty. It consists of 20 questions distributed in dimensions: age, self-perception of health, functional disabilities, cognition, mood, communication and multiple comorbidities[12]. The values are stratified as follows: from 0 to 6, the older person is robust; from 7 to 14, the older person is potentially frail; and the value ≤15, the older person is characterized as frail[12]. For the present study, the potentially frail and frail were grouped, due to the small number of frail subjects, which reduces the accuracy of the statistical test.

In addition to the final score of the IVCF-20[12], some questions were used as independent variables of the study, namely self-perception of health, which was addressed through the question: "In general, compared to other people your age, would you say your health is:", with the answer: "excellent, very good or good; fair or bad". Falls in the last year, with the question: "Have you had two or more falls in the last year?". The variables: "stopped shopping, controlling money and performing small household chores because of physical health" came from the questions: "Due to your health or physical condition, did you stop shopping?"; "did you stop controlling your money, spending or paying your house bills?"; "Due to your health or physical condition, have you stopped doing small housework, such as washing dishes, tidying the house or doing light cleaning?" respectively and had as a pattern of answers: "yes, and no or not for reasons other than health". The indication of sarcopenia was measured through physical assessments as indicated by the instrument, having as a guiding question: do you have any of the four conditions listed below? Unintentional weight loss of 4.5 kg or 5% of body weight in the last year or 6 kg in the last 6 months or 3 kg in the last month; Body mass index (BMI) less than 22 kg/m2; Calf circumference <31 cm; Time spent in gait speed test (4m) >5 seconds[12].

The fourth questionnaire applied was for pharmacological evaluation, the active principles used by the older people were investigated, with a view to quantifying the medications used continuously, without considering a minimum time of use, and dichotomizing the use or not of polypharmacy (use of five or more medications[1,2]).

Polypharmacy was used as the dependent variable. As independent variables, sociodemographic and lifestyle characteristics, presence of self-reported chronic diseases, self-perception of health, falls in

the last year, independence to perform instrumental activities of daily living, suggestive of sarcopenia and cognitive impairment and level of frailty were considered.

The results were analyzed using absolute and relative frequency. To verify the association between the dependent variable and the independent variables, the chi-square test was performed. Then, logistic regression was performed considering the input of variables using the stepwise technique that presented p value ≤0.20, remaining in the model the variables that presented p value ≤0.05 or that adjusted the model.

The research was approved by the Ethics Committee in Research with Human Beings of a Higher Education Institution, opinion 3,591,149, respecting the dictates of Resolution 466/12 of the National Health Council and the Declaration of Helsinki.

RESULTS

The final sample consisted of 80 older people, predominantly women, aged between 60 and 74 years, married, white, with incomplete primary education, income of up to two minimum wages, presenting themselves as retirees or pensioners and with no need for a caregiver (Table 1).

It could be seen that 40.0% of the older people evaluated used polypharmacy. When analyzing the association of sociodemographic characteristics with polypharmacy, an association was found only with the need for a caregiver (p=0.002) (Table 1).

Regarding lifestyle and health, it was noted that most older people did not use alcohol and tobacco, did not perform physical activities, had high blood pressure, did not have obesity and diabetes, were not hospitalized and had no falls in the last year. Still, most older people reported having undergone surgery previously and self-rated their health as good. Individuals who didn't stop shopping, didn't stop controlling money and didn't stop doing small housework due to physical condition prevailed. Furthermore, older people who showed signs of sarcopenia, considered robust and with suggestive impairment, made up most of the sample (Table 2).

The characteristics that were associated with polypharmacy were: diabetes (p<0.001), hospitalization in the last year (p=0.002), self-perception of health (p=0.034), stop shopping because of physical condition (p=0.014), stop controlling money because of physical condition (p=0.009), stop doing small housework because of physical condition (p=0.011), indicative of sarcopenia (p<0.001) and frailty level (p<0.001) (Table 2).

The multivariate analysis showed that older people considered potentially frail or frail were 3.73 times more likely to use polypharmacy when compared to non-frail (p=0.036). The same occurred with indication of sarcopenia and diabetes, as individuals with such conditions were 5.02 and 9.20, respectively, more likely to use 5 or more medications (p<0.05) (Table 3).

Table 1. Sociodemographic characteristics of older people residing in a rural area of a medium-sized municipality, according to the use of polypharmacy (N=80). Ponta Grossa (PR), 2020.

Variables	Yes n(%)	No n(%)	Total n(%)	*p* value
Presence of Polypharmacy	32 (40.0)	48 (60.0)	80 (100.0)	
Age				0.188
60-74 years	17 (34.7)	32 (65.3)	49 (61.2)	
75-80 years	12 (42.9)	16 (57.1)	28 (35.0)	
≤ 85 years	3 (9.4)	0 (0.0)	3 (3.8)	
Sex				0.143
Female	20 (47.6)	22 (52.4)	42 (52.5)	
Male	12 (31.6)	26 (68.4)	38 (47.5)	
Color				0.830
White	24 (39.3)	37 (60.7)	61 (76.2)	
Others	8 (42.1)	11 (57.9)	19 (23.8)	
Education				0.306
Illiterate	10 (55.6)	8 (44.4)	18 (22.5)	
Incomplete primary education	19 (35.8)	34 (64.2)	53 (66.2)	
Complete primary education	3 (33.3)	6 (67.7)	9 (11.2)	
Marital status				0.637
Married	19 (38.0)	31 (62.0)	50 (62.5)	
Others	13 (43.3)	17 (56.7)	30 (37.5)	
Average monthly income				0.265
Up to 2 minimum wages*	25 (37.3)	42 (62.7)	67 (83.8)	
2 to 5 minimum wages	7 (53.8)	6 (46.2)	13 (16.2)	
Retired or pensioner				0.901
Yes	27 (40.3)	40 (59.7)	67 (83.8)	
No	5 (38.5)	8 (61.5)	13 (16.2)	
Has a caregiver				0.002
It is not necessary	23 (33.3)	46 (66.7)	69 (86.2)	
Yes	9 (81.8)	2 (18.2)	11 (13.8)	

* Minimum wage in 2018: BRL 954.00

Source: Authors, 2021.

Table 2. Lifestyle and health of older people residing in a rural area of a medium-sized municipality, according to the use of Polypharmacy. Ponta Grossa (PR) (2020) (n=80).

Variables	Yes n(%)	No n(%)	Total n(%)	*p* value
Alcoholic				0.819
No	26 (40.6)	38 (59.4)	64 (80.0)	
Yes	6 (37.5)	10 (62.5)	16 (20.0)	
Smoker				0.926
No	19 (40.4)	28 (59.6)	47 (58.8)	
Yes	13 (39.4)	20 (60.6)	33 (41.2)	

to be continued

Continuation of Table 2

Variables	Yes n(%)	No n(%)	Total n(%)	*p* value
Performs physical activity				0.565
No	22 (42.3)	30 (57.7)	52 (65.0)	
Yes	10 (35.7)	18 (64.3)	28 (35.0)	
Hypertension				0.080
No	4 (22.2)	14 (77.8)	18 (22.5)	
Yes	28 (45.2)	34 (54.8)	62 (77.5)	
Obesity				0.332
No	28 (38.4)	45 (61.6)	73 (91.2)	
Yes	4 (57.1)	3 (42.9)	7 (8.8)	
Diabetes				0.001
No	16 (27.6)	42 (72.4)	58 (72.5)	
Yes	16 (72.7)	6 (27.3)	22 (27.5)	
Hospitalization in the last year				0.002
No	22 (32.8)	45 (67.2)	67 (83.3)	
Yes	10 (76.9)	3 (23. 1)	13 (16.2)	
Falls in the last year				0.205
No	19 (35.2)	35 (64.8)	54 (67.5)	
Yes	13 (50.0)	13 (50.0)	26 (32.5)	
Previous surgery				0.066
No	7 (25.9)	20 (74.1)	27 (33.8)	
Yes	25 (47.2)	28 (52.8)	53 (66.2)	
Self-perception of health				0.034
Excellent, very good or good	13 (29.5)	31 (70.5)	44 (50.0)	
Fair or bad	19 (52.8)	17 (47.2)	36 (45.0)	
Stopped shopping because of physical health				0.014
No	25 (35.2)	46 (64.8)	71 (88.8)	
Yes	7 (77.8)	2 (22.2)	9 (11.2)	
Stopped controlling money due to physical condition				0.009
No	26 (35.6)	47 (64.4)	73 (91.2)	
Yes	6 (85.7)	1 (14.3)	7 (8.8)	
Stopped doing small housework				0.011
No	28 (35.0)	48 (60.0)	76 (95.0)	
Yes	4(5.0)	0 (0.0)	4 (5.0)	
Indicator of sarcopenia				0.001
No	9 (22.0)	32 (78.0)	41 (51.2)	
Yes	23 (59.0)	16 (41.0)	39 (48.8)	
Frailty level				<0.001
Robust	6 (16.7)	30 (83.3)	36 (45.0)	
Pre Frail / Frail	26 (59.1)	18 (40.9)	44 (55.0)	
Cognitive assessment				0.429
No suggestive impairment	11 (13.8)	21 (26.3)	32 (40.0)	
With suggestive impairment	17 (21.3)	22 (27.5)	39 (48.8)	
No answer	4 (5.0)	5 (6.2)	9 (11.2)	

Source: Authors, 2021.

Table 3. Adjusted multiple analysis of association between polypharmacy and independent variables (n=80). Ponta Grossa (PR), Brazil, 2020.

Variables	OR (95% CI)	*p* value
Frailty		
Robust	1.00	0.036
Pre Frail or Frail	3.73 (1.09-12.74)	
Indication of sarcopenia		
No	1.00	0.014
Yes	5.02 (1.39-18.13)	
Diabetes		
No	1.00	0.001
Yes	9.20 (2.37-36.05)	

Source: Authors, 2021.

DISCUSSION

The present study discusses the prevalence and factors associated with polypharmacy in older people in a rural area, and it is possible to verify that the level of frailty, the indication of sarcopenia and diabetes were factors that increased the chances of older people using polypharmacy.

When stratified by area of residence, there are few studies on the prevalence of polypharmacy among older people in rural areas, with the focus being mostly on individuals from urban areas[13], denoting the importance of the research in question.

The prevalence of polypharmacy found in cross-sectional studies carried out in the urban area in the city of Airaquara (BA) identified that 29.0% of the older people used five or more medications[7]. Another cross-sectional study carried out with older people living in urban areas in seven Brazilian cities found that 18.4% used polymedication[14]. On the other hand, older people residing in rural areas tend to make greater use of polypharmacy when compared to residents in urban areas, since they have less accessibility to health services, due to geographic barriers and low concentration of public and private transport, increasing the chances of using several medications simultaneously[15]. A cross-sectional study carried out with older people living in a rural area of Spain, showed the prevalence of polypharmacy in 56.0% of the older people[16], corroborating the high prevalence found in the investigated rural area.

In the present study, the level of frailty can significantly increase the chances of using polypharmacy, in line with the national and international literature[15,17]. It is noteworthy that frailty is a condition related to physiological, neuromuscular, endocrine and immunological changes[18] and may be associated with multimorbidity, functional impairment and hospitalizations, factors that corroborate the use of polypharmacy[19,20].

Moraes et al.[12], emphasize that frailty is conceptualized as a decrease in homeostatic reserve or in the ability to adapt to biopsychosocial aggressions, increasing vulnerability to functional decline. Thus, older people considered frail tend to decrease the level of physical activities, reduce gait speed and, consequently, limit the ability to perform basic activities of daily living (BADL), developing a negative impact on social relationships and autonomy[21]. These conditions contribute to the increased exposure of the older person to physical and psychological diseases, falls and hospitalizations, increasing the use of medications simultaneously[22].

Furthermore, frail older people tend to develop unintentional weight loss, weakness and excessive use of medications[18]. These factors may lead to the development of sarcopenia, a condition that can be

defined as a progressive and generalized skeletal muscle disorder that involves accelerated loss of muscle mass and function[23].

The presence of sarcopenia contributed significantly to increasing the chances of older people using polymedication. The loss of muscle mass tends to make older people more susceptible to dependence and functional disability, increasing the chances of the individual suffering falls, fractures and being hospitalized[24]. It is worth mentioning that the etiology of sarcopenia results not only from frailty, but from other factors such as metabolic, nutritional and hormonal factors, which may favor or be a consequence of the use of multiple medications[25].

In addition, studies show that sarcopenia may be related to obesity[26,27]. Despite not having influenced the use of medications in the present study, it is possible to observe that obese older people tend to have a decrease in muscle mass, with the function of the muscles supplied by adipose tissue. Furthermore, obese individuals have worse physical performance, lower cognitive development and worsening of cardiovascular diseases, conditions that justify the use of several medications simultaneously[26].

In addition, living in rural areas can contribute to the development of frailty and sarcopenia, increasing the chances of using five or more medications, since older people face difficulties imposed by the environment, such as low income, low education and difficulties in accessing health services[7,8]. These conditions can make it difficult to carry out educational actions aimed at a better quality of life for these individuals, as well as to carry out early interventions for health-related complications[28].

Another factor that was associated with polypharmacy was diabetes. In Brazil, the National Health Survey (PNS) estimated that 19.9% of older people aged between 65 and 74 years reported a medical diagnosis of diabetes[29]. In addition, in a longitudinal census study carried out in Mexico, it was found that 16.16% of men and 19.91% of women over 60 years of age had diabetes[30].

Older people with diabetes are more likely to use several medications simultaneously[31], since it is associated with several complications, such as diabetic retinopathy, chronic kidney disease and peripheral neuropathy[32]. It is worth mentioning that the risk factors for diabetes are also considered risks for the development of other chronic diseases, including arterial hypertension, acute myocardial infarction and heart failure, which can lead the older person to develop other morbidities[33]. Also, diabetes can cause cognitive disorders, a condition that can interfere with the autonomy of the older person, being a predisposed factor for the development of frailty syndrome, which, already mentioned, also increases the chances of polypharmacy[34].

Despite the scarcity of environments intended for physical exercise in rural areas, studies show that walking and occupational activities developed in the countryside can be considered strategies to provide a better quality of life and help reduce the number of medications used by these older people[35].

In view of the above, there is an imminent need to monitor the health condition, at the population and individual level, of the older people, especially those who live in rural areas, in order to encourage good living habits, so that there is a reduction in the number of prescription medications[6].

Also, health professionals, especially the nursing team, must know the organic changes characteristic of aging, as well as develop a vigilant role regarding the conditions addressed here for polypharmacy. In this way, they can elucidate together with the city managers strategies for the rational use of medicines, as well as ways to cover the population residing in rural areas, in order to avoid possible iatrogenic events.

The limitations of the study were characterized by the scope of the sample being with individuals from a single rural location, allowing to consider the results found only for the population in question, in addition to the sampling process being by convenience, without considering a sample calculation and small number of subjects in some classes of variables, the confidence interval being very large, which compromises the accuracy of the estimate. Still, it is a cross-sectional study, it is not possible to establish cause and effect relationships, it is also known that the data come from self-reports, and there is a memory bias. However, the findings

shown here are extremely relevant for the deepening of knowledge about the subject, since there are few studies that deal with the subject.

CONCLUSION

The prevalence of polypharmacy among older people living in the investigated rural area was high. Factors such as level of frailty, diabetes and indication of sarcopenia were significantly associated with polypharmacy.

The findings discussed in this study will favor the health team, as well as managers, to investigate strategies aimed at the prevention and intervention of polymedication in older people, such as encouraging the practice of physical activities and balanced diet, aiming at non-pharmacological actions within the rural environment.

In addition, monitoring by the multiprofessional team is necessary to assess the demands for maintaining the healthy aging of older people, in particular, performing medication reconciliation periodically, to avoid possible adverse drug reactions, drug interactions and iatrogenics, aggravating the health condition of these people.

Edited by: Maria Luiza Diniz de Sousa Lopes

REFERENCES

1. Pereira KG, Peres MA, Lop D, Boing AC, Boing AF, Aziz M, et al. Polifarmácia em idosos: Um estudo de base populacional. Rev Bras Epidemiol. 2017;20(2):335-44. Available from: https://www.scielo.br/j/rbepid/a/HW5m6chDzrqRpMh8xJVvDrx/?format=pdf&lang=pt
2. Fagundes LC, Ramos GCF, Barbosa ATF, Medeiros SM, Lima CA, Costa FM, et al. Prevalência e fatores associados à polifarmácia em idosos comunitários: estudo epidemiológico de base populacional. Ciênc Saúde Colet. 2018;23(2):607-16. Available from: https://www.revistas.usp.br/rmrp/article/view/154921/150819
3. World Health Organization. Medication Without Harm – Global Patient Safety Challenge on Medication Safety. Geneva: WHO; 2017 [cited 2021 Nov. 18]. Available from: https://www.who.int/initiatives/medication-without-harm
4. Nascimento RCRM, Álvares J, Guerra AA, Gomes IC, Silveira MS, Costa EA, et al. Polifarmácia: uma realidade na atenção primária do Sistema Único de Saúde. Rev Saúde Pública. 2017;51:1-12. Available from: https://www.scielo.br/j/rsp/a/xMVtMdQ7pdM7zcGSVFBMrdm/?lang=pt&format=pdf
5. Silva IR, Giatti L, Chor D, Fonseca MJM, Mengue SS, Acurcio FA, et al. Polypharmacy, socioeconomic indicators and number of diseases: Results from elsa-Brasil. Rev Bras Epidemiol. 2020;23:1-14. Available from: https://www.scielo.br/j/rbepid/a/xxGNvT4cRpD9vWgjmbrcJVt/?lang=en
6. Macena WG, Hermano LO, Costa TC. Alterações fisiológicas decorrentes do envelhecimento. Rev Mosaicum. 2018;27:224-36. Available from: https://revistamosaicum.org/index.php/mosaicum/article/view/64/46
7. Sales AS, Sales MGS, Casotti CA. Perfil farmacoterapêutico e fatores associados à polifarmácia entre idosos de Aiquara, Bahia, em 2014. Epidemiol Serv Saúde. 2017;26(1):121-32. Available from: https://www.scielo.br/j/ress/a/kDxqZTspWMgfT4Yxx93dC9g/?format=pdf&lang=pt
8. Grden CRB, Bordin D, Cabral LPA, Pinto LA, Fadel CB. Atuação da Residência Multidisciplinar em Saúde do Idoso em uma comunidade Rural. Rev Conex UEPG. 2019;15(2):187-92. Available from: https://www.redalyc.org/journal/5141/514162119009/514162119009.pdf
9. Instituto Brasileiro de Geografia e Estatística [Internet] Censo demográfico. Ponta Grossa, PR; 2021 [cited 2021 Nov. 18]. Available from: https://cidades.ibge.gov.br/brasil/pr/ponta-grossa/panorama.
10. Ponta Grossa (Prefeitura). Fundação Municipal de Saúde [Internet]. Ponta Grossa; 2021 [cited 2021 Nov. 18]. Available from: https://www.pontagrossa.pr.gov.br/fms/unidades-de-saude
11. Brucki SMD, Nitrini R, Caramelli P, Bertolucci PHF, Okamoto IH. Suggestions for utilization of the mini-mental state examination in Brazil. Arq Neuropsiquiatr. 2003;61(3):777-81. Available from: https://www.scielo.br/j/anp/a/YgRksxZVZ4b9j3gS4gw97NN/?format=pdf&lang=pt

12. Moraes EN, Carmo JA, Moraes FL, Azevedo RS, Machado CJ, Montilla DER. Clinical-Functional Vulnerability Index-20 (IVCF-20): Rapid recognition of frail older adults. Rev Saúde Pública. 2016;50-81. Available from: https://pubmed.ncbi.nlm.nih.gov/28099667/

13. Salcher EBG, Dellani MP, Portella MR, Doring M. Factors Associated With the Use of Medicines Potentially Inadequate for Urban and Rural. Rev Saúde Pesqui. 2018;11(1):139-49. Available from: https://periodicos.unicesumar.edu.br/index.php/saudpesq/article/view/6129/3172

14. Marques PP, Assumpção D, Rezende R, Neri AL, Francisco PMSB. Polifarmácia em idosos comunitários: resultados do estudo Fibra. Rev Bras Geriatr Gerontol. 2019;2(5):1-13. Available from: https://www.scielo.br/j/rbgg/a/wr4rsrFhfBRBq9ynz7Vrj4d/?lang= pt&format=pdf

15. Arauna D, Cerda A, García García JF, Wehinger S, Castro F, Méndez D, et al. Polypharmacy is associated with frailty, nutritional risk and chronic disease in chilean older adults: Remarks from piei-es study. Clin Interv Aging. 2020;15:1013-22. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7334011/

16. Polanco HO, Unidad T. Originales Consumo de fármacos en mayores de 65 años en una zona rural. Rev Metas Enferm. 2018;21(1):14-20. Available from: https://www.enfermeria21.com/revistas/metas/articulo/81173/consumo-de-farmacos-en-mayores-de-65-anos-en-una-zona-rural/

17. Melo EMA, Marques APO, Leal MCC, Melo HMA. Síndrome da fragilidade e fatores associados em idosos residentes em instituições de longa permanência. Saúde Debate. 2018;42(117):468-80. Available from: https://www.scielo.br/j/sdeb/a/4nWzWXZCQjKqHQ7QhskGR7y/?format=pdf&lang=pt

18. Pillatt AP, Nielsson J, Schneider RH. Efeitos do exercício físico em idosos fragilizados: uma revisão sistemática. Fisioter Pesqui. 2019;26(2):210-7. Available from: https://www.scielo.br/j/fp/a/HxHRwfLJ9NZmkkDymvGRL4G/?format=pdf&lang=pt

19. Duarte YAO, Nunes DP, Andrade FB, Corona LP, Brito TRP, Santos JLF, et al. Frailty in older adults in the city of São Paulo: Prevalence and associated factors. Rev Bras Epidemiol. 2018;21(2):1-16. Available from: https://www.scielo.br/j/rbepid/a/dhZVDQWSSkkLCWcS6KDZGVp/?format=pdf&lang=pt

20. Liberalesso TEM, Dallazen F, Bandeira VAC, Berlize EM. Prevalência de fragilidade em uma população de longevos na região Sul do Brasil. Saúde Debate. 2017;41(113):553-62. Available from: https://www.scielo.br/j/sdeb/a/VYjv4MbJw4LP8vj74HJMtcH/?format=pdf&lang=pt

21. Costa LGO, Cruz AO, Noronha DO, Vitoriao MGM, Ferraz DD. Perception of elderly, caregiver and physiotherapist about functionality after ambulatory physiotherapeutic tre. Rev Bras Ciênc Mov. 2020;28(2):23-32. Available from: https://docs.bvsalud.org/biblioref/2020/09/1121062/percepcao-do-idoso-fragil-do-cuidador.pdf

22. Grden CRB, Rodrigues CRB, Cabral LPA, Reche PM, Bordin D, Borges. Prevalência e fatores associados à fragilidade em idosos atendidos em um ambulatório de especialidades. Rev Eletrônica Enferm. 2019;21:1-8. Available from: https://revistas.ufg.br/fen/article/view/52195/33733

23. Cruz-Jentoft AJ, Sayer AA. Sarcopenia. Lancet. 2019;393(10191):2636-46. Available from: https://pubmed.ncbi.nlm.nih.gov/31171417/

24. Keihan V, da Silva Jr. JP, Araújo TL, Matsudo VKL, Matsudo SM. Circunferência da panturrilha como preditor de ausência de sarcopenia em idosos institucionalizados: um estudo transversal. Nutr Saúde Ativ Fís. 2020;25(11):167-72. Available from: https://docs.bvsalud.org/biblioref/2021/02/1146919/rdt_v25n4_167-172.pdf

25. Oliveira RS, Souza IFS, Câmara SMA, Souza MC. Sarcopenia, funcionalidade e estado nutricional em idosos residentes na comunidade. Rev Bras Geriatr Gerontol. 2018;21(3):342-51. Available from: https://www.scielo.br/j/rbgg/a/McJGnscsbbC6R4HKrq6YWyG/?format=pdf&lang=pt

26. Schneider RH, Beatriz L, Franz B. Influência da obesidade nos critérios de classificação de sarcopenia em idosos. Rev Bras Geriatr Gerontol. 2020;23(3):1-12. Available from: https://www.scielo.br/j/rbgg/a/BJBHY3QrJJg5w4dmKMWPYgL/?format=pdf&lang=pt

27. Silva RF, Figueiredo MLF, Darder JJT, Santos AMR, Tyrrell MA. Rastreio da sarcopenia em idosos na atenção primária à saúde: saberes e práticas do enfermeiro. Rev Bras Enferm. 2020;73(3):1-7. Available from: https://www.scielo.br/j/reben/a/HLtwtWRTwNy8FzTHPngtp3t/?lang=pt&format=pdf

28. Furtado GE, Santos SS, Rocha SV, Souza NR, Santos CA, Viana HPS. Association among nutritional status and handgrip strength in elderly people living in rural areas. Motricidade, 2016;12(1):22-9. Available from: https://www.researchgate.net/publication/320719611_Associacoes_entre_estado_nutricional_e_a_forca_de_preensao_manual_em_idosos_residentes_em_areas_rurais#read

29. Instituto Brasileiro de Geografia e Estatística. Relatório da Pesquisa Nacional de Saúde. Brasília, DF: MS; 2013 [cited 2021 Jan. 10]. Available from:https://abeso.org.br/wp-content/uploads/2019/12/59496b5633873.pdf

30. Lozano KD, Gaxiola RL. Effects of depression and diabetes on the mortality risk of Mexican older adults. Horiz Sanitario. 2020;19(2):241-53. Available from: http://www.scielo.org.mx/scielo.php?pid=S2007-74592020000200241&script=sci_abstract&tlng=en

31. Cavalcanti L, Canever BP, Rosa LM, Locks MOH, Manfrini GC, Willrich GPB. Diabetes Mellitus: estratégias de Educação em Saúde para o Autocuidado. Rev Enferm UFPE Online. 2021;15(1):1-10. Available from: https://periodicos.ufpe.br/revistas/revistaenfermagem/article/view/246321/37465

32. Leitão VBG, Francisco PMSB, Malta DC, Costa KS. Tendência do uso e fontes de obtenção de antidiabéticos orais para tratamento de diabetes no Brasil de 2012 a 2018: análise do inquérito Vigitel. Rev Bras Epidemiol. 2021;24:1-13. Available from: https://www.scielo.br/j/rbepid/a/rZTYq9SCtf59spQGmfd9LdL/?format=pdf&lang=pt

33. Salomão Souza NM, Cunha AM, Silva FMR, Quadros KAN, Santos RC, Andrade SN. Fatores relacionados ao diabetes mellitus que podem influenciar no autocuidado. Nursing. 2020;23(268):4580-97. Available from: http://revistas.mpmcomunicacao.com.br/index.php/revistanursing/article/view/868/969

34. Zapata-Tragodara D, Roque H, Parodi JF. Relación entre trastornos neurocognitivos,Diabetes Mellitus Tipo 2 y otros factores en adultos mayores del Centro Médico Naval del Perú, entre los años 2010 a 2015. Rev Neuropsiquiatr. 2020;83(2):87-96. Available from: http://www.scielo.org.pe/pdf/rnp/v83n2/0034-8597-rnp-83-02-87.pdf

35. Duran-Badillo T, Salazar-Golzález BC, Cruz-Quevedo JE, Sánchez-Alejo EJ, Gutierrez-Sanchez G, Hernández- Cortés PL. Sensory and cognitive functions, gait ability and functionality of older adults. Rev Latinoam Enferm. 2020;28:1-8. Available from: https://www.scielo.br/j/rlae/a/DD3rvTHhYKzv4hbnCfYLyyd/?format=pdf&lang=pt