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Original Article

TIME IN SEDENTARY BEHAVIOR AND PHYSICAL ACTIVITY AS DISCRIMINATORS OF DIABESITY IN QUILOMBOLAS

TEMPO EM COMPORTAMENTO SEDENTÁRIO E ATIVIDADE FÍSICA COMO DISCRIMINADORES DE DIABESIDADE EM QUILOMBOLAS

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RESUMO

Introdução: A Diabesidade caracteriza-se como uma condição simultânea de diabetes tipo 02 e obesidade. Dentre os aspectos que influenciam o desenvolvimento da diabesidade, o tempo em comportamento sedentário e o tempo de atividade física apresentam-se como importantes fatores de risco. Objetivos: estimar pontos de corte para o tempo em comportamento sedentário e atividade física como discriminador de presença de diabesidade e avaliar a capacidade preditiva do CS e AF para identificar essa condição em adultos quilombolas. Metodologia: trata-se de estudo transversal com amostra composta por 332 adultos (idade ≥ 50 anos), participantes do estudo de Perfil Epidemiológico dos Quilombolas baianos residentes na microrregião de Guanambi, Brasil. Os dados foram obtidos por meio de entrevistas e avaliação antropométrica. Foram incluídas informações sociodemográficas e estilo de vida (atividade física e comportamento sedentário). Para a análise do ponto de corte do Comportamento Sedentário e o tempo de atividade física como preditores de diabesidade, foi utilizada a curva Receiver Opereting Characteristic (ROC). Resultados: Tempo em comportamento sedentário >120 min/dia e tempo de atividade física >240 min/semana foram os melhores pontos de corte para discriminar a diabesidade em quilombola, com áreasob a curva ROC de 0,62, IC 95% (0,56-0,67) e 0,62 (IC 95%: 0,55-0,67), respectivamente. Conclusões: Os resultados mostraram que o tempo em comportamento sedentário e atividade física apresentaram uma boa capacidade para discriminar apresença de diabesidade entre adultos quilombolas.

Palavras-chave: diabesidade; estilo de vida, diabetes; obesidade

ABSTRACT

Introduction: Diabesity is characterized as a simultaneous condition of type 02 diabetes and obesity. Among the aspects that influence the development of diabetes, the time in sedentary behavior and the time of physical activity are important risk factors. Objectives: To estimate cut-off points for time spent in sedentary behavior and physical activity as a discriminator of the presence of diabesity and to evaluate the predictive ability of WC and PA to identify this condition in quilombola adults. Methodology: this is a cross-sectional study with a sample composed of 332 adults (age ≥ 50 years), participants in the study of the Epidemiological Profile of Quilombolas from Bahia living in the micro-region of Guanambi, Brazil. The data were obtained by means of interviews and anthropometric evaluation. Sociodemographic and lifestyle information (physical activity and sedentary behavior) were included. To analyze the cut-off point of Sedentary Behavior as a predictor of diabesity,the Receiver Operating Characteristic (ROC) curve was used. Results: Time in sedentary behavior >120 min/day and time in physical activity <240 min/week were the best cut-off points for discriminating diabesity in quilombola, with area under the ROC curve of 0.62, 95% CI (0.56-0.67) and 0.62 (95% CI: 0.55-0.67), respectively. Conclusions: The results showed that time in sedentary behavior and time in physical activity showed a good ability to discriminate the presence of diabesityamong quilombola adults.

Keywords: diabesity; lifestyle, diabetes; obesity

Introduction

Sedentary behavior is defined as time spent in sitting, reclining, or lying down with energy expenditure close to resting values, that is, ≤ 1.5 metabolic equivalents (METs[).1,2] On

does not meet the minimum recommendations for physical activity, that is, less than 150 minutes per week of moderate and/or vigorous physical activity. [3] Both conditions are related to higher exposures to negative health events. Both conditions are related to higher exposures tonegative health events.

Scientific evidence has demonstrated that the association between excessive time in sedentary behavior with negative health outcomes, such as the occurrence of cardiovascular diseases [4], metabolic syndrome[2,5], diabetes mellitus[5,6], hypertension[7], and being overweight[8], and can be considered a risk factor for all-cause mortality, regardless of the level of habitual physical activity[4,9].

Physical inactivity, in turn, accelerates the functional decline of the body, causing greater functional disability, loss of quality of life, leading to an increased risk of mortality[10], development of diseases such as: cardiovascular problems, obesity and diabetes mellitus type[2,11].

There is little information on cutoff points for sedentary behaviour and physicalactivity for the quilombola population. Among the evidence found, a study carried out withthe black population stands out. This investigation showed that a total of 185 to 285 minutes per week of accumulated physical activity in different domains may be adequate for the prevention of diabetes in adults[12]. In another survey, this one carried out among the quilombola population, the authors observed that the increase in TV time was related to the presence of three or more components of the Metabolic Syndrome and the time spent in sedentary activities (watching television for 5 hours or more) was associated with with a greater waist circumference in Quilombola adults and elderly [13].

The concomitant existence of obesity with type 2 diabetes mellitus is a condition known as Diabesity[14]. The combination of these two diseases is associated with a sevenfold increased risk of mortality[15]. Recent data from the National Diabetes Statistics Report[16]highlights that in the United States, 89.0% of adults with diabetes are overweight or obese. According to the International Diabetes Federation, over the past two years (2019-2021), there has been a 16% increase in the incidence of diabetes in the world population, totaling 537 million diabetic adults worldwide in 2021. In Brazil, the most recent estimates add 15,733.6 million people with the disease, about 8.8% of the population[17].

Genetic characteristics, increased life expectancy, and health-related risk behaviors: smoking, excessive alcohol consumption, inadequate dietary intake, insufficient physical activity, and increased time spent in sedentary activities may contribute to higher occurrence of diabesity[18].

The evidence of association of physical inactivity, sedentary behavior with diabetes[19] and obesity[20] were based on the occurrence of these conditions in isolation in adult and elderly populations.

Furthermore, findings in the literature suggest that social determinants, especially unfavorable socioeconomic conditions, increase vulnerability to risk behaviors[21] and to becoming ill from chronic diseases[22]. In this sense, it is recognized that racism determines important unfavorable inequalities for the black population, with impact on socialvulnerability indicators, and on the illness and death of this population[23].

As for the impact of racial-ethnic belonging, it is known that diabetes differentially affects black populations, influenced by genetic, environmental, behavioral issues and socioeconomic vulnerability[24,25], a picture that seems similar in the context of obesity.

In the context of lifestyle, investigations with participation of quilombolas identified a predominance of excessive sedentary behavior[13] and an important prevalence of physical inactivity[26].

However, information on the association between lifestyle elements and the simultaneous condition of diabetes in black populations, especially in quilombolas, is still incipient. In this sense, this work aims to estimate cut-off points for time in sedentarybehavior and physical activity as a discriminator of the presence of diabesity and to evaluate the predictive ability of CS and PA to identify this condition in adults (age ≥ 50 years) quilombolas.

Methods

This is a population-based cross-sectional study with remnants of quilombos from the microregion of Guanambi, Bahia, Brazil, which was conducted in the period from April to November 2016. The region consists of 18 municipalities and, there were 42 certified quilombos during the collection period, distributed in 10 of these municipalities[27].

The sample was obtained assuming 50% prevalence for unknown outcome, 95% confidence, 5% sampling error, 1.5 times effect for one-stage clustering, 30% addition for refusals and 20% for losses and confounding, more details about the sample selection process has been published in a previous study[13]. For the purpose of the present study, only information on adults aged ≥ 50 years was included, totaling a sample of 348 individuals (40.8% of the total population).

Data collection was carried out in a joint effort system, on days previously scheduled by the residents' associations of the remaining quilombo communities in common agreement with the residents. In each of the communities, the collections took place in up to three visits. For this purpose, it was formed. Data collection was carried out by a previously trained team composed of health professionals and/or academics.

For the present study, interviews and anthropometric assessment were conducted. Anthropometric measurements were measured body weight (in kg) and height (in meters) and evaluated by a previously trained professional using standardized methods[28]. For this, a previously calibrated digital scale, from the Omron brand, model hbf-514c, with a resolution of 100 grams and a capacity of 150 kg, was used to measure body mass. Height was obtained using a Sanny portable aluminum stadiometer, Caprice model, with a resolution of 0.1mm.

For the present study, information regarding the following variables was used: sex (male/female), age: in complete years and categorized by age group (50 to 74 and 75 years or older); occupation: categorized as having no paid work or paid work; marital status: (with partner/without partner); education: (≤ 5 years/5 years); tobacco use: categorized into currently smoking (yes/no); regular alcohol consumption: (yes/no); has diabetes (yes/no); is obese (yes/no); has diabesity (yes/no).

The main independent variables considered were sedentary behavior and physical inactivity, both assessed using questions from the International Physical Activity Questionnaire (IPAQ) short version. This instrument allows you to measure the time spent sitting during a weekday and a weekend day (hours/minutes) and the time spent in light, moderate, and intense physical activities during the week and weekend. The time spent in CS was recorded in minutes and the final score was obtained from the calculation of the average time spent sitting (min/week). Time spent in physical activity (hours/minutes) was determinedbased on the average of the sum of time spent in physical activity of different intensities during the week and weekend.

Diabesdity was classified based on self-reported information of diabetes mellitus diagnosis and the calculation of body mass index (BMI=kg/m²)[29]. Body mass index (BMI)

was calculated by dividing weight (kg) by height squared (m²). For the categorization of BMI, the strata of the World Health Organization (1999) were considered: underweight (< 18.5 kg/m²), normal weight (18.5 - 24.99 kg/m²), overweight (> 25 - 29 .99 kg/m²), obesity (≥ 30 kg/m²)[28].

The Statistical Package for the Social Sciences for Windows (SPSS) version 22 software was used for data analysis. Descriptive statistical procedures (simple and relative frequencies and measures of dispersion) were used for the univariate analysis of the data. For the bivariate analysis, Pearson's chi-square test was used to compare the study variables between men and women.

The discriminatory ability, sensitivity and specificity of the CS and FI to assess the presence of diabesity were established from the analysis of the Receiver Operating Characteristic (ROC) curves. The area under the ROC curve (AUC) determines the discriminatory ability of the indicator for the presence or absence of diabesity. The 95% interval was adopted for the statistical analysis of the data.

The study "Epidemiological Profile of Bahia's Quilombolas" was approved by the Research Ethics Committee of the State University of Southwest Bahia (Opinion No. 1.386.019/2016), and followed the Brazilian standards for research with human beings, as provided by the National Health Council Resolution No. 466/2012.

Results

The sample included 331 individuals with a mean age of 61.66 (± 9.56 years), and the majority were female (52.9%). Most of the respondents had less than 5 years of schooling (84.2%) lived with a partner (80.9%), had paid work (85.8%) and did not smoke (87.8%) or drink (75.2%). The prevalence of diabetes, obesity, and diabesity were 17.8%, 16%, and 4 .2% respectively (Table 1).

Table 1 - Sociodemographic and behavioral characteristics of quilombola adults living in the municipality of Guanambi, Bahia, Brazil

Variables	n	%
Sex		
Male	156	47,1
Female	175	52,9
Age		
50 – 74	285	86,1
75 or more	46	13,9
Occupation		
Has a paid job	284	85,8
Doesn't has a paid job	47	14,2
Marital status		
With partner	267	80,9
without partner	63	19,1
Education		
≤ 5 years	250	84,2
> 5 years	47	15,8
Currently smoke		
Yes	40	12,2
No	288	87,8
Regular alcohol consumption		
Yes	82	24,8
No	249	75,2
Diabetes		
Yes	59	17,8
No	272	82,2
Obesity		
Yes	53	16
No	278	84
Diabesity		
Yes	14	4,2
No	317	95,8

Source: authors

The mean time spent in sedentary behavior (CS) was 138.89(±116.17) min/day 137.50 ±109.40 min/day for men and 140.05 ±121.95 min/day for women) and the mean time spent in PA was 109.43 (±117.37) min/week, being 112.87 (±111.32) for men and 106.55 (±122.55) for women - table 2.

Table 2 - Time of Physical Activity and Sedentary Behavior, mean and standard deviation in quilombola adults in the municipality of Guanambi, Bahia, Brazil

Variables	Average (standard deviation)
Sedentary Behavior*	
General	138,89 (±116,17)
Male	137,50 (±109,40)
Female	140,05 (±121,95)
Physical Activity*	
General	109, 43(±117,37)
Male	112,87 (±111,32)
Female	106,55 (±122,55)

Note: *Anova test. p value>=0.05

Source: authors

The Area Under the Curve (ASC) scores were observed to be 0.62 (95% CI: 0.56-0.67) and 0.62 (95% CI: 0.55-0.67) for the CS and AF population respectively (Figures 1and 2). The cut-off points with the highest accuracy scores to discriminate diabesity were: > 120 min/day (Sensitivity = 63.6% and Specificity = 62.4%) for sedentary behavior and > 240 min/week (Sensitivity = 66.4% and Specificity = 66.7%) for physical activity (Table 3).

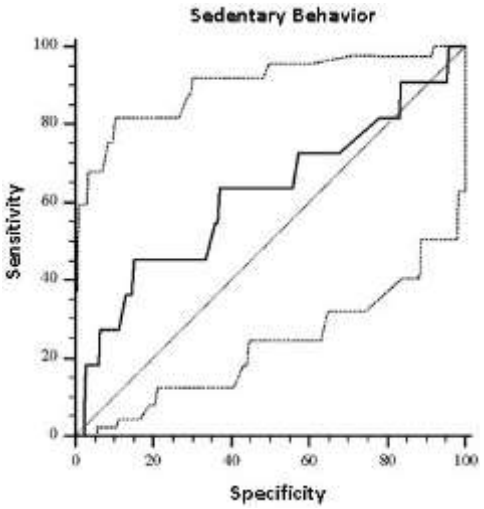

Figure 1 - Area under the curve (ROC) between Sedentary Behavior and diabesity in quilombola adult individuals in the municipality of Guanambi-BA

Source: authors

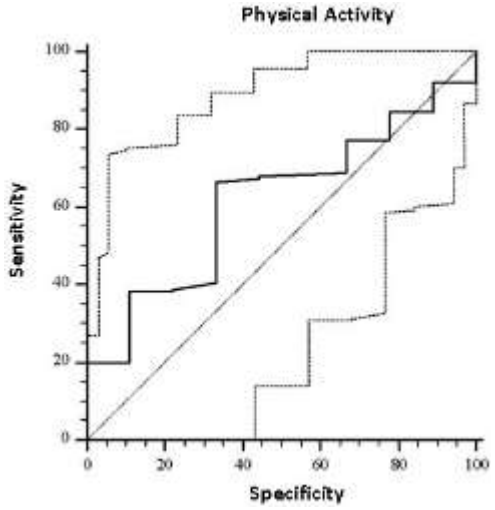

Figure 2 - Area under the curve (ROC) between Physical Activity and diabesity in adult quilombola individuals, Bahia, Brazil, 2016

Source: authors

Table 3 - Area under the ROC curve and 95% CI between WC, PA and diabesity in quilombola adults, Bahia, Brazil.

Variables	Cut-off point (min/day)	Sensitivity (%)	Specificity (%)	Area (95%CI)
Sedentary Behavior	> 120	63,6	62,4	0,62 (0,56-0,67)
Physical Activity	> 240	66,4	66,7	0,62 (0,55-0,67)

Source: authors

Discussion

The sociodemographic characteristics of the quilombolas are similar to those found in other remaining communities of quilombos in terms of distribution by sex (female) and age group (younger)[13].

The results of the present study showed that physical activity and sedentary behavior have an acceptable predictive power to discriminate diabesity. In addition, the best cut-off points of CS and PA were identified to discriminate diabesity.

Studies that have evaluated the discriminatory power of sedentary behavior and physical activity for diabesity screening are still incipient. Some studies have analyzed diabetes and obesity in isolation, among these a survey of elderly people in the interior of Bahia, Brazil showed that the best cutoff points of time in sedentary behavior to discriminate overweight was 390 and 270 minutes per day or more for men and women, respectively[30]. In another study, conducted with the same population, the authors identified that the cutoff point of > 325 minutes per day was the one that best discriminated the presence of diabetes mellitus[31].

Results from other investigations such as that of Silva et al.[32] who evaluated elderly people from 24 municipalities that are members of the Regional Superintendence of Health of Uberaba, MG, Brazil demonstrated that the time in CS of 330 min/day was the one that best identified the presence of diabetes mellitus. Findings from investigations in other countries,

such as the survey by Gómez-Cabello et al. [33] with Spanish elderly showed that time > 4 hours/day in CS increased exposure to overweight-obesity. The authors of that study concluded that increasing time in sedentary behavior increases the risk of overweight/obesity independent of walking time.

Regarding physical activity, previous studies have shown a negative relationship between obesity and low level of weekly physical activity in the elderly[34,35]. In a study by Pitanga et al. [12], who evaluated black adults aged 20 to 96 years living in the city of Salvador, BA, the authors demonstrated that 185 minutes/week of cumulative physical activity in the different domains for men and 215 minutes/week for women were the best cutoff points to predict the absence of diabetes. In another study, conducted by Di Francesco et al. [34], the authors demonstrated that walking less than 30 minutes per day was associated with 2.7 times greater likelihood of being obese and that high-intensity exercise, such as brisk walking or gardening, was inversely correlated with body fat.

Despite the incipient information about the cut-off points of CS and PA to discriminate the presence of diabesity, it is already well established in the literature, as exposed above, that the increased time spent in CS and the lack of regular physical activity, are directly related to increased obesity and changes in glycemic rates, and may also contribute to the occurrence and worsening of Diabetes Mellitus 2[,1,3].

One of the physiological mechanisms to account for the deleterious health effects of high time in CS are associated with a reduction in the activity of lipoprotein lipase (LPL), which is responsible for breaking down fat and converting it into energy. When this enzyme isat a low level of activity it causes a reduction in the uptake of plasma triglycerides by skeletal muscle, a decrease in HDL cholesterol concentration, and a postprandial increase in lipids[36].

On the other hand, it is known that regular physical activity practice is related to a reduction in the physiological changes of aging, promoting greater glycemic control, in the lipid profile, in blood pressure control, in the anthropometric profile, and in the cardiovascularrisk factors of diabetic elderly people[1,37,38] besides promoting an increase in aerobic capacity,muscle strength, and flexibility[39].

In this sense, one of the dimensions of the active aging proposal recommended by the World Health Organization refers precisely to the practice of physical activity and the reduction of sedentary behavior, as strategies to meet the demands imposed by population aging in the world[3,40].

As a limitation of the study, the assessment of WC and PA were done using self-reported measures that may be subject to recall bias. Also, the self-reported nature of the variable presence of type 2 diabetes mellitus, may have been under-reported. On the other hand, the strengths of the study include a representative sample of quilombolas, communities that have been little researched, and the use of previously validated evaluation instruments. Furthermore, the study reflects a relevant problem, especially in this population that is characterized by low levels of education, income, and insufficient access to health services, which can exacerbate the problem of the health indicators studied.

Conclusion

Finally, the findings of the present study showed that WC (with the cutoff point of > 120 min/week) and time of physical activity (<240 min/week) have acceptable predictive power for determining diabesity, indicating specific cut-off points. In this way, they can be used in the day-to-day clinical practice, especially enhancing the service and care for populations that have restricted access to health services. In addition, they make it possible to add useful information for health professionals with the goal of improving the health, fitness, and quality of life of all

people through regular physical activity and SC reduction in order to strengthen preventive health.

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