REVISTA BRASILEIRA DE MEDICINA DE FAMÍLIA E COMUNIDADE
RBMFC

www.rbmfc.org.br
ISSN 2197-7994

Research Article

Factors associated with systemic arterial hypertension and diabetes mellitus in the population served by the Vozes das Ruas Project in Jundiaí

Fatores associados à hipertensão arterial sistêmica e diabetes *mellitus* na população atendida pelo Projeto Vozes das Ruas em Jundiaí

Factores asociados a la hipertensión arterial sistémica y la diabetes mellitus en la población atendida por el proyecto Vozes das Ruas en Jundiaí

Lucas Castro Pires[1], Lucas Gabricio Marçola[1], João Paulo Bartolo Siqueira[1], Natália Arthur Vieira[1], Raissa Alves Jorge[1], Adriano Pires Barbosa[1], Marília Jesus Batista[1]

[1]Jundiaí School of Medicine – Jundiaí (SP), Brazil.

Abstract

Introduction: Chronic noncommunicable diseases (NCDs) — including diabetes mellitus (DM) and systemic arterial hypertension (SAH) — are responsible for most of the worldwide deaths today, and the identification of associated factors is an essential tool for their prevention and health promotion strategies. **Objective:** To determine the prevalence of SAH and DM in the adult population served by Projeto Vozes das Ruas (PVR) in Jundiaí, SP, Brazil and associated factors. **Methods:** A cross-sectional study was carried out from March to November 2019, with a sample of adults over 18 years of age, participating in PVR's health promotion actions in 2019, which consisted in the application of a sociodemographic and health behavior questionnaire, evaluation of capillary glucose, blood pressure, weight, height and waist circumference and subsequent health counseling. Descriptive analysis of the data was performed to determine the association of the outcomes DM and SAH with independent variables. A chi-square test was carried out and variables with $p<0.20$ were included in multivariate logistic regression ($p<0.05$). **Results:** The sample consisted of 50% females with an average age of 48.56 years. The self-reported prevalence of DM was 16.2% and SAH 30.2%, with a relationship between them. The common associated factors were: age group over 39 years and continuous-use medications. Associated with DM were family history of DM, use of basic health unit and smoking history. In relation to SAH the associations were less than eight years of schooling, overweight and obesity and smoking. **Conclusions:** In the population studied, there was a high prevalence of two of the main NCDs, SAH and DM, which presented risk factors of extreme relevance for the planning of health promotion and disease prevention strategies.

Keywords: Hypertension; Diabetes mellitus, Noncommunicable diseases; Epidemiology.

Corresponding author:
Marília Jesus Batista
E-mail: mariliajbatista@gmail.com

Funding:
No external funding.
Ethical approval:
15933519.0.0000.5412
Provenance:
Not commissioned.
Peer review:
External.
Received on: 03/10/2021.
Accepted on: 08/15/2021.

How to cite: Pires LC, Marçola LG, Siqueira JPB, Nogueira NA, Jorge RA, Barbosa AP, Batista MJ. Factors associated with systemic arterial hypertension and diabetes mellitus in the population served by the Vozes das Ruas Project in Jundiaí. Rev Bras Med Fam Comunidade. 2022;17(44):2986. https://doi.org/10.5712/rbmfc17(44)2986.

Resumo

Introdução: As doenças crônicas não transmissíveis (DCNT) — incluindo diabetes (DM) e hipertensão arterial sistêmica (HAS) — são responsáveis por grande parte das mortes mundiais atualmente, sendo a identificação de fatores associados uma ferramenta fundamental para sua prevenção e estratégias de promoção da saúde. **Objetivo:** Determinar a prevalência de HAS e DM na população adulta atendida pelo Projeto Vozes das Ruas (PVR) em Jundiaí (SP) e fatores associados. **Métodos:** Os participantes do estudo transversal, conduzido de março a novembro de 2019, foram adultos acima de 18 anos, voluntários das ações de promoção de saúde do PVR em 2019, que consistiram na aplicação de um questionário sociodemográfico e de comportamentos em saúde; na avaliação de glicemia capilar, pressão arterial, peso, altura e circunferência abdominal; e posterior aconselhamento em saúde. Realizou-se análise descritiva dos dados para verificar a associação dos desfechos DM e HAS com variáveis independentes. Utilizaram-se teste χ^2 e regressão logística multivariada para variáveis com p<0,20, adotando-se a significância de 5%. **Resultados:** A amostra foi composta de 580 participantes, 50% do sexo feminino e com idade média de 48,56 anos. A prevalência autodeclarada de DM foi 16,2% e de HAS, 30,2%. Os fatores associados em comum foram: faixa etária acima de 39 anos e uso de medicação contínua. Associados à DM foram: antecedente familiar de DM, uso de unidade básica de saúde, histórico de tabagismo. Em relação à HAS as associações foram: menos de oito anos de estudo, sobrepeso e obesidade. **Conclusões:** Na população estudada houve elevada prevalência de duas das principais DCNT — HAS e DM — que apresentaram fatores associados de extrema relevância para o planejamento de estratégias de promoção da saúde e prevenção de doenças.

Palavras-chave: Hipertensão; Diabetes mellitus; Doenças não transmissíveis; Epidemiologia.

Resumen

Introducción: Las enfermedades crónicas no transmisibles (ENT), incluidas la diabetes (DM) y la hipertensión arterial sistémica (HSA), son responsables de la mayoría de las muertes a nivel mundial en la actualidad, siendo la identificación de los factores asociados una herramienta fundamental para su prevención y estrategias para promover la salud. **Objetivo:** Determinar la prevalencia de HAS y DM en la población adulta atendida por Projeto Vozes das Ruas (PVR) en Jundiaí (SP) y factores asociados. **Métodos:** Se realizó un estudio cuantitativo transversal de marzo a noviembre de 2019. La muestra estuvo conformada por 580 participantes y los datos fueron analizados y correlacionados con variables sociodemográficas, antecedentes clínicos y familiares, conducta de salud, uso de medicamentos, alimentación y actividad física. Se realizó un análisis descriptivo y para verificar la asociación de los resultados de DM y HAS con variables independientes se utilizó Chi-cuadrado y regresión logística multivariante para las variables con p<0,20, adoptando una significancia del 5%. **Resultados:** La muestra estuvo constituida por 50% de mujeres y una edad media de 48,56 años. La prevalencia autonotificada de DM fue del 16,2% y de HSA del 30,2%, con relación entre ellas. Los factores asociados comunes fueron: grupo de edad mayor de 39 años y uso de medicación continua. Asociados a la DM estaban: antecedentes familiares de DM, uso de SBU, antecedentes de tabaquismo. Con relación a la HAS las asociaciones fueron: menos de ocho años de estudio, sobrepeso y obesidad, tabaquismo. **Conclusiones:** En la población estudiada, hubo una alta prevalencia de dos de las principales ENT, HAS y DM, que presentaron factores de riesgo de extrema relevancia para la planificación de estrategias de promoción de la salud y prevención de enfermedades.

Palabras-clave: Hipertensión; Diabetes mellitus; Enfermedades no transmisibles; Epidemiología.

INTRODUCTION

A large part of morbidity and mortality in Brazil is due to chronic noncommunicable diseases (NCDs), especially cardiovascular diseases, diabetes mellitus (DM), cancer, and chronic respiratory diseases.[1] These diseases were responsible for 70 and 63% of deaths in Brazil and worldwide in the last decade.[2,3] In middle- and low-income countries, almost 28 million deaths from these causes occur in people under 70 years of age.[3,4]

Among the NCDs, systemic arterial hypertension (SAH) is one of the main conditions for care in Family Health Strategy (FHS)[5] and is widely associated with increased cardiovascular risk, where its prevention and treatment is of utmost importance.[3] DM is another NCD with considerable morbidity and mortality rates, being associated with several chronic complications, such as cardiovascular diseases, retinopathy and diabetic nephropathy.[6]

Therefore, the FHS, through comprehensive and intersectoral measures that address the associated factors, is important in promoting health and improving quality of life.[7] In the current scenario, alcohol abuse,

inadequate diet and sedentary lifestyle are the main factors associated with NCDs,[1] as well as obesity, which has been increasing in recent years and is an aggravating factor in combating these conditions.[3]

To change these patterns, it is necessary to emphasize early preventive strategies, formulated on the basis of data and studies that relate the main determinants of health and disease,[1] enabling the union between clinical work and health promotion.[7] Thus, epidemiology works as a support for public health, as it identifies the main needs related to the population and provides improvements in the functioning of the Unified Health System (SUS).[8]

In addition to the mortality due to NCDs, it is also necessary to consider the high costs for the health system. People with these diseases use services twice as often when compared to those who do not have them[3] and the FHS is a key tool to reduce, for example, hospitalizations for causes sensitive to Primary Health Care.[9]

Thus, the objective of this study was to identify the prevalence of NCDs and factors associated with SAH and DM in the population served by the Projeto Vozes das Ruas (PVR; "Voice from the Streets Project").

METHODS

Outline

A cross-sectional quantitative study was carried out with an adult population of Jundiaí (SP, Brazil) that received health care assistance through PVR. This is an extension project of the Jundiaí School of Medicine (FMJ), which since 2010 has been working in the community with non-profit social actions aimed at promoting the population's quality of life. In it, medical students from the 1st to the 6th year serve the population of Jundiaí and the region through health efforts that take place in schools and other public places such as squares and parks and consist in filling out a questionnaire, carrying out anthropometric measurements, measuring blood pressure (BP), capillary blood glucose and general guidelines, promoting health education, disease prevention, lifestyle changes and encouraging healthy habits.

The study was conducted using the following inclusion criteria:

1. Persons 18 years or older;
2. PVR participating volunteers.

Exclusion criteria:

1. Persons who did not sign an informed consent form;
2. Participants who answered less than half of the questionnaire.

Location

The study was conducted in Jundiaí, a city located in the interior of the state of São Paulo, with a population of 423,006 inhabitants,[10] of which 354,204 live in urban areas and 15,922 in rural areas. The municipality has an area of 431.2 km^2 and a human development index of 0.834.[10] The population service and data collection were carried out in municipal and state schools in the neighborhoods São Camilo, Almerinda Chaves and Vila Marlene and public squares and public buildings with activities

aimed at the population, namely: City Park, Argos Educational and Cultural Complex, Marechal Floriano Peixoto Square.

Collection of data

Data were collected from March to November 2019, through a specific questionnaire, applied in the form of an interview by FMJ students from 1st to 6th year, PVR volunteers, who received training given by professors from the Public Health and Internal Medicine departments of the FMJ. The questionnaire was applied at different stages in the organization of the PVR extension project.

There was an initial approach to the volunteer explaining about the project and the activities offered, moving on to the collection of sociodemographic data (see sociodemographic characterization). Subsequently, the physical examination was performed: measurement of capillary blood glucose, using a disposable lancet, procedure gloves, cotton, AccuChek Active glucose meter; and BP measurement, following the technique of the 7th Brazilian Guidelines on Arterial Hypertension, of the Brazilian Society of Cardiology,[11] using a properly calibrated stethoscope and sphygmomanometer. The volunteer's weight, height and waist circumference were also determined in the physical examination. After these procedures, there was an interview about clinical and family history, health behavior, medication use, diet and physical activity, as described below.

According to the information collected and in view of the health problems and determinants, the members of the PVR responsible for the final questioning guided the participants about possible changes in lifestyle, with a dialogue aimed at biopsychosocial well-being, the promotion of health and disease prevention.

Study variables

The questionnaire was designed according to the theoretical conceptual model adapted for the study (Figure 1),[12,13] which considers the socioeconomic context, demographic characteristics, health history, habits and clinical condition described below.

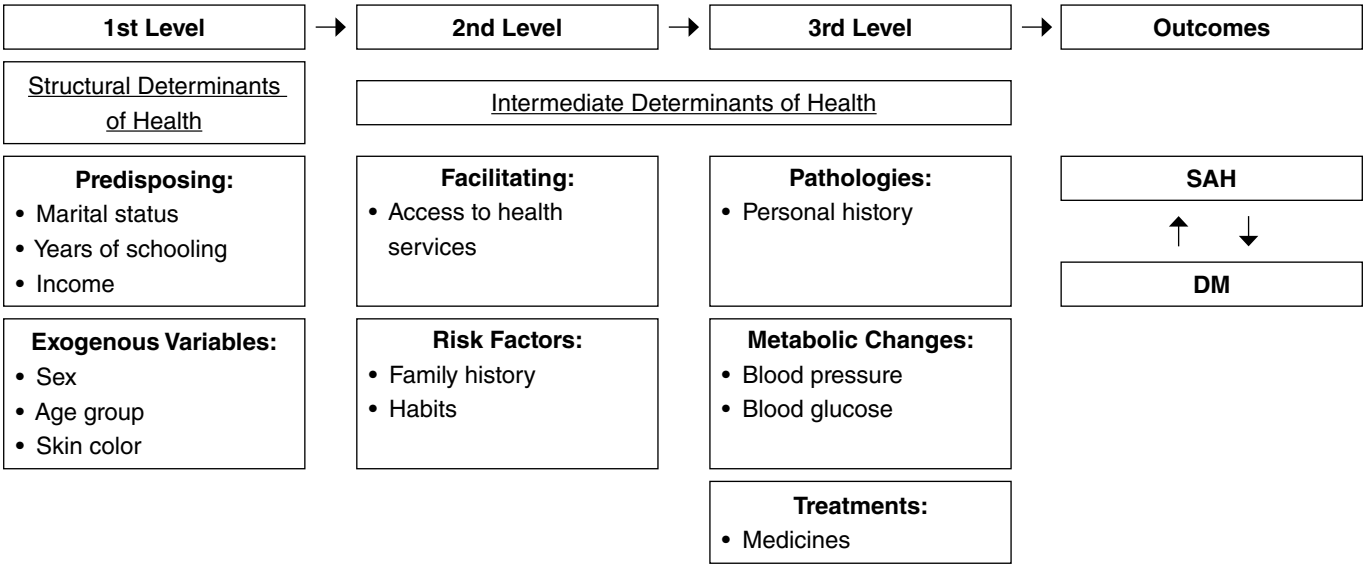

Figure 1. Conceptual theoretical model used n the study, Jundiaí (SP), 2020.

Sociodemographic characterization: age group (between 18 and 39 years old; between 40 and 59, 60 or older), sex (female and male), educational level (up to eight years of study and nine or more years of study), color (white and non-white), marital status (with and without a partner), family income (up to R$1,995.99, between R$ 1,996.00 and R$ 3,991.99 and R$ 3,992.00 or more), type of health service (exclusive to SUS and private insurance) and whether they use the basic health unit (UBS) in the neighborhood (yes or no).

Physical examination: weight, height, body mass index (BMI, calculated by weight divided by height squared, the normal range being between 18.5 and 24.9 in adults and between 22.0 and 26.9 in the elderly).[14]

Capillary blood glucose: blood glucose and time of the last food intake.

Blood pressure: systolic pressure, diastolic pressure.

Self-reported medical history: DM, SAH, stroke, acute myocardial infarction or others.

Family history in 1st degree relatives: DM, SAH, hypercholesterolemia, obesity or others.

Health behavior: smoking (active, ex-smoker, never smoked), alcohol consumption, number of times a week.

Continuous-use medications: yes or no — hypoglycemic drugs, antihypertensives, acetylsalicylic acid (ASA), statins, diuretics. In addition, the number of times a day the drug is used was determined.

Food: number of meals per day (up to two, three or more).

Physical activity: number of times a week physical activity is practiced (none, one to two, three or more), and if practiced, which activity (walking, competitive sport, gymnastics, weight training, dance or other) and number of times a week, or if not, the reason.

Ethics aspects

The study was approved by the Research Ethics Committee (Certificate of Presentation for Ethical Assessment — CAAE:15933519.0.0000.5412), No. 3,634,854. The entire research was carried out in accordance with ethical standards, and the confidentiality of all information was guaranteed to maintain the privacy of the participants.

Analysis of data

The data collected by the questionnaires were tabulated via Microsoft Excel by double typing. Statistical analysis was performed using the Statistical Package for Social Sciences software (IBM SPSS Statistics 23, IBM Corporation, Armonk, New York, USA). Descriptive and exploratory analyses were performed on the variables, with calculation of relative frequencies, mean, median, standard deviation and confidence interval. After the descriptive analyses, the independent variables related to the outcome were selected on the basis of the conceptual theoretical model adopted for the study, categorized and dichotomized for comparison with the dependent variables: SAH and DM (NCD).

Bivariate analyses were performed using the χ^2 test or Fisher's exact test. Univariate logistic regression was used, and variables with $p<0.20$ were entered for multivariate logistic regression analysis. The measure of association in the present study was the prevalence ratio (PR), since this was a cross-sectional study. The confidence interval (CI) adopted was 95% and the Hosmer and Lemeshow test was used to verify the adherence of the models.

RESULTS

Characterization of sample

Information was collected from 580 people helped by the PVR in the city of Jundiaí, with an average age of 48.56 years. In the present study, 10.6% of patients had DM and SAH (n=56).

Regarding the clinical data collected from the population during the PVR activities, the mean weight was 74.70 kg, the mean height was 1.67 m and the mean BMI was 26.77 kg/m^2, and 55.5% of the sample were overweight (BMI>24.9). Mean capillary blood glucose was 107.38 mg/dL. Mean systolic BP was 123.27 mmHg and mean diastolic pressure was 79.35 mmHg.

Evaluating the self-reported personal history of the participants cared for in the project, in addition to those already presented in Table 1, 2.4% (n=9) declared that they had a cerebrovascular accident (CVA) and 3.2% (n= 12) said that they had already suffered an acute myocardial infarction (AMI). Regarding family history, 51.0% (n=271) of people reported having family members with DM, 62.4% (n=332) family members diagnosed with SAH and 18.1% (n=96) family members with obesity.

Table 1. Characterization of persons served by Vozes das Ruas Project in Jundiaí, São Paulo.

Characteristics of sample	Absolute frequency	Relative frequency (%)
Demographics		
Sex		
Male	289	50.0
Female	289	50.0
Skin color		
While	338	59.3
Non-white	232	40.7
Age group		
Between 18 and 39 years	166	28.6
Between 40 and 59 years	266	45.9
60 years or older	148	25.5
Socioeconomic		
Marital status		
With partner	333	58.9
Without partner	232	41.1
Years of schooling		
Up to 8 years	213	37.2
9 or more years	359	62.8
Income		
Up to R$ 1,995.99	204	37.6
Between R$ 1,996.00 and R$ 3,991.99	168	30.9
R$ 3,992.00 or more	171	31.5
Facilitators		
Access		
Exclusive SUS	315	55.1
Private insurance	257	44.9

Continue...

Table 1. Continuation.

Characteristics of sample	Absolute frequency	Relative frequency (%)
UBS		
Yes	361	63.1
No	211	36.9
Outcomes		
SAH		
Yes	160	30.2
No	370	69.8
DM		
Yes	86	16.2
No	444	83.8

SUS: United Health System; UBS: basic health unit; SAH: systemic arterial hypertension; DM: diabetes mellitus.

Regarding the use of medications, 59.2% (n=325) of the participants reported being on some continuous-use medications, of which 18.3% (n=71) said they used hypoglycemic agents, 6.7% (n=26) diuretics, 37.2% (n=144) antihypertensives and 6.2% (n=24) ASA.

Analyzing the habits of the population served by the project, 11.5% (n=65) of the people were smokers and 25.7% (n=145) ex-smokers and 56.6% (320) never smoked. Regarding alcohol consumption, 43.6% (n=248) of the population used it, and 8.8% (n=19) drank daily. Of all people, 61.9% (n=354) reported performing physical activities, with 17.7% (n=96) having daily practice. Among those active, the modality most performed was walking, and 38.1% (n=218) of the sample reported being sedentary and not practicing any type of physical exercise. Among sedentary people, the main reasons that prevented them from exercising were lack of time by 41.6% (n=67) and lack of interest by 37.3% (n=60).

Diabetes mellitus

The associations between DM and exogenous characteristics, predisposing health factors, family history, facilitating variables, habits, personal history, continuous-use medications and BMI can be seen in Tables 2 and 3. Hosmer and Lemeshow test: p=0.935.

Table 2. Univariate analysis of diabetes mellitus and study variables.

Variable	Parameters	DM		PR (95%CI)	p-value
		Yes % (n)	No % (n)		
Sex	Female	47.1 (40)	51.0 (226)	1.00	0.504
	Male	52.9 (45)	49.0 (217)	1.17 (0.74–1.86)	
Skin color	White	65.5 (55)	58.9 (257)	1.32 (0.81–2.15)	0.263
	Non-white	34.5 (29)	41.1 (179)	1.00	
Age group	18–39	3.5 (3)	32.0 (142)	1.00	
	40–59	46.5 (40)	46.2 (205)	**9.23 (2.80–30.44)**	**0.000***
	60 or older	50.0 (43)	21.8 (97)	**20.98 (6.32–69.56)**	**0.000***

Continue...

Table 2. Continuation.

Variable	Parameters	DM		PR (95%CI)	p-value
		Yes % (n)	No % (n)		
Marital status	With partner	63.1 (53)	57.9 (245)	1.29 (0.80–2.10)	0.289
	Without partner	36.9 (31)	43.2 (186)	1.00	
Years of schooling	Up to 8	56.0 (47)	35.3 (155)	**2.33 (1.45–3.74)**	**0.000***
	9 or more	44.0 (37)	64.7 (284)	1.00	
Income (R$)	Up to 1,995.99	38.8 (31)	38.0 (158)	1.00	
	1,996.00–3,991.99	35.0 (28)	30.0 (125)	1.14 (0.65–2.00)	0.644
	3,992.00 or more	26.3 (21)	32.0 (133)	0.80 (0.44–1.46)	0.478
Family history					
DM	Yes	72.6 (61)	44.3 (194)	**3.34 (1.99–5.58)**	**0.000***
	No	27.4 (23)	55.7 (244)	1.00	
SAH	Yes	69.0 (58)	57.3 (251)	**1.66 (1.01–2.74)**	**0.046***
	No	31.0 (26)	42.7 (187)	1.00	
Hypercholesterolemia	Yes	32.1 (27)	25.9 (113)	1.36 (0.82–2.25)	0.235
	No	67.9 (57)	74.1 (324)	1.00	
Obesity	Yes	19.0 (16)	16.2 (71)	1.21 (0.66–2.21)	0.529
	No	81.0 (68)	83.8 (366)	1.00	
Access	Exclusive SUS	62.4 (53)	54.3 (238)	1.39 (0.86–2.24)	0.175
	Private insurance	37.6 (32)	45.7 (200)	1.00	
UBS	Yes	82.1(69)	59.6 (261)	**3.12 (1.73–5.63)**	**0.000***
	No	17.9 (15)	40.4 (177)	1.00	
PA[a] weekly	Never	43.8 (35)	40.7 (169)	1.00	
	1 to 2 times	13.8 (11)	16.4 (68)	0.78 (0.37–1.62)	0.509
	3 or more times	42.5 (34)	42.9 (178)	0.92 (0.55–1.54)	0.759
Smoking	Active	6.0 (5)	14.3 (58)	0.55 (0.21–1.47)	0.239
	Ex-smoker	47.0 (39)	23.6 (96)	**2.62 (1.59–4.34)**	**0.000***
	Never smoked	47.0 (39)	62.1 (252)	1.00	
Meals per day	Up to 2	15.5 (13)	20.8 (91)	1.00	0.267
	3 or more	84.5 (71)	79.2 (347)	1.43 (0.76–2.70)	
Personal history					
AMI	Yes	5.8 (5)	1.6 (7)	**3.85 (1.19–12.44)**	**0.031***
	No	94.2 (81)	98.4 (437)	1.00	
SAH	Yes	65.1 (56)	23.4 (104)	**6.10 (3.72–10.01)**	**0.000***
	No	34.9 (30)	76.6 (340)	1.00	
CVA	Yes	2.3 (2)	1.6 (7)	1.49 (0.30–7.28)	0.644
	No	97.7 (84)	98.4 (437)	1.00	
Medications					
Denied all	Yes	7.1 (6)	44.7 (192)	**0.09 (0.04–0.22)**	**0.000***
	No	92.9 (79)	55.3 (238)	1.00	
Statin	Yes	21.2 (18)	6.5 (28)	**3.85 (2.02–7.36)**	**0.000***
	No	78.8 (67)	93.5 (402)	1.00	
ASA	Yes	10.6 (9)	3.5 (15)	**3.28 (1.38–7.76)**	**0.007***
	No	89.4 (76)	96.5 (415)	1.00	
Overweight or obesity	Yes	66.3 (57)	52.4 (231)	**1.78 (1.10–2.90)**	**0.018***
	No	33.7 (29)	47.6 (210)	1.00	

DM: diabetes mellitus; PR: prevalence ratio; CI: confidence interval; SAH: systemic arterial hypertension; UBS: basic health unit; PA[a]: physical activity; AMI: acute myocardial infarction; CVA: cerebrovascular accident; ASA: acetylsalicylic acid. *chi-square test $p<0.05$; numbers in bold represent significant variables.

Table 3. Univariate and multivariate analysis by logistic regression of diabetes *mellitus* and study variables.

Variable	Parameters	Univariate analysis		Multivariate analysis	
		Crude PR	p-valor	Adjusted PR	p-value
Age group	18–39	1.00		1.00	
	40–59	**9.23 (2.80–30.44)**	**0.000***	**16.43 (2.10–127.89)**	**0.008***
	60 or older	**20.98 (6.32–69.56)**	**0.000***	**14.11 (1.74–114.24)**	**0.013***
Years of schooling	Up to 8	**2.33 (1.45–3.74)**	**0.000***	1.54 (0.74–3.20)	0.249
	9 or more	1.00		1.00	
Family history					
DM	Yes	**3.34 (1.99–5.58)**	**0.000***	**5.00 (2.53–9.88)**	**0.000***
	No	1.00			
SAH	Yes	**1.66 (1.01–2.74)**	**0.046***	0.73 (0.37–1.44)	0.361
	No	1.00			
UBS	Yes	**3.12 (1.73–5.63)**	**0.000***	**2.38 (1.03–5.54)**	**0.043***
	No	1.00			
Smoking	Active	0.55 (0.21–1.47)	0.239	0.89 (0.28 – 2.79)	0.843
	Ex-smoker	**2.62 (1.59–4.34)**	**0.000***	**3.56 (1.78–7.12)**	**0.000***
	Never smoked	1.00		1.00	
AMI	Yes	**3.85 (1.19–12.44)**	**0.031***	1.14 (0.26–4.97)	0.863
	No	1.00		1.00	
SAH	Yes	**6.10 (3.72–10.01)**	**0.000***	**2.40 (1.19–4.83)**	**0.014***
	No	1.00		1.00	
Continuous-use medications					
Denied all	Yes	**0.09 (0.04–0.22)**	**0.000***	**0.17 (0.06–0.49)**	**0.001***
	No	1.00		1.00	
Statin	Yes	**3.85 (2.02–7.36)**	**0.000***	2.25 (0.98–5.18)	0.057
	No	1.00		1.00	
ASA	Yes	**3.28 (1.38–7.76)**	**0.007***	1.02 (0.35–2.94)	0.972
	No	1.00		1.00	
Overweight or obesity	Yes	**1.78 (1.10–2.90)**	**0.018***	1.40 (0.71–2.75)	0.332
	No	1.00		1.00	

PR: prevalence ratio; DM: diabetes mellitus; SAH: systemic arterial hypertension; UBS: basic health unit; AMI: acute myocardial infarction; ASA: acetylsalicylic acid. *chi-square test p<0.05; numbers in bold represent significant variables.

Systemic arterial hypertension

The associations of univariate and multivariate analyses between SAH and exogenous characteristics, predisposing health factors and family history, facilitating variables, habits, personal history, continuous-use medications and BMI can be seen in Tables 4 and 5. Hosmer and Lemeshow test:

DISCUSSION

Among NCDs, DM and SAH are conditions that have been growing in Brazil and worldwide. In the late 1980s, the prevalence of DM was 7.6% in the adult population,[15] reaching 15% in the city of Ribeirão Preto in 2010[16] and 20% in other Brazilian regions.[3] These data are similar to those found in the present study, where the prevalence was 16.2%.

Table 4. Univariate analysis of systemic arterial hypertension and study variables.

Variable	Parameters	SAH		PR (95%CI)	p-value
		Yes % (n)	No % (n)		
Sex	Female	49.4 (79)	50.8 (187)	1.00	0.761
	Male	50.6 (81)	49.2 (181)	1.05 (0.73–1.53)	
Skin color	White	61.8 (97)	59.2 (215)	1.11 (0.75–1.63)	0.585
	Non-white	38.2 (60)	40.8 (148)	1.00	
Age group	18–39	8.1 (13)	35.7 (132)	1.00	
	40–59	42.5 (68)	47.8 (177)	**3.90 (2.06–7.36)**	**0.000***
	60 or older	49.4 (79)	16.5 (61)	**13.15 (6.79–25.45)**	**0.000***
Marital status	With partner	57.9 (88)	57.9 (210)	1.00 (0.68 – 1.47)	0.993
	Without partner	42.1 (64)	42.1 (153)	1.00	
Years of schooling	Up to 8	58.0 (91)	30.3 (111)	**3.16 (2.15–4.66)**	**0.000***
	9 or more	42.0 (66)	69.7 (255)	1.00	
Income (R$)	Up to 1.995,99	45.1 (69)	35.0 (120)	**1.88 (1.17–3.03)**	**0.009***
	1,996.00–3,991.99	31.4 (48)	30.6 (105)	1.49 (0.90–2.48)	0.0117
	3,992.00 or more	23.5 (36)	34.4 (118)	1.00	
Family history					
DM	Yes	50.3 (79)	48.2 (176)	1.08 (0.74–1.58)	0.660
	No	49.7 (78)	51.8 (189)	1.00	
SAH	Yes	70.7 (111)	54.2 (198)	**2.03 (1.36–3.03)**	**0.000***
	No	29.3 (46)	45.8 (167)	1.00	
Hypercholesterolemia	Yes	25.5 (40)	27.5 (100)	0.90 (0.58–1.38)	0.637
	No	74.5 (117)	72.5 (264)	1.00	
Obesity	Yes	15.9 (25)	17 (62)	0.92 (0.55–1.53)	0.755
	No	84.1 (132)	83.0 (302)	1.00	
Access	SUS	65.0 (102)	51.6 (189)	**1.73 (1.18–2.55)**	**0.005***
	Private insurance	35.0 (55)	48.4 (177)	1.00	
UBS	Yes	77.2 (122)	57.1 (208)	**2.54 (1.66–3.89)**	**0.000***
	No	22.8 (36)	42.9 (156)	1.00	
PA[a] weekly	Never	44.4 (64)	39.9 (140)	1.00	
	1 to 2 times	13.2 (19)	17.1 (60)	0.69 (0.38–1.25)	0.473
	3 or more times	42.4 (61)	43 (151)	0.88 (0.58–1.34)	
Smoking	Active	5.7 (9)	14.8 (54)	**0.36 (0.17–0.77)**	**0.008***
	Ex-smoker	32.4 (48)	25.5 (87)	**0.30 (0.14–0.66)**	**0.003***
	Never smoked	61.5 (91)	58.7 (200)	1.00	
Meals per day	Up to 2	19.5 (31)	20.1 (73)	1.00	
	3 or more	80.5 (128)	79.9 (290)	1.03 (0.65–1.66)	0.872
Personal history					
AMI	Yes	5.0 (8)	1.1 (4)	**4.81 (1.42–16.23)**	**0.009***
	No	95.0 (152)	98.9 (366)	1.00	
DM	Yes	35.0 (56)	8.1 (30)	**6.10 (3.72–10.01)**	**0.000***
	No	65.0 (104)	91.9 (340)	1.00	
CVA	Yes	3.8 (6)	0.8 (3)	**4.76 (1.17–19.30)**	**0.025***
	No	96.3 (154)	99.2 (367)	1.00	

Continue...

Table 4. Continuation.

Variable	Parameters	SAH		PR (95%CI)	p-value
		Yes % (n)	No % (n)		
Continuous-use medications					
Denied all	Yes	6.3 (10)	53.0 (188)	**0.05 (0.03–0.11)**	**0.000***
	No	93.8 (150)	47.0 (167)	1.00	
Statin	Yes	15.0 (24)	6.2 (22)	**2.67 (1.44–4.92)**	**0.001***
	No	85.0 (136)	93.8 (333)	1.00	
ASA	Yes	7.5 (12)	3.4 (12)	**2.31 (1.01–5.27)**	**0.040***
	No	92.5 (148)	96.6 (343)	1.00	
Overweight or obesity	Yes	70.4 (112)	47.8 (176)	**2.60 (1.74–3.87)**	**0.000***
	No	29.6 (47)	52.2 (192)	1.00	

SAH: systemic arterial hypertension; PR: prevalence ratio; DM: diabetes mellitus; SUS: United Health System; UBS: basic health unit; PA[a]: physical activity; AMI: acute myocardial infarction; CVA: cerebrovascular accident; ASA: acetylsalicylic acid. * chi-square p<0,05; numbers in bold represent significant variables.

Table 5. Univariate and multivariate analysis by logistic regression of systemic arterial hypertension and study variables.

Variable	Parameters	Univariate analysis		Multivariate analysis	
		Crude PR	p-value	Adjusted PR	p-value
Age group	18–39	1.00		1.00	
	40–59	**3.90 (2.06–7.36)**	**0.000***	**2.64 (1.06–6.55)**	**0,036***
	60 or older	**13.15 (6.79–25.45)**	**0.000***	**7.83 (2.89–21.25)**	**0,000***
Years of schooling	Up to 8	**3.16 (2.15–4.66)**	**0.000***	**2.23 (1.14–4.37)**	**0,020***
	9 or more	1.00			
Income (R$)	Up to 1.995,99	**1.88 (1.17–3.03)**	**0.009**	0.84 (0.35–1.99)	0,690
	1,996.00–3,991.99	**1.49 (0.90–2.48)**	0.117	1.17 (0.54–2.55)	
	3,992.00 or more	1.00		1.00	
Family history					
SAH	Yes	**2.03 (1.36–3.03)**	**0.000***	1.55 (0.85–2.81)	0,149
	No	1.00			
Access	SUS	**1.73 (1.18–2.55)**	**0.005***	1.03 (0.49–2.20)	0,932
	Private insurance	1.00		1.00	
UBS	Yes	**2.54 (1.66–3.89)**	**0.000***	1.95 (0.96–3.95)	0,063
	No	1.00		1.00	
Smoking	Active	**0.36 (0.17–0.77)**	**0.008***	**0.31 (0.11–0.79)**	**0,015***
	Ex-smoker	**0.30 (0.14–0.66)**	**0.003***	**0.44 (0.22–0.88)**	**0,021***
	Never smoked	1.00			
Personal history					
AMI	Yes	**4.81 (1.42 – 16.23)**	**0.009***	1.40 (0.30–6.55)	0,672
	No	1.00			
DM	Yes	**6.10 (3.72 – 10.01)**	**0.000***	**2.13 (1.05–4.31)**	**0,036***
	No	1.00			
CVA	Yes	**4.76 (1.17 – 19.30)**	**0.025***	5.22 (0.75–47.43)	0,142
	No	1.00			

Continue...

Table 5. Continuation.

Variable	Parameters	Univariate analysis		Multivariate analysis	
		Crude PR	p-value	Adjusted PR	p-value
Continuous-use medications					
Denied all	Yes	**0.05 (0.03–0.11)**		**0.07 (0.03–0.17)**	**0,000***
	No	1.00	**0.000***		
Statin	Yes	**2.67 (1.44–4.92)**		0.92 (0.37–2.29)	0,859
	No	1.00	**0.001***	1	
ASA	Yes	**2.31 (1.01–5.27)**		0.44 (0.14–1.40)	0,164
	No	1.00	**0.040***	1	
Overweight or obesity	Yes	**2.60 (1.74–3.87)**		**2.57 (1.41–4.70)**	**0,002***
	No	1.00	**0.000***		

PR: prevalence ratio; SAH: systemic arterial hypertension; SUS: United Health System; UBS: basic health unit; AMI: acute myocardial infarction; DM: diabetes mellitus; CVA: cerebrovascular accident; ASA: acetylsalicylic. *chi-square test p<0,05; numbers in bold represent significant variables.

The prevalence of SAH in Brazil reaches 32.5% in adults and more than 60% in the elderly.[17] Regarding our study population, 30.2% reported having hypertension and, in the population over 60 years old, 49.4% were hypertensive.

Considering the impact that DM and SAH have, the present study evaluated the main factors related to these pathologies in the population served by the PVR. There were common associated factors for the two diseases: age and continuous-use medications. In addition, overweight and education were associated with hypertension, and for diabetes, being an ex-smoker and seeking care at a UBS. The identification of these factors makes it possible to define strategies for health promotion and prevention of SAH, DM and their complications. The importance of working on health promotion strategies in the approach of common risk for these conditions is highlighted, as they share the same associated factors.

Regarding the age group, there was an increase in the prevalence of DM in people between 40 and 59 years old (adjusted PR - PRa=16.43; 95%CI 2.10–127.89) and over 60 years old (PRa=14.11; 95%CI 1.74–114.21). Likewise, there was an association between SAH and the age group between 40 and 59 years (PRa=2.64; 95%CI 1.06–6.55) and over 60 years (PRa=7.83; 95%CI 2.89 –21.25). These data corroborate both the Brazilian and international literature.[11,18,19]

An association between DM and SAH was also observed, a fact already described in the literature.[20] Insulin resistance, which marks type 2 DM promotes endothelial changes caused by the formation of glycated products, reduction of nitric oxide and hyperinsulinemia, which have a trophic effect on vascular muscles, increasing peripheral vascular resistance.[21] In addition, factors such as advanced age and lifestyle may contribute to the genesis of both pathologies.[19]

The denial of continuous use of medications was inversely associated with SAH (PRa=0.05; 95%CI 0.03–0.11) and DM (PRa=0.17; 95%CI 0.06–0.49), possibly associated with the lack of diagnosis of other pathologies due to lack of access or information. Another factor was the association of SAH and DM with older age in populations with more polypharmacy.[22]

Family history is a determining factor in seeking an early diagnosis of diabetes, as individuals with a family history of the disease in a first-degree relative have two to three times greater risk of developing

it.[23,24] This result agrees with the present study (PRa= 5.00; 95%CI 2.53–9.88), and the risk in those with a maternal and paternal history of DM is even greater.[23,24]

Also, in relation to diabetic individuals, there was an association with the use of UBS (PRa=2.38; 95%CI 1.03–-5.54), which may be related to the better self-care of these patients and the early diagnosis of asymptomatic patients, corroborating the need for medical follow-up, health monitoring and longitudinality of primary health care.[16]

Keeping in mind the influence of self-care in relation to the development and evolution of diseases, it is important to emphasize the role of habits such as smoking. Although active smoking has a high association with type 2 DM[25-28] because of the mechanisms of increased insulin resistance[29,30] and increased visceral fat,[31] we found here an association between being an ex-smoker and a higher prevalence of diabetes (PRa=2.40; 95%CI 1.19–4.83). This result may be a consequence of individuals having stopped smoking and increasing their adipose tissue, contributing to the occurrence of the disease[31;32]. Smoking cessation is beneficial,[32] especially since diabetes is related to several other comorbidities. This was demonstrated by the study by Rzewuska et al.,[33] who stated that among individuals with diabetes, 26.6% reported another comorbidity, 23.2% had two other morbidities and 32.0% had three or more associated comorbidities.

In the analysis between SAH and associated factors, both active smoking (PRa=0.31; 95%CI 0.11–0.79) and previous smoking (PRa=0.44; 95%CI 0.22–0.88) had an inverse association with hypertension, which is in disagreement with the literature.[17,34-36] This finding can be explained by a possible tendency of change in the behavior of individuals after receiving a diagnosis of SAH or DM, who may be more likely to quit smoking, causing the prevalence of smoking to fall among diabetics and hypertensive patients. However, future studies are needed to confirm this hypothesis.

Another important point was the association between years of schooling and SAH (PRa=2.23; 95%CI 1.14–4.37). In addition to confirming the important role of health determinants, the level of education has an impact on understanding health information and access to it, essential aspects for the effectiveness of health promotion and disease prevention programs.[37]

Obesity and overweight were associated with SAH (PRa=2.57; 95%CI 1.41–4.70), which may be related to neurohormonal mechanisms associated with obesity, such as activation of the sympathetic autonomic system, retention of sodium, activation of the renin-angiotensin-aldosterone system, leptin resistance, and a lifestyle with inadequate nutrition and a sedentary lifestyle.[19,38,39]

To reduce public health costs and improve the quality of care, studies related to NCDs and their associated factors are needed, enabling the formulation of projects in the area of health with scientific basis.[40]

The results of the present work must be considered, with the exception of their various limitations:

1. The sample represents a convenience selection, addressing a specific population of people served by a voluntary project, and therefore, the results cannot be extrapolated;
2. The data were obtained in a cross-sectional manner, which prevents a causal relation;
3. The information was collected through self-reporting and may have a measurement error due to memory bias.

However, the study analyzed DM and SAH, conditions prevalent in the population, on the basis of a conceptual theoretical model, considering confounding factors that may interfere with outcomes. The results may help the control and combat of these conditions in the scope of primary health care. Future studies should improve the sample design, considering longitudinal approaches, and

investigate interactions that allow expanding knowledge of confounding factors that can interfere with the outcomes studied.

CONCLUSION

In the population studied, there was a high prevalence of two of the main NCDs, SAH and DM. Common associated factors for these two diseases were age over 39 years and continuous-use medications, and they were associated with each other. Having a family history of DM, being a former smoker and going to the UBS for care were factors associated with the development of DM. Fewer years of schooling and being overweight/obese reflected a higher prevalence of SAH. The present study provides extremely relevant data for the planning of health promotion and disease prevention strategies through the identification of associated factors..

ACKNOWLEDGMENTS

We thank all the volunteers and participants of the Vozes das Ruas Project.

CONFLICT OF INTERESTS

None to declare.

AUTHORS' CONTRIBUTIONS

LCP: conceptualization, investigation, formal analysis, writing – first draft, writing – review and editing. LGM: conceptualization, investigation, writing – first draft, writing – review and editing. JPBS: conceptualization, investigation, writing – first draft, writing – review and editing. NAV: conceptualization, investigation, writing – first draft, writing – review and editing. RAJ: conceptualization, investigation, writing – first draft, writing – review and editing. APB: conceptualization, investigation, writing – first draft, writing – review and editing, supervision. MJB: conceptualization, investigation, formal analysis, writing – first draft, writing – review and editing, supervision, validation.

REFERENCES

1. 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(Supl):126-34. https://doi.org/10.1590/S0034-89102012000700017
2. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Análise de Situação de Saúde. Plano de ações estratégicas para o enfrentamento das doenças crônicas não transmissíveis (DCNT) no Brasil 2011-2022. Brasília: Ministério da Saúde; 2011. Disponível em: https://bvsms.saude.gov.br/bvs/publicacoes/plano_acoes_enfrent_dcnt_2011.pdf
3. Schmidt MI, Duncan BB, Azevedo e Silva G, Menezes AM, Monteiro CA, Barreto SM, et al. Chronic non-communicable diseases in Brazil: burden and current challenges. Lancet. 2011;377(9781):1949-61. https://doi.org/10.1016/S0140-6736(11)60135-9
4. Malta DC, Bernal RTI, Lima MG, Araújo SSC, Silva MMA, Freitas MIF, et al. Noncommunicable diseases and the use of health services: analysis of the National Health Survey in Brazil. Rev Saúde Pública. 2017;51(suppl 1):4s. https://doi.org/10.1590/S1518-8787.2017051000090
5. Pimentel ÍRS, Coelho BC, Lima JC, Ribeiro FG, Sampaio FPC, Pinheiro RP, et al. Caracterização da demanda em uma Unidade de Saúde da Família. Rev Bras Med Fam Comunidade 2011;6(20):175-81. https://doi.org/10.5712/rbmfc6(20)95
6. Sociedade Brasileira de Diabetes. Diretrizes da Sociedade Brasileira de Diabetes –2017/2018. São Paulo: Editora Clannad; 2017.

7. Informes Técnicos Institucionais. Programa Saúde da Família. Rev Saúde Pública 2000;34(3):316-9. https://doi.org/10.1590/S0034-89102000000300018
8. A epidemiologia nas políticas, programas e serviços de saúde. Rev Bras Epidemiol 2005;8(supl 1):28-39. https://doi.org/10.1590/S1415-790X2005000500004
9. Pereira HNS, Santos RIO, Uehara SCSA. Efeito da Estratégia Saúde da Família na redução de internações por doenças crônicas não transmissíveis. Revista Enfermagem UERJ 2020;28:e49931. https://doi.org/10.12957/reuerj.2020.49931
10. Instituto Brasileiro de Geografia e Estatística. Cidades: dados básicos de 2010 [Internet]; 2010. Disponível em: http//www.ibge.gov.br/cidadesat/painel/painel.php?codmun=410840
11. Malachias MVB, Gomes MAM, Nobre F, Alessi A, Feitosa AD, Coelho EB. Diagnóstico e classificação. In: 7ª Diretriz Brasileira de Hipertensão Arterial. Arq Bras Cardiol 2016;107(3 Suppl 3):7-13. https://doi.org/10.5935/abc.20160152
12. Solar O, Irwin A. A conceptual framework for action on the social determinants of health. Geneva: World Health Organization; 2010. Disponível em: https://www.who.int/sdhconference/resources/ConceptualframeworkforactiononSDH_eng.pdf
13. Kumar S, Preetha GS. Health promotion: an effective tool for global health. Indian J Community Med 2012;37(1):5-12. https://doi.org/10.4103/0970-0218.94009
14. Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Orientaçãoes para a coleta e análise de dados antropométricos em serviços de saúde: Norma Técnica de Vigilância Alimentar e Nutricional - SISVAN. Brasília: Ministério da Saúde; 2011. Disponível em: https://bvsms.saude.gov.br/bvs/publicacoes/orientacoes_coleta_analise_dados_antropometricos.pdf
15. Malerbi DA, Franco LJ. Multicenter study of the prevalence of diabetes mellitus and impaired glucose tolerance in the urban Brazilian population aged 30-69 yr. The Brazilian Cooperative Group on the Study of Diabetes Prevalence. Diabetes Care 1992;15(11):1509-16. https://doi.org/10.2337/diacare.15.11.1509
16. Moraes SA, Freitas ICM, Gimeno SGA, Mondini L. Prevalência de diabetes mellitus e identificação de fatores associados em adultos residentes em área urbana de Ribeirão Preto, São Paulo, Brasil, 2006: Projeto OBEDIARP. Cad Saúde Pública 2010;26(5):929-41. https://doi.org/10.1590/s0102-311x2010000500015
17. Pronk NP, Peek CJ, Goldstein MG. Addressing multiple behavioral risk factors in primary care. A synthesis of current knowledge and stakeholder dialogue sessions. Am J Prev Med 2004;27(2 Suppl):4-17. https://doi.org/10.1016/j.amepre.2004.04.024
18. Barreto SM, Passos VMA, Firmo JOA, Guerra HL, Vidigal PG, Lima-Costa MFF. Hypertension and clustering of cardiovascular risk factors in a community in Southeast Brazil: the Bambuí health and ageing study. Arq Bras Cardiol 2001;77(6):576-81. https://doi.org/10.1590/s0066-782x2001001200008
19. Magalhães LBNC, Amorim AM, Rezende EP. Conceito e aspectos epidemiológicos da hipertensão arterial. Rev Bras Hipertens 2018;25(1):6-12.
20. Fletcher B, Gulanick M, Lamendola C. Risk factors for type 2 diabetes mellitus. J Cardiovasc Nurs 2002;16(2):17-23. https://doi.org/10.1097/00005082-200201000-00003
21. Wajchenberg BL. Disfunção endotelial no diabetes do tipo 2 diabetes mellitus. Arq Bras Endocrinol Metab 2002;46(5):514-9. https://doi.org/10.1590/S0004-27302002000500004
22. Ramos LR, Tavares NUL, Bertoldi AD, Farias MR, Oliveira MA, Luiza VL, et al. Polypharmacy and polymorbidity in older adults in Brazil: a public health challenge. Rev Saúde Pública 2016;50(suppl 2):9s. https://doi.org/10.1590/s1518-8787.2016050006145
23. Scott RA, Langenberg C, Sharp SJ, Franks PW, Rolandsson O, Drogan D, et al. The link between family history and risk of type 2 diabetes is not explained by anthropometric, lifestyle or genetic risk factors: the EPIC-InterAct study. Diabetologia 2013;56(1):60-9. https://doi.org/10.1007/s00125-012-2715-x
24. Meigs JB, Cupples LA, Wilson PW. Parental transmission of type 2 diabetes: the Framingham Offspring Study. Diabetes 2000;49(12):2201-7. https://doi.org/10.2337/diabetes.49.12.2201
25. Meisinger C, Döring A, Thorand B, Löwel H. Association of cigarette smoking and tar and nicotine intake with development of type 2 diabetes mellitus in men and women from the general population: the MONICA/KORA Augsburg Cohort Study. Diabetologia 2006;49(8):1770-6. https://doi.org/10.1007/s00125-006-0298-0
26. Uchimoto S, Tsumura K, Hayashi T, Suematsu C, Endo G, Fujii S, et al. Impact of cigarette smoking on the incidence of type 2 diabetes mellitus in middle-aged Japanese men: the Osaka Health Survey. Diabet Med 1999;16(11):951-5. https://doi.org/10.1046/j.1464-5491.1999.00173.x
27. Manson JE, Ajani UA, Liu S, Nathan DM, Hennekens CH. A prospective study of cigarette smoking and the incidence of diabetes mellitus among US male physicians. Am J Med 2000;109(7):538-42. https://doi.org/10.1016/s0002-9343(00)00568-4
28. Willi C, Bodenmann P, Ghali WA, Faris PD, Cornuz J. Active smoking and the risk of type 2 diabetes: a systematic review and meta-analysis. JAMA 2007;298(22):2654-64. https://doi.org/10.1001/jama.298.22.2654
29. Houston TK, Person SD, Pletcher MJ, Liu K, Iribarren C, Kiefe CI. Active and passive smoking and development of glucose intolerance among young adults in a prospective cohort: CARDIA study. BMJ 2006;332(7549):1064-9. https://doi.org/10.1136/bmj.38779.584028.55
30. Frati AC, Iniestra F, Ariza CR. Acute effect of cigarette smoking on glucose tolerance and other cardiovascular risk factors. Diabetes Care 1996;19(2):112-8. https://doi.org/10.2337/diacare.19.2.112
31. Chiolero A, Faeh D, Paccaud F, Cornuz J. Consequences of smoking for body weight, body fat distribution, and insulin resistance. Am J Clin Nutr 2008;87(4):801-9. https://doi.org/10.1093/ajcn/87.4.801

32. Hu Y, Zong G, Liu G, Wang M, Rosner B, Pan A, et al. Smoking cessation, weight change, type 2 diabetes, and mortality. N Engl J Med 2018;379(7):623-32. https://doi.org/10.1056/NEJMoa1803626
33. Rzewuska M, Azevedo-Marques JM, Coxon D, Zanetti ML, Zanetti AC, Franco LJ, et al. Epidemiology of multimorbidity within the Brazilian adult general population: evidence from the 2013 National Health Survey (PNS 2013). PLoS One 2017;12(2):e0171813. https://doi.org/10.1371/journal.pone.0171813
34. Fine LJ, Philogene GS, Gramling R, Coups EJ, Sinha S. Prevalence of multiple chronic disease risk factors. 2001 National Health Interview Survey. Am J Prev Med 2004;27(2 Suppl):18-24. https://doi.org/10.1016/j.amepre.2004.04.017
35. de Sousa MG. Tabagismo e hipertensão arterial: como o tabaco eleva a pressão. Rev Bras Hipertens 2015;22(3):78-83.
36. Jacondino CB, Schwanke CHA, Closs VE, Gomes I, Borges CA, Gottlieb MGV. Associação do tabagismo com biomarcadores REDOX e fatores de risco cardiometabólicos em idosos. Cad Saúde Colet 2019;27(1):45-52. https://doi.org/10.1590/1414-462X201900010279
37. Medina MG, Aquino R, Vilasbôas ALQ, Mota E, Pinto Júnior EP, Luz LA, et al. Promoção da saúde e prevenção de doenças crônicas: o que fazem as equipes de Saúde da Família? Saúde Debate 2014;38(spe):69-82. https://doi.org/10.5935/0103-1104.2014S006
38. Rahmouni K, Correia MLG, Haynes WG, Mark AL. Obesity-associated hypertension: new insights into mechanisms. Hypertension 2005;45(1):9-14. https://doi.org/10.1161/01.HYP.0000151325.83008.b4
39. Jiang SZ, Lu W, Zong XF, Ruan HY, Liu Y. Obesity and hypertension. Exp Ther Med 2016;12(4):2395-9. https://doi.org/10.3892/etm.2016.3667
40. Baumgartel C, Onofrei M, Grillo LP, Lacerda LLV, Mezadri T. Fatores de risco e proteção de doenças crônicas em adultos: estudo de base populacional em uma cidade de médio porte no sul do Brasil. Rev Bras Med Fam Comunidade 2017;11(38):1-13. https://doi.org/10.5712/rbmfc11(38)1248