Dement Neuropsychol 2024;18:e20230089

Original Article

https://doi.org/10.1590/1980-5764-DN-2023-0089

The effectiveness of participation in the active aging program of a university hospital

Ana Paula Bagli Moreira[1], Egídio Lima Dorea[2], Thaís Bento Lima da Silva[1,3], Tiago Nascimento Ordonez[1], Esteban Fernandez Tuesta[1], Beatriz Aparecida Ozello Gutierrez[1]

ABSTRACT. Active aging is based on four pillars: health, safety, participation, and lifelong learning. These pillars help individuals improve their quality of life throughout the aging process. **Objective:** To analyze the effectiveness of the Active Aging Program; identify the sociodemographic profile of the participants; identify prevalent diseases in the initial evaluation; and assess the results of the program after one year of follow-up. **Methods:** This is a quantitative, cross-sectional, exploratory, desk research, and descriptive study. Data from 545 employees of University of São Paulo participating in the Active Aging Program of the University Teaching Hospital of the University of São Paulo (HU-USP) between 2015 and 2018 were analyzed using the Minitab Program. For data analysis, Pearson's chi-square test was used to determine the association between Groups A and B. For continuous measures, the paired *t*-test was used to verify differences in means, adopting a 95% confidence interval and significance level of 0.05. **Results:** Statistically significant correlations were found when crossing sex with smoking; sex with triglycerides; age with risk factors for cardiovascular diseases, being the age group 40–59 statistically more significant; physical activity with risk factors for cardiovascular diseases; and body mass index at program entry with the one-year result. **Conclusion:** The study expanded knowledge about risk factors for cardiovascular diseases and provided important information for the continuity of the program.

Keywords: Healthy Aging; Quality of Life; Health Promotion; Health Education; Geriatrics.

A efetividade de participação no programa envelhecimento ativo do hospital universitário

RESUMO. O envelhecimento ativo se apoia em quatro pilares: saúde, segurança, participação e aprendizagem ao longo da vida. Esses pilares auxiliam os indivíduos na qualidade de vida ao longo do processo de envelhecimento. **Objetivo:** Analisar a efetividade do Programa Envelhecimento Ativo; identificar o perfil sociodemográfico dos participantes; identificar patologias predominantes na avaliação inicial; e verificar os resultados do programa após um ano de acompanhamento. **Métodos:** Trata-se de pesquisa quantitativa, de caráter transversal, exploratória, documentária e descritiva. Foram analisados os dados de 545 funcionários da Universidade de São Paulo que participaram do Programa do Envelhecimento Ativo do Hospital Universitário da Universidade de São Paulo (HU-USP) no período de 2015 a 2018. Os dados foram analisados pelo Programa Minitab. Na análise de dados, usou-se o Qui-quadrado para testar a associação entre os grupos. Já para medida contínua, utilizou-se o Teste T Pareado, para verificar se as médias eram diferentes. Nas análises, foi usado um período de confiabilidade de 95% e nível de relevância de 0,05. **Resultados:** Foram encontradas correlações estatisticamente expressivas no cruzamento de sexo com tabagismo; sexo com triglicérides; idade com fatores de risco para doenças cardiovasculares sendo que a faixa etária de 40–59 foi estatisticamente mais significativa; atividade física com prevalência de fatores de riscos para doenças cardiovasculares; e índice de massa corpórea inicial com o resultado após um ano. **Conclusão:** A pesquisa ampliou o conhecimento a respeito dos fatores de risco para doenças cardiovasculares e forneceu informações importantes para a continuidade do programa.

Palavras-chave: Envelhecimento Saudável; Qualidade de Vida; Promoção da Saúde; Educação em Saúde; Geriatria.

This study was conducted by School of Arts, Science and Humanities, Universidade de São Paulo, São Paulo, Brazil.

[1]Universidade de São Paulo, Escola de Artes, Ciências e Humanidades, São Paulo SP, Brazil.

[2]Universidade de São Paulo, Hospital Universitário, São Paulo SP, Brazil.

[3]Universidade de São Paulo, Faculdade de Medicina, Hospital das Clínicas, Grupo de Neurologia Cognitiva e do Comportamento, São Paulo SP, Brazil.

Correspondence: Beatriz Aparecida Ozello Gutierrez; Email: biaagutierrez@gmail.com.

Disclosure: The authors report no conflicts of interest.

Funding: none.

Received on September 27, 2023; Received in its final form on April 06, 2024; Accepted on April 14, 2024.

INTRODUCTION

According to data from the Pan American Health Organization/World Health Organization (PAHO/WHO, 2020), the older adult population will significantly increase worldwide. It is estimated that by 2030, 1.4 billion people will be aged 60 years or more. In this sense, it is evident that global strategies will be necessary for healthy aging, so the Decade of Healthy Ageing (2020–2030) aims to ensure that, in addition to living longer, people will also live a healthy life[1].

Chronic non-communicable diseases (CNCDs) are the main factors of disability. Thus, the PAHO/WHO document aims that intrinsic (physical and mental) and extrinsic (interaction with the environment) capacities are preserved for the quality of life of older adults individuals[1,2].

It is known that older adults are one of the groups most affected by CNCDs, with healthy aging being a priority measure so that the population does not age with functional disabilities[1,2]. Thus, at the beginning of the 21st century, the WHO released the first document on this global concern called Active Aging[3].

Active Aging proposes that the aging process is a beneficial experience for all individuals, through opportunities for participation, safety, and health, having as main objective, the quality of life over the years[3]. In 2015, the International Longevity Center Brazil (*Centro Internacional de Longevidade Brasil*) added the lifelong learning pillar as one of the factors for aging with quality of life[4].

Thus, the pillars that constitute Active Aging are participation, safety, health, and lifelong learning[3,4]. Following this path, in 2015, the WHO published another document on aging called the World Report on Aging and Health, citing the definition of functional capacity as our physical, mental, and environmental abilities in this material, that is, the preservation of intrinsic and extrinsic factors that constitute our functional capacity[5].

Since CNCDs comprise the main factor of functional disability, they are considered a public health problem at a global level. CNCDs undermine independence and autonomy, especially in the population aged 60 and over[2]. In this sense, healthy aging means maintaining functional capacity throughout the aging process[5]. In 2021, the Ministry of Health launched a new document with strategies for the prevention of CNCDs, reaffirming that public policies are fundamental for their control and prevention[6].

In this way, institutions must have programs to encourage active and healthy aging of their employees, following the demands of an aging population, which promote the prevention of CNCDs, and thus, provide quality of life throughout the aging process. Although it is known that the old age phase may not involve pathologies such as CNCDs, it is still in this phase that we have a greater predisposition[3,5,7].

Thinking about it, the University of São Paulo (USP) maintains a program that seeks to promote the "active aging" of its employees. This program is named after this concept and is intended to promote quality of life improvement in the university faculty[8].

The Active Aging Program seeks to encourage more active social relationships in the family and at work, guide participants on prudent financial management, promote a balanced diet, and encourage physical activity practice. In addition, the objective was to monitor the determination of risk factors and disease control. To this end, the program serves multiple fronts through a multidisciplinary team[8].

This team is made up of 20 professionals from the University Hospital of USP (HU-USP), the USP Center for Sports Practices (CEPEUSP, *Centro de Práticas Esportivas da USP*), the Institute of Psychology (IP, *Instituto de Psicologia*), the Specialized Service in Occupational Safety and Medicine (SESMT, *Serviços Especializados em Engenharia de Segurança e em Medicina do Trabalho*), and the Faculty of Economics, Administration, Accounting and Actuarial (FEA, *Faculdade de Economia, Administração, Contabilidade e Atuária*), working together to help workers have a better quality of life[8]. Thus, this study aimed to analyze the effectiveness of the Active Aging Program; identify the sociodemographic profile of the participants; identify the prevalence of diseases in the initial assessment; and evaluate the results of the program after one year of follow-up.

METHODS

Study type

A quantitative, cross-sectional, exploratory, descriptive, and retrospective study was performed. Data from 545 USP employees enrolled in the Active Aging Program of the HU-USP were analyzed. However, some participants dropped out of the program (Figure 1).

Procedures

Institutes of the University of São Paulo sign up for the Active Aging Program and a talk and workshop are then given to those interested in taking part. At the time of data collection, the program encompassed 15 USP institutes: the University of São Paulo Publishing House (EDUSP, *Editora da Universidade de São Paulo*), the Polytechnic School (EP, *Escola Politécnica*), the School of

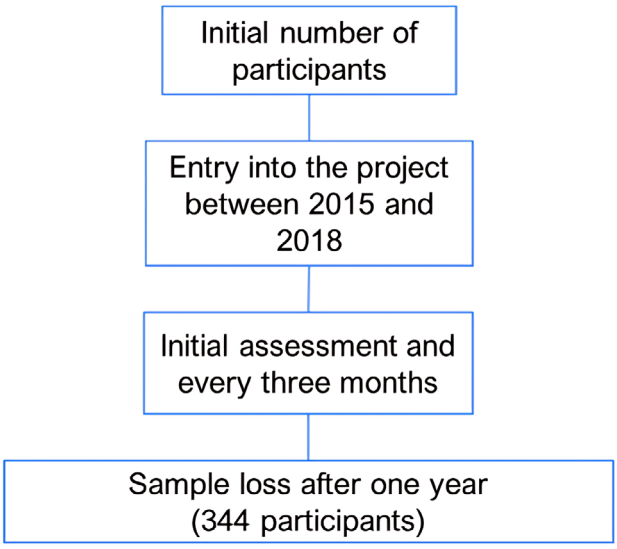

Figure 1. Flowchart of the number of study participants.

Architecture and Urbanism (FAU, *Faculdade de Arquitetura e Urbanismo*), the School of Economics, Administration, Accounting and Actuarial (FEA, *Faculdade de Economia, Administração, Contabilidade e Atuária*), the School of Veterinary Medicine and Animal Science (FMVZ, *Faculdade de Medicina Veterinária e Zootecnia*), Institute of Biosciences (IB, *Instituto de Biociências*), Institute of Energy and the Environment (IEE, *Instituto de Energia e Ambiente*), Institute of Physics (IF, *Instituto de Física*), Institute of Mathematics and Statistics (IME, *Instituto de Matemática e Estatística*), Institute of Oceanography (IO, *Instituto Oceanográfico*), Institute of Psychology (IP, *Instituto de Psicologia*), Museum of Archeology and Ethnology (MAE, *Museu de Arqueologia e Etnologia*), and the USP Dean´s Office (RUSP, *Reitoria da USP*) Departments — Health, Security, and Social Communication (SCS) Superintendencies. The program includes monitoring of several specialties and assessments every three months.

Population and sample

The study population included staff from 15 institutes of the University of São Paulo enrolled in the Active Aging Program of the HU-USP between 2015 and 2018, at the city´s central campus — Butantã. The initial sample was defined as 545 participants in the program during the period investigated. The sample was stratified by sex and age into three groups (20–39 years; 40–59 years; and 60–72 years)[9].

Variables analyzed

Based on the premise that the Active Aging Program of the HU-USP was established to enhance the quality of life of its employees and improve the well-being of participants[8], the present study aimed at determining whether there were improvements in biological markers, such as body mass index (BMI), among participants and to assess their quality of life. The program takes into account the participation, which was also a factor in common with this research[3].

Sociodemographic data were collected using a dedicated form recording age, sex, and institution of origin. This record included an outpatient follow-up sheet containing clinical information (height, body weight, nutritional status, smoking status, alcohol use, sedentarism, blood pressure, and triglycerides level) that was collected. Comorbidities such as hypertension, diabetes mellitus type II, dyslipidemia, and obesity were considered risk factors for cardiovascular diseases (CVDs).

Statistical analyses

For the data analysis, the chi-square test was used to test the association between groups. For continuous measures, the paired *t*-test was employed to determine whether the means differed. In the analyses, a 95% confidence interval (95%CI) and significance level of 0.050 were adopted. The results are presented in the form of tables. Statistical analyses were performed using the Minitab Program, version 17 (2019).

Ethical aspects

This study was approved by the Research Ethics Committee of the HU-USP, under number 492.769. All study participants signed the free and informed consent form.

RESULTS

A total of 545 individuals from 15 USP institutes were included in the study. The participants' ages ranged from 27 to 72 years. The majority of participants were female (277; 50.8%), from the Polytechnic School (149; 27.3%), aged between 40–59 years (407; 74.7%), did not smoke (434; 80.6%), did not drink alcohol (536; 99.6%), were overweight (203; 37.8%), and did not participate in physical activity (306; 56.7%) (Table 1).

Table 2 shows significant associations for correlations between sex and smoking (p=0.018), males were more strongly associated with the profile of being former smokers; sex and triglyceride levels (p=0.000), females showed better results compared to males; age and risk factors for CVDs (p=0.042), the 40–59 age group was statistically more significant; and physical activity and prevalence of risk factors for CVDs (p=0.010), those who practice more physical activity have fewer risk factors.

Table 1. Sociodemographic characteristics and clinical variables (n=545).

	Quantity and percentage (%)
Sex	
Female	277 (50.8)
Male	268 (49.2)
Institutes of the University of São Paulo	
EDUSP	28 (5.1)
EP	149 (27.3)
FAU	8 (1.5)
FEA	24 (4.4)
FMVZ	66 (12.2)
IB	17 (3.2)
IEE	55 (10.1)
IF	40 (7.3)
IME	43 (7.9)
IO	16 (3.0)
IP	7 (1.2)
MAE	7 (1.2)
RUSP/HEALTH SUP.	4 (0.7)
RUSP/SEC. SUP.	55 (10.1)
SCS	26 (4.8)
Stages of human life	
Older adults	52 (9.6)
Middle-age	407 (74.7)
Young	86 (15.7)
Body mass index	
Low weight	5 (0.9)
Normal range	141 (26.2)
Overweight	203 (37.8)
Obesity	188 (35.1)

Notes: EDUSP (*Editora da Universidade de São Paulo*): University of São Paulo Publishing House; EP (*Escola Politécnica*): Polytechnic School; FAU (*Faculdade de Arquitetura e Urbanismo*): School of Architecture and Urbanism; FEA (*Faculdade de Economia, Administração, Contabilidade e Atuária*): School of Economics, Administration, Accounting and Actuary; FMVZ (*Faculdade de Medicina Veterinária e Zootecnia*): School of Veterinary Medicine and Animal Science; IB (*Instituto de Biociências*): Institute of Biosciences; IEE (*Instituto de Energia e Ambiente*): Institute of Energy and the Environment; IF (*Instituto de Física*): Institute of Physics; IME (*Instituto de Matemática e Estatística*): Institute of Mathematics and Statistics; IO (*Instituto Oceanográfico*): Institute of Oceanography; IP (*Instituto de Psicologia*): Institute of Psychology; MAE: (*Museu de Arqueologia e Etnologia*): Museum of Archeology and Ethnology; RUSP (*Reitoria da USP*): Dean´s Office of the University of São Paulo; HEALTH SUP. (*Superintendência de Saúde*): Health Superintendency; SEC. SUP. (*Superintendência de Segurança*): Superintendency of Security; SCS (*Comunicação Social*): Social Communication.

Table 2. Chi-square tests of association between participant characteristics and health variables at program entry and respective p-values (null hypothesis is non-association among variables). São Paulo, 2020.

Variable 1	Variable 2					p-values
Smoking (2015–2018) (n=538)						
Sex	Former	No	Yes	Total		p-value
Female	17	231	26	274		0.018*
Male	35	203	26	264		
Triglycerides according to the program's assessment (2019) (n=515)						
Sex		No	Yes	Total		p-value
Female		215	43	258		0.000*
Male		167	90	257		
Number of risk factors for cardiovascular diseases by age (2019) (n=466)						
Age	0	1	2	3	Total	p-value
27–39	29	30	7	0	66	0.042*
40–59	147	138	61	11	357	
60–72	22	11	6	4	43	
Number of risk factors for cardiovascular diseases by engagement in physical activity (2019) (n=466)						
Engagement	0	1	2	3	Total	p-value
0–No	105	111	36	13	265	0.010*
1–Yes	93	68	38	2	201	OR=1.22*

Notes: p-values<0.050 (significance level). *Hypertension, diabetes mellitus type II, dyslipidemia, and obesity were considered risk factors for cardiovascular diseases.

Table 3 reveals that participants' BMI improved between program entry and follow-up after one year in the Active Aging Program. This difference reached statistical significance (p=0.041), confirming a positive behavioral change in their habits.

DISCUSSION

The present study found significant results in correlations between sex and smoking, sex and triglycerides, age and risk factors for CVDs, physical activity and risk factors for CVDs, and BMI at program entry and after one-year follow-up among employees participating in the Active Aging Program.

Comparison of the sociodemographic variables sex and triglycerides revealed that females had the best outcomes (Table 2). In a Brazilian study carried out in a northeastern city, results indicated that women had a higher incidence of hypertriglyceridemic waist.

Table 3. Paired *t*-test comparing body mass index after one year (n=201).

	Mean	SD	CI for mean	*t*	p-value
BMI status at first assessment	28.509	5.366	(0.020–0.913)	2.06	0.041*
BMI status at one year	28.042	4.630			
Difference	0.467	3.211			

Abbreviations: SD, standard deviation; CI: Confidence interval; BMI: body mass index.
Notes: *t*-test difference in mean=0 (vs no=0); *significant at 0.050.

The authors mentioned that individuals who showed physical inactivity also presented a higher frequency of hypertriglyceridemic waist[10]. Comparing the two studies it is possible to verify that despite being of the same sex (female), depending on the participants, there may be differences regarding clinical variables.

Correlation of the variables sex and smoking showed that males were more strongly associated with the profile of former smokers (Table 2). In the National Health Survey (*Pesquisa Nacional de Saúde*), there was a greater association between smokers and former smokers with a diagnosis of heart disease. Another study conducted in 2019 showed that inhabitants of the North and Northeast regions of Brazil had a lower prevalence of smoking[11,12].

In the present study, the comorbidities hypertension, diabetes mellitus type II, dyslipidemia, and obesity were prevalent. These health conditions were categorized as risk factors for CVD. Although not considered a disease, excess weight was also a predominant condition associated with CVDs in the present study[13].

In the association between sociodemographic variables and clinical variables, age and CVD risk factors was more statistically significant in the 40–59 years age group. The literature shows that the age groups 40 years and older represent a period when chronic diseases tend to manifest[14].

Based on the premise that the socioeconomic impact of CVDs can be significant in Brazil, data from a survey conducted by the Brazilian Society of Cardiology (*Sociedade Brasileira de Cardiologia*) showed a rise in the number of surgery admissions and expenditure on cardiology consultations, revealing that 28% of all deaths were associated with CVD[15,16].

The findings of the present study corroborate results of previous studies, correlating CVD risk factors with factors for metabolic syndrome. Metabolic syndrome comprises a set of disorders and can be triggered by a single factor[17].

In the present study, the analysis of the relationship between engagement in physical activity and risk factors for CVDs showed that physical activity was directly linked with the number of risk factors for NCDs. Similarly, the transversal study denominated "Prevalence of Metabolic Syndrome in individuals with Type 2 Diabetes Mellitus" found that a large percentage of participants with low level of physical activity also harbored NCDs[17].

Comparison of BMI at program entry versus follow-up after one year on the Active Aging Program showed a decrease in BMI, where 115 out of the 201 participants had a lower index. In a previous literature review, weight loss could be associated with positive changes in several markers of CVD risk[18]. In this way, we realize that the Active Aging Program affects different aspects of quality of life, which can influence participants' lives in a positive way.

Moreover, a study conducted in the USA found that obesity placed a burden on private health systems in the form of higher costs generated by comorbid conditions — obese patients caused 42% more expenditures in healthcare than patients with healthy BMIs[19].

Another study on active aging investigated physical activity in everyday life and revealed that men were more active. This also emphasizes that practicing physical activity on a daily basis can interfere with the aging process. This study was carried out in the city of Campinas, showing that the application of this policy is possible throughout the national territory[20]. The Decade of Healthy Ageing aims mainly to guarantee quality of life throughout the aging process and, by implementing programs like this, we can ensure this premise[1].

In conclusion, the present study has expanded knowledge on risk factors for CVD and yields contributing information for the continuity of the program that not only supports employees during their aging process but also contributes to improving their quality of life. Future studies should implement programs for active aging in both public and private institutes in an effort to achieve the WHO vision. Also, the sociodemographic profile, along with clinical and lifestyle variables, of program participants should be described before and after program participation.

Study limitations

The study has some limitations pertaining to the sample investigated. The population selected for this study, namely USP employees, did not adhere to the program as expected, which resulted in different sample sizes among the tables. The sample selection was also an issue, given that the sampling process was not random. Lastly, the sample size, although fairly large, led to gaps in data for some aspects.

AUTHORS' CONTRIBUTIONS

APBM: conceptualization, design of the work, writing. ELD: reviewing the manuscript. TBLS: reviewing the manuscript. TNO: data acquisition. EFT: data acquisition. BAOG: conceptualization, design of the work, writing, reviewing the manuscript. All authors approved the final version of the manuscript and agree to be responsible for all aspects of the work.

REFERENCES

1. Organização Pan-Americana da Saúde. Década do envelhecimento saudável 2020-2030 [Internet]. Brasília: OPAS; 2020 [cited on Sept 7, 2022]. Available from: https://iris.paho.org/handle/10665.2/52902
2. Silva DSM, Assumpção D, Francisco PMSB, Yassuda MS, Neri AL, Borim FSA. Doenças crônicas não transmissíveis considerando determinantes sociodemográficos em coorte de idosos. Rev Bras Geriatr Gerontol. 2022;25(5):e210204. https://doi.org/10.1590/1981-22562022025.210204.pt
3. World Health Organization. Envelhecimento ativo: uma política de saúde [Internet]. Tradução Suzana Gontijo. Brasília: OPAS; 2005 [cited on June 19, 2019]. Available from: https://bvsms.saude.gov.br/bvs/publicacoes/envelhecimento_ativo.pdf
4. Centro Internacional de Longevidade Brasil. Envelhecimento ativo: um marco político em resposta à revolução da longevidade [Internet]. Rio de Janeiro: Centro Internacional de Longevidade Brasil; 2015 [cited on Mar 16, 2020]. Available from: http://ilcbrazil.org/portugues/wp-content/uploads/sites/4/2015/12/Envelhecimento-Ativo-Um-Marco-Pol%C3%ADtico-ILC-Brasil_web.pdf
5. Organização Mundial da Saúde. Relatório mundial de envelhecimento e saúde [Internet]. Brasília: OMS; 2015 [cited on Mar 16, 2020]. Available from: https://apps.who.int/iris/bitstream/handle/10665/186468/WHO_FWC_ALC_15.01_por.pdf;jsessionid=D1B056598D53B09454ACD5ABCD4E0B53?sequence=6
6. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Análise em Saúde e Vigilância de Doenças Não Transmissíveis. Plano de ações estratégicas para o enfrentamento das doenças crônicas e agravos não transmissíveis no Brasil 2021-2030 [Internet]. Brasília: Ministério da Saúde; 2021 [cited on Apr 07, 2023]. Available from: https://www.gov.br/saude/pt-br/centrais-de-conteudo/publicacoes/svsa/doencas-cronicas-nao-transmissiveis-dcnt/09-plano-de-dant-2022_2030.pdf
7. Francisco PMSB, Assumpção D, Bacurau AGM, Silva DSM, Yassuda MS, Borim FSA. Diabetes mellitus em idosos, prevalência e incidência: resultados do Estudo Fibra. Rev Bras Geriatr Gerontol. 2022; 25(5):e210203. https://doi.org/10.1590/1981-22562022025.210203.pt
8. Leão I. Projeto da USP motiva funcionários a viver e envelhecer com qualidade [Internet]. Jornal da USP, 09 setembro 2016 [cited on Sept 7, 2022]. Avialable from: https://jornal.usp.br/universidade/projeto-da-usp-motiva-funcionarios-a-viver-e-envelhecer-com-qualidade/
9. Oliveira MA, Luiza VL, Tavares NUL, Mengue SS, Arrais PSD, Farias MR, et al. Access to medicines for chronic diseases in Brazil: a multidimensional approach. Rev Saude Publica. 2016;50(suppl 2):6s. https://doi.org/10.1590/S1518-8787.2016050006161
10. Fagundes LC, Fernandes MH, Brito TA, Coqueiro RS, Carneiro JAO. Prevalence and factors associated with hypertriglyceridemic waist in the elderly: a population-based study. Cien Saude Colet. 2018;23(2):607-16. https://doi.org/10.1590/1413-81232018232.02862016
11. Gonçalves RPF, Haikal DSA, Freitas MIF, Machado IE, Malta DC. Diagnóstico médico autorreferido de doença cardíaca e fatores de risco associados: Pesquisa Nacional de Saúde. Rev Bras Epidemiol. 2019;22(suppl 2):E190016.SUPL.2. https://doi.org/10.1590/1980-549720190016.supl.2
12. Meller FO, Santos LP, Miranda VIA, Tomasi CD, Soratto J, Quadra MR, et al. Desigualdades nos comportamentos de risco para doenças crônicas não transmissíveis: Vigitel, 2019. Cad Saúde Pública. 2022;38(6):e00273520. https://doi.org/10.1590/0102-311XPT273520
13. Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Envelhecimento e saúde da pessoa idosa [Internet]. Brasília: Ministério da Saúde; 2006 [cited on Mar 16, 2020]. Available from: https://bvsms.saude.gov.br/bvs/publicacoes/evelhecimento_saude_pessoa_idosa.pdf
14. Mássimo EAL, Souza HNF, Freitas MIF. Chronic non-communicable diseases, risk and health promotion: social construction of Vigitel participants. Ciênc Saúde Coletiva. 2015;20(3):679-88. https://doi.org/10.1590/1413-81232015203.14742014
15. Duncan BB, Chor D, Aquino EML, Bensenor IM, Mill JG, Schmidt MI, et al. Doenças crônicas não transmissíveis no Brasil: prioridade para enfrentamento e investigação. Rev Saúde Pública. 2012;46(suppl 1):126-34. https://doi.org/10.1590/S0034-89102012000700017
16. Siqueira ASE, Siqueira-Filho AG, Land MGP. Analysis of the economic impact of cardiovascular diseases in the last five years in Brazil. Arq Bras Cardiol. 2017;109(1):39-46. https://doi.org/10.5935/abc.20170068
17. Lira Neto JCG, Xavier MA, Borges JWP, Araújo MFM, Damasceno MMC, Freitas RWJF. Prevalence of metabolic syndrome in individuals with type 2 diabetes mellitus. Rev Bras Enferm. 2017;70(2):282-7. https://doi.org/10.1590/0034-7167-2016-0145
18. Fruh SM. Obesity: risk factors, complications, and strategies for sustainable long-term weight management. J Am Assoc Nurse Pract. 2017;29(S1):S3-S14. https://doi.org/10.1002/2327-6924.12510
19. Apovian CM. Obesity: definition, comorbidities, causes, and burden. Am J Manag Care. 2016;22(7 Suppl):s176-85. PMID: 27356115.
20. Sousa NFS, Lima MG, Cesar CLG, Barros MBA. Envelhecimento ativo: prevalência e diferenças de gênero e idade em estudo de base populacional. Cad Saúde Pública. 2018;34(11):e00173317. https://doi.org/10.1590/0102-311x00173317