OBJECTIVE: To verify the association of sociodemographic and clinical variables to different levels of physical activity in older adults enrolled in a health insurance plan in Brazil. METHODS: A quantitative cross-sectional study was conducted on a sample of 361 older adults enrolled in a health insurance plan in the city of São Paulo, SP, Brazil. Levels of physical activity were measured using the International Physical Activity Questionnaire (IPAQ), which has been translated, adapted and validated for use in Brazilian geriatric populations. Sociodemographic characteristics, functional capacity for activities of daily living, cognitive function, depressive symptoms, risk of falls, self-perceived health and nutritional status were also evaluated. Results were analyzed using descriptive methods followed by ANOVA and Chi-Square tests. When homogeneity of variances was violated, the Brown-Forsythe test was used, followed by Dunnett’s test for multiple comparisons. RESULTS: Low levels of physical activity were reported by 63.3% of participants, with only 5.6% practicing vigorous physical activity. In this sample, variables such as positive self-perceived health (p = 0.032), adequate sleep without medication (p = 0.020) and independence for activities of daily living (p < 0.001) were positively associated with higher levels of physical activity. Advanced age (p < 0.001), cognitive decline (p < 0.001), depressive symptoms (p < 0.001) and mobility impairments (p < 0.001) were associated with low levels of physical activity. CONCLUSION: Demographic and clinical variables displayed positive and negative associations with different levels of physical activity in older adults receiving health insurance plans. KEYWORDS: population dynamics; physical activity; sedentary behavior; prepaid health plans.

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Low levels of physical activity and related variables

INTRODUCTION

According to the World Health Organization (WHO), regular and appropriate physical activity is an important dimension of health promotion and risk factor reduction. Physical activity can also prevent complications associated with non-communicable chronic diseases (NCCD), and help delay the onset and progression of these conditions. The WHO defines physical activity as any movement produced by the musculoskeletal system which requires energy expenditure, including sports, games, housework, traveling, and other actions performed during work and/or leisure activities.1

According to the WHO, nearly 3.2 million deaths every year are caused by issues associated with a sedentary lifestyle. Physical inactivity has therefore become a major contributor to increased worldwide mortality rates, second only to hypertension and smoking. The prevalence of sedentary behavior has increased considerably in several countries and had a major impact on mortality rates.1,2

According to the National Household Survey (Pesquisa Nacional por Amostra de Domicílios; PNAD) conducted in 2015 by the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística; IBGE), 72.4% of Brazilian citizens aged 60 years or older do not engage in regular physical activity.3 Older adults with a sedentary lifestyle age faster, show more signs of pathological aging and display larger differences between their chronological and biological ages. In addition to an unhealthy lifestyle, the physical, physiological, psychological and social consequences of aging can also contribute to functional and cognitive decline.4

In response to these issues, in 2018, the WHO issued a global action plan to promote health and physical activity, with the goal of reducing physical inactivity by up to 15% by the year 2030. The plan includes recommendations for environmental improvement and for the training of professionals who could implement and encourage activities such as walking, biking, active recreation, dancing and games.5

In light of these studies and recommendations, the National Supplementary Health Agency (Agência Nacional de Saúde Suplementar), which is responsible for protecting the public interest in supplementary health care by regulating health insurance providers, has, since 2005, encouraged these institutions to develop programs focused on health education and promotion, as well as disease prevention and management.6

Health promotion programs structured around physical activity have a high cost-benefit ratio. Since older adults comprise a significant proportion of public and private health service users in Brazil, researchers have grown increasingly interested in the factors associated with different levels of physical activity in order to raise awareness of the issue.7 However, few studies on the topic have been conducted in older patients in the private health sector in Brazil. This is the first study to investigate physical activity in this particular population group, and its findings may therefore encourage the wider availability of physical activity programs for these individuals.

In light of these observations and the scarcity of studies on the health of older individuals in the private health care system, the aim of this study was to measure and evaluate the association between different levels of physical activity...
and the sociodemographic and clinical characteristics of older patients in the supplementary health sector using the International Physical Activity Questionnaire (IPAQ).

**METHOD**

This quantitative, exploratory, cross-sectional study was conducted in 2018, and involved a survey administered to a group of older individuals who had a group medical plan provided by a health insurance company in the city of São Paulo (SP, Brazil).

Eligible participants were community-dwelling adults aged 60 years or older, of both genders, living in the city of São Paulo, enrolled in a health insurance plan, who had joined a chronic disease management (CDM) program.

The program in question is offered to individuals with a high-risk profile as determined by the health insurance plan. It involves activities implemented and supervised by a multiprofessional team, responsible for the monitoring, assessment and follow-up of health status in group participants. All older adults with at least one NCCD who were currently receiving medical treatment were eligible to take part in the program. CDM programs are conducted using internationally recognized methods, which include monthly telephone monitoring and home visits performed at different intervals depending on clinical necessity.5,8

The sample size for this study was calculated based on the total number of participants in the CDM program (N = 471), a 95% confidence interval and a sample error of 2%. This resulted in a required sample size of 361 participants. These individuals were drawn from the total population by random number selection.

The level of physical activity performed by participants in the CDM program was measured using the IPAQ as adapted to older adults. This self-administered questionnaire was initially developed by the WHO, the Center for Disease Control and Prevention (CDC) in the United States, and the Karolinska Institute in Sweden, as a means of collecting internationally comparable data on physical activity. The questionnaire was later adapted and validated for use in older adults. This created a need to adapt the structure and administration of the IPAQ without affecting its psychometric properties.9

The IPAQ was selected for the present study because it has proved suitable for the assessment of overall levels of physical activity across different regions. It is also easy to administer, inexpensive and can be completed by self-report.

The version of the IPAQ which has undergone cross-cultural adaptation and validation for use in older adults evaluates the time spent performing different activities in the previous seven days or a regular week. This instrument contains 15 questions distributed into five domains:

- Job-related physical activity;
- Transportation physical activity;
- Housework, maintenance and caring for family;
- Recreation, sport and leisure-time physical activity;
- Time spent sitting.

For every domain, except for time spent sitting, physical activities were defined based on the presence of moderate to severe intensity and a duration of at least 10 minutes.9

The sum of scores on all physical activity domains was then classified into one of the following categories: vigorous, moderate or low. Vigorous physical activity involved one of the following: vigorous physical activity at least three times a week, for at least 150 min/week, or a combination of walking and moderate to vigorous activity with a total duration of 300 min/week. Moderate intensity physical activity was defined as ≥ three days of moderate activity or walking at least 30 minutes a day; or ≥ five days of any combination of walking and moderate to vigorous activity, for a total of at least 600 min/week. Participants who did not meet criteria for vigorous or moderate activity were classified in the low-intensity physical activity group.9

Sociodemographic and clinical variables were investigated using a questionnaire developed by the authors of the present study to evaluate multidimensional aspects of health in older adults. The variables included age (years); gender (male or female); marital status (common law/married, separated/divorced, single or widowed); education (≤ 3 years; 4 to 7 years; and ≥ 8 years); self-perceived health status (bad, poor, fair, good or excellent); dependence in basic activities of daily living (ADLs), evaluated using the Katz Index;10 dependence in instrumental activities of daily living (IADLs), evaluated using the Lawton Index;10 sleep quality (good, with or without medication; or poor, with or without medication); the Timed Up and Go (TUG) test to evaluate risk of falls;11 history of falls in the past year; body mass index (BMI), classified according to age-dependent cutoffs;12 Mini Mental State Examination (MMSE), to screen for cognitive impairments and risk of dementia; and the geriatric depression scale (GDS), developed by Yesavage to screen for depressive symptoms.13
Cognitive impairment was defined as a score lower than 18 for those with up to three years of education, 19 for those with four to seven years of education, and 24 for those with ≥ 8 years of education, while depressive symptoms were assessed based on a cut-off of ≥ 6 points.\textsuperscript{13,14}

Forty-four older adults were excluded from the study for the following reasons: living in institutional care; hospitalization; and/or neuropsychiatric illnesses which could interfere with their ability to respond to the previously mentioned questionnaires.

Data were collected during home visits. When participants were contacted to schedule the visits, they were informed of the goals of the study and told that their participation would be voluntary, that confidentiality would be assured and that refusal to participate would not interfere with the services provided by their health insurance plan. The data collected from individuals who agreed to take part in the study were stored in electronic records and later transferred to a database for analysis. Responses were collected using the previously mentioned self-report questionnaires, before being scored and classified.

All information was reviewed, and inconsistencies were resolved by revisiting the original interview.

Data were described using frequencies and percentages for qualitative variables, and measures of central tendency and dispersion for quantitative variables. Groups with different levels of physical activity as determined by the IPAQ adapted for older adults were compared using $\chi^2$ tests and analysis of variance (ANOVA) for qualitative and quantitative variables, respectively. When the assumption of homogeneity of variances was violated, a Brown-Forsythe adjustment was implemented. Multiple comparisons with statistically significant findings were followed by Dunnett’s post-hoc test.

All analytical procedures were conducted using the Statistical Package for Social Sciences (SPSS\textsuperscript{®}) for Windows, Chicago, United States. Results were considered significant at 5% (p < 0.05).

This study was approved by the Research Ethics Committee (REC) of the Pontifícia Universidade Católica de São Paulo (PUC-SP) (Certificate of Presentation for Ethical Appreciation [CAAE] No. 87307118.5.0000.5482 and Report no. 2.626.054. Participants were only contacted after ethical approval was obtained.

**RESULTS**

The sample consisted of 361 older adults recruited from a health insurance provider in the city of São Paulo. The sample was mostly female (n = 68.4%), and ranged in age from 67 to 104 years, with a mean of 79.3 years (SD = 7.7). Most participants were in a relationship (n = 47%) or widowed (n = 40%), and 70% had university education.

Further analysis showed that 81.5% (n = 294) of the sample rated their health as good or excellent, and only 1.7% (n = 6) had a negative perception of their health status. Independence in ADLs and IADLs was reported by 89.2% (n = 322) and 68.6% (n = 247) of participants, respectively. Among those considered fully independent in IADLs, 3.3% (n = 12) had a sedentary lifestyle.

The risk of falls, as measured by the TUG, revealed that 59.4% of the sample did not show mobility impairments and completed the task in < 10 seconds, while 24.5% (n = 87) had some difficulty and completed it within < 20 seconds and 16% had moderate to severe impairments (> 20 seconds). However, only 13.3% (n = 48) of these individuals had a history of falls with or without fractures in the previous year.

Sleep quality measures revealed that 61.2% (n = 221) of participants reported adequate sleep quality and duration, although 53.7% (n = 194) of these individuals used medication for sleep. Among participants with sleep disorders and poor sleep quality, 27.1% (n = 98) experienced these difficulties despite taking sleep medication.

The overall mean BMI for participants as a group was 26.3 kg/m\textsuperscript{2} (SD = 4.4).

The classification of physical activity levels as measured by the IPAQ revealed that 63.3% (n = 228) of older adults had a low level of physical activity, 31.1% (n = 112) had moderate levels and only 5.6% (n = 20) reported vigorous physical activity.

Comparisons between participants with different levels of physical activity as determined by the IPAQ were carried out using $\chi^2$, ANOVA, Brown-Forsythe and Dunnett tests. These procedures revealed significant differences between participant groups with regards to the number of individuals who perceived their health as excellent (p = 0.032), reported adequate sleep without medication (p = 0.020) and were independent in ADLs (p < 0.001) and IADLs (p < 0.001). Low levels of physical activity were also significantly related to older age (p < 0.001), moderate to severe mobility impairments (p < 0.001), cognitive decline (p < 0.001) and depressive symptoms (p < 0.001).

**DISCUSSION**

This study involved 361 older adults with group medical insurance plans from a health insurance provider in the city of São Paulo. Two-thirds of participants reported low levels of physical activity, which were significantly associated
with cognitive decline, depressive symptoms and mobility impairments.

Regular physical activity for at least 150 min/week can have significant benefits for older adults, such as: reduced mortality rates by up to 46%; increased longevity; prevention of functional limitations; improvement and maintenance of cognitive functions; reduced risk of comorbidities, especially cancer and circulatory system diseases; reduced rate of complications of chronic illnesses; improved serum cholesterol, as well as increased self-esteem, better self-perceived health and more opportunities for interaction with other people and environments.2,15

The present findings revealed that a significant proportion of older adults reported little to no physical activity. The percentage of participants reporting moderate to vigorous levels of physical activity in the present study was also lower than that described for the Brazilian population, which is 27.6%.3

In the present study, some variables were significantly associated with different levels of physical activity. Positive self-perceived health status, adequate sleep without medication and independence in ADLs and IADLs were positively associated with higher levels of physical activity. Studies have shown that variables such as self-perceived health and functional capacity for everyday tasks are closely related to the practice of physical exercise, as well as restorative sleep in older adults.16

On the other hand, older age, cognitive decline, depressive symptoms and moderate to severe mobility impairments were significantly associated with low levels of physical activity in the present study. The aging process tends to have a larger impact on functioning, mobility, cognition and health status in individuals with advanced age, which contribute to low physical activity levels in these individuals.3,4 However, the literature has shown that even individuals older than 85 years with a sedentary lifestyle can benefit from physical activity, and experience an increase in life expectancy of up to three years.7

Neuropsychiatric signs and symptoms (cognitive decline and depressive symptoms) have also been investigated in connection with regular physical activity, which has a protective role against these issues.17,18 These benefits may be associated with the effects of exercise on the biological properties of the central nervous system, such as increased brain circulation, changes in neurotransmitter synthesis and uptake, neuroendocrine and humoral factors, as well as changes in the growth factors responsible for angiogenesis.19

However, it is important to note that the association between low levels of physical activity and neuropsychiatric symptoms is often the result of preexisting psychiatric conditions, which can result from the progression of chronic illnesses, low education levels, widowhood, social isolation and aging itself, which can also contribute to the low levels of physical activity in this age group.4,13,20

A sedentary lifestyle can aggravate functional impairments, since regular and continuous physical activity can delay or minimize the effects of aging and the progression of degenerative disorders, possibly decreasing cardiovascular and cerebrovascular risk factors and preventing undesirable outcomes, increasing quality of life, in addition to improving health, self-perceived health status and functional capacity. It is important to note that the benefits of physical activity do not depend on sociodemographic variables, but on the intensity, duration and type of activity performed.16

Self-perceived health is an important subjective indicator of multidimensional health in older adults, since it incorporates physical, cognitive and emotional aspects of well-being and life satisfaction. This type of indicator is often used in populational studies of older adults due to its consistent association with mortality, morbidity, depression and functional disability.6,15 In the present study, most participants had a positive self-perception of health, regardless of current clinical condition, a finding which corroborates those of previous studies in the literature.17 Nevertheless, it is important to remember that this is a variable and time-sensitive measure of health status, which is susceptible to cyclical changes in the well-being of older adults, with institutionalized individuals (regardless of region) reporting poorer self-perceived health than community-dwelling older adults.15

Given the particular characteristics of participants in the present study, our findings must be interpreted with caution. The cross-sectional design of this study might also be considered a limitation, since it does not allow for the determination of causal relationships between the variables. It is also important to consider the possible impact of confounding variables such as previous lifestyle habits and the availability and access to adequate environments for the practice of physical activity. Given the characteristics of the IPAQ, its responses are also subject to self-report bias.

CONCLUSION

The participants investigated in the present study had a high prevalence of unhealthy lifestyle habits, such as overweight and little to no physical activity. Additionally, variables such as positive self-perception of health status, adequate sleep without medication and independence in ADLs were positively associated with higher levels of physical activity, while advanced age, cognitive decline, depressive symptoms
and moderate to severe mobility impairments were associated with low levels of physical activity among older adults. These findings highlight the need for widespread implementation and dissemination of initiatives that stimulate physical activity in older adults, in order to prevent falls as well as the onset and progression of chronic diseases, contribute to health education and promotion, and encourage early screening for conditions which may affect individuals in this age group.

CONFLICT OF INTERESTS
The authors declare no conflict of interests.

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