







# Healthy lifestyle and recommendations in health care among hypertensive and diabetic patients in Brazil, 2019

## *Adoção dos comportamentos saudáveis e recomendações recebidas nos atendimentos de saúde entre hipertensos e diabéticos no Brasil, 2019*

Célia Landmann Szwarcwald<sup>I</sup> , Paulo Roberto Borges de Souza Júnior<sup>I</sup> ,  
Giseli Nogueira Damacena<sup>I</sup> , Sheila Rizzato Stopa<sup>II</sup> , Marilisa Berti de Azevedo Barros<sup>III</sup> ,  
Deborah Carvalho Malta<sup>IV</sup> 

**ABSTRACT:** *Objective:* To estimate prevalence of healthy behaviors among individuals aged 30 years or more, diagnosed with arterial hypertension and diabetes mellitus, using information from the National Health Survey, 2019. *Methods:* Cross-sectional study with cluster sampling and simple random sampling in three stages. Individuals were aggregated according the following conditions: having arterial hypertension; arterial hypertension only; diabetes mellitus; diabetes mellitus only; arterial hypertension and diabetes mellitus only; without chronic non-communicable diseases. Poisson regression models and crude and adjusted prevalence ratios for sex, age group, and schooling were used. The proportion of recommendations received by patients with arterial hypertension and diabetes mellitus was estimated by type of care (public/private). *Results:* A total of 69,285 individuals aged 30 years or more was analyzed. Compared to individuals without non-communicable diseases, prevalence of consumption of fruits and vegetables  $\geq 5$  days a week was significantly higher among individuals with arterial hypertension (39.9% - 95%CI 38.8–41.0) and those with diabetes mellitus (42.8% - 95%CI 40.7–44.9). However, estimates of not having consumed ultra-processed food were low, 19.7% (95%CI 18.9–20.6) and 21.9% (95%CI 20.3–23.5), respectively. Prevalence of not smoking reached values close to 90% and significant prevalence ratios, whereas the practice of physical activity had levels below 30% and non-significant prevalence ratios. The proportion of healthy eating recommendations reached 90%, but it was close to 70% for not smoking. *Conclusions:* It is necessary to encourage the practice of healthy lifestyles and provide information about the benefits of physical activity and the harmful effects of unhealthy eating for well-being and aging with quality.

**Keywords:** Healthy lifestyle. Health promotion. Health Care. Longevity. Quality of life. Brazil.

<sup>I</sup>Instituto de Comunicação e Informação Científica e Tecnológica em Saúde, Fundação Oswaldo Cruz – Rio de Janeiro (RJ), Brazil.

<sup>II</sup>Department of Health Analysis and Surveillance of Non-Communicable Diseases, Secretariat of Health Surveillance, Ministry of Health – Brasília (DF), Brazil.

<sup>III</sup>Public Health Department, School of Medical Sciences, Universidade Estadual de Campinas – Campinas (SP), Brazil.

<sup>IV</sup>Maternal Child Nursing and Public Health Department, Nursing School, Universidade Federal de Minas Gerais – Belo Horizonte (MG), Brazil.

**Corresponding author:** Célia Landmann Szwarcwald. Avenida Brasil, 4365, Manguinhos, CEP: 21040-360, Rio de Janeiro (RJ), Brasil. E-mail: celia\_ls@hotmail.com

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**RESUMO:** *Objetivo:* Estimar as prevalências dos comportamentos saudáveis entre os indivíduos de 30 anos ou mais com diagnóstico de hipertensão arterial e diabetes *mellitus* utilizando as informações da Pesquisa Nacional de Saúde, 2019. *Métodos:* Estudo corte-transversal com amostragem por conglomerados e amostra aleatória simples nos três estágios. Os indivíduos foram agregados segundo as seguintes condições: ter hipertensão arterial; ter apenas hipertensão arterial; ter diabetes *mellitus*; ter apenas diabetes *mellitus*; ter apenas hipertensão arterial e diabetes *mellitus*; não ter doença crônica não transmissível. Foram utilizados modelos de regressão de Poisson e razões de prevalências brutas e ajustadas por sexo, grupo de idade e grau de escolaridade. As proporções de recomendações recebidas entre os hipertensos e diabéticos foram estimadas por tipo de atendimento (público/privado). *Resultados:* Foram analisados 69.285 indivíduos com 30 anos ou mais. Comparados aos indivíduos sem doença crônica não transmissível, as prevalências de consumo de frutas e hortaliças  $\geq 5$  dias na semana foram significativamente maiores entre os hipertensos, 39,9% (intervalo de confiança — IC95% 38,8–41,0) e diabéticos, 42,8% (IC95% 40,7–44,9). Contudo, as de não ter consumido alimento ultraprocessado foram baixas, 19,7% (IC95% 18,9–20,6) e 21,9% (IC95% 20,3–23,5), respectivamente. As prevalências de não fumar alcançaram valores próximos a 90% e razões de prevalência significativas, enquanto a prática de atividade física teve níveis inferiores a 30% e razões de prevalências não significativas. As proporções de recomendações recebidas para alimentação saudável alcançaram 90%, mas foram próximas a 70% para não fumar. *Conclusões:* É preciso estimular a prática dos estilos de vida saudáveis e prover informações sobre os benefícios da atividade física e os efeitos nocivos da alimentação não saudável para o bem-estar e o envelhecimento com qualidade.

*Palavras-chave:* Comportamentos saudáveis. Promoção da saúde. Área de atendimento em saúde; longevidade. Qualidade de vida. Brasil.

## INTRODUCTION

Demographic transition is one of the most important social trends of the XXI century<sup>1</sup>. Many of the changes in global demographic patterns are a result of historical processes of social and economic development, of improvements in environmental conditions and public health, besides advances in medicine and the creation of new intervention technologies. The progress has contributed with a strong reduction of the fertility rate, the remarkable reduction in childhood mortality and increased life expectancy<sup>2</sup>. However, while the population ages, chronic health issues increase and cause limitations in routine activities, functional incapacities and loss in quality of life<sup>3,4</sup>.

In this context, the identification of factors that influence the quality of life during the aging process has become an essential matter. As part of the sustainable development goals, most public health actions have been focusing on the promotion of health, stimulating healthy behaviors and reducing risk factors<sup>5</sup>. The efforts have been addressed to the promotion of practicing physical activities and healthy eating habits, the prevention and control of smoking and alcohol abuse<sup>6</sup>.

Studies from several countries have shown the importance of adopting healthy lifestyles, throughout life, aiming at a healthy aging process<sup>7-9</sup>. Studies in France<sup>10</sup> and in the United

States<sup>11</sup> showed that the adoption of healthy behaviors can increase healthy life expectancy considerably.

Another line of research has analyzed the impact of lifestyle among patients with chronic diseases<sup>12,13</sup>. The results showed not only the beneficial intervention of healthy behaviors<sup>14</sup>, but also the harmful effects of unhealthy habits, such as physical inactivity, inappropriate diet, excess weight, smoking and alcohol abuse on the worsening and the sequelae of the diseases<sup>15</sup>.

The increased longevity of the Brazilian population<sup>16</sup> has led to the growth of chronic non-communicable diseases (NCDs), responsible for more than 70% of premature deaths and for a substantial part of the total disease load among the elderly<sup>17,18</sup>. Several initiatives have been developed by the National Program of Health Promotion, implemented in articulation with primary health care<sup>19,20</sup>. Recommendations in health care centers involve the promotion of physical activities, prevention and control of smoking, prevention of alcohol abuse, adoption of healthy eating habits and maintenance of adequate weight<sup>20</sup>.

Results of a telephone survey in Brazilian capitals showed considerable advances in several healthy behaviors, from 2006 to 2019<sup>21</sup>. In comparison to other countries in the world, Brazil stood out for the low prevalence of tobacco consumption (16.5%), in 2018, much lower than the median estimation of 22.0%. On the other hand, the prevalence of insufficient physical activity (47.0%) is one of the highest in the world and corresponds to the percentage of 97% in the set of countries. As to the prevalence rates of arterial hypertension (AH) and diabetes mellitus (DM), standardized by age and estimated for 2015, the estimates in Brazil pointed out to 23.3 and 8.3%, respectively, which are slightly lower than the average prevalence rates of the total of countries<sup>22</sup>.

Using the data from the National Health Survey, 2019 (Pesquisa Nacional de Saúde-PNS, 2019), this study aimed at comparing the prevalence rates of healthy behaviors between individuals aged 30 years or more diagnosed with AH and DM and those who do not have NCD, and to investigate the proportion of hypertensive and diabetic individuals who received recommendations from health care centers for the adoption of healthy behaviors.

## METHODS

### STUDY DESIGN

In this study, the source of information was the National Health Survey (PNS - 2019). This is a cross-sectional study carried out by the Ministry of Health, in partnership with the Brazilian Institute of Geography and Statistics (IBGE), in 2019. It included visits to 108,525 permanent private households, and 94,114 interviews were carried out. The non-response rates were, respectively, 8.1 and 6.4%<sup>23</sup>.

PNS-2019 was approved by the National Commission of Ethics in Research (CONEP) in August, 2019 (process n. 3.529.376).

## SAMPLE

The PNS sample constitutes a subsample of the master sample of Integrated Household Survey System (SIPD), in IBGE. A cluster sampling was used in three selection stages (census tracts or composition of tracts, households, individuals), with stratification of primary sample units (UPA). In all stages, the selection of sampling units was performed by simple random sample<sup>23,24</sup>.

## STUDY VARIABLES

In this study, we used the information from the individual survey, answered by one selected resident of the household.

Given the small prevalence rates of AH (2.8%) and DM (0.6%) among individuals aged 30 years or less, which, in general, are diabetes type I, in this study we considered individuals aged 30 years or more.

To calculate prevalence of diagnosis of at least one NCD, the following diseases were considered: AH, DM, heart disease, stroke, asthma, arthritis, chronic back pain, work-related musculoskeletal disorder (WMSD), depression, another mental illness, lung disease, cancer and chronic kidney failure.

To investigate the influence of comorbidities in the adoption of healthy behaviors, individuals were aggregated according to the diagnosis of: AH; only AH and no other NCD; DM; only DM and no other NCD; only AH and DM.

As to healthy behaviors, the following habits were considered: practice of physical activity during leisure time at the recommended level (150 minutes or more of moderate physical activities or 75 minutes or more of vigorous physical activities a week)<sup>25</sup>; not drinking heavily, defined as the consumption of eight or more doses of alcohol a week for women, and 15 or more doses for men<sup>26</sup>; not smoking tobacco products currently; being a former smoker of tobacco products.

Regarding dietary habits, based on the questionnaire about food intake on weekdays present in both PNS editions, we considered the regular intake of fruits and vegetables ( $\geq 5$  days a week), indicator that was validated by Monteiro et al.<sup>27</sup>. Based on the questionnaire about food intake on the day previous to the survey, introduced in PNS-2019, the following indicators were considered: did not consume ultra-processed foods; did not consume any sweets; and did not drink soft drinks. As to the maintenance of adequate weight, weight measurement in the month previous to the survey was the considered indicator. Regarding the intake of salt, the perception of adequate/low consumption was considered.

The following sociodemographic characteristics were observed: sex, age group (30–49, 50–59, 60–69, 70 or more) and schooling (no schooling/incomplete elementary school; complete elementary school/incomplete high school; complete high school/incomplete higher education; complete higher education).

## DATA ANALYSIS

The prevalence rates of healthy behaviors and the respective 95% confidence intervals were estimated among those who reported a diagnosis of AH and only AH. Poisson regression models were used to compare the prevalence rates of healthy behaviors among individuals who reported AH and only AH with the ones found among individuals who did not refer any NCD. Crude prevalence ratios (PR) and those adjusted by sex, age group and schooling were calculated. The PR tests were used to detect differences in the prevalence ratios at a 5% significance level. The same procedures were used for individuals who reported DM and only DM, and those who reported only AH and DM.

To verify the recommendations made to individuals diagnosed with AH and DM, who received medical care for these reasons, the following topics were analyzed, respectively: “In any of the appointments due to hypertension (diabetes), has any physician or another health professional given you any of these recommendations”? Among individuals diagnosed with AH, the recommendations related to healthy behaviors were: keeping a healthy diet; maintaining adequate weight; consuming less salt; practicing regular physical activities; not smoking; not drinking excessively. Among diabetic individuals, the same recommendations were considered, however, excluding the item “consuming less salt” and including “reducing the intake of pasta and bread”. The proportions of recommendations received among hypertensive and diabetic individuals and the respective confidence intervals were estimated by type of service, public (in the Unified Health System – SUS) or private (not SUS).

In the statistical analysis, the PNS sample design was considered by observing the sampling weights and the cluster effect. The Software for Statistics and Data Science (StataCorp LP, CollegeStation, Texas, United States), version 14.0, survey mode, was used.

## RESULTS

We analyzed 69,285 individuals aged 30 years or more. Of these, 20,720 (29.9%) referred a medical diagnosis of AH, and 8,257 (11.9%) referred only AH; 6,746 (9.7%) reported a diagnosis of DM, and 1,215 (1.8%), only DM. Regarding AH and DM, 4,362 (6.3%) reported a diagnosis of both diseases, and 1,555 (2.2%), only the two diseases.

Table 1 shows the prevalence rates of healthy behaviors among individuals aged 30 years or more diagnosed with AH, only AH, diabetes, only diabetes, and no NCD. The highest prevalence rates occurred for not drinking heavily, ranging from 92.3% (95%CI 91.9–92.8)

Table 1. Prevalence rates (%) of the adoption of healthy behaviors and respective confidence intervals among individuals aged 30 years or more with self-reported diagnosis of arterial hypertension, only arterial hypertension, diabetes mellitus, only diabetes mellitus, and those with no self-reported diagnosis of chronic non-communicable diseases (NCD). Brazil, 2019.

Behaviors	AH		Only AH		DM		Only DM		No NCD	
	%	95%CI	%	95%CI	%	95%CI	%	95%CI	%	95%CI
Consumption of fruits and vegetables $\geq 5$ weekdays	39.9	38.8–41.0	37.7	35.9–39.5	42.8	40.7–44.9	44.3	3.9–48.8	32.6	31.7–33.6
Did not consume ultra-processed foods *	19.7	18.9–20.6	19.7	18.2–21.4	21.9	20.3–23.5	21.6	18.4–25.1	15.5	14.8–16.2
Did not consume sweets*	57.1	55.9–58.3	56.3	54.4–58.2	61.5	59.5–63.5	61.5	57.1–65.7	53.6	52.5–54.7
Did not drink soft drinks*	75.3	74.2–76.3	72.9	71.2–74.6	76.4	74.4–78.4	76.6	72.2–80.5	66.9	65.9–67.8
Adequate/low perception of salt consumption	41.3	40.0–42.5	38.3	36.5–40.2	41.0	39.0–43.0	28.5	24.9–32.3	22.8	22.1–23.6
Weight verification for at least 1 month	56.9	55.8–58.0	56.9	54.9–58.8	58.6	56.6–60.6	60.2	55.8–64.5	58.5	57.4–59.6
Practice of physical activity**	22.6	21.5–23.6	26.9	25.2–28.7	20.2	18.6–21.9	23.8	20.3–27.7	31.1	30.1–32.1
Not drinking heavily***	94.8	94.3–95.3	93.4	92.5–94.2	96.7	95.9–97.3	96.1	94.3–97.4	92.3	91.8–92.8
Currently not smoking tobacco products	89.0	88.3–89.8	88.8	87.3–90.1	89.6	88.2–90.9	88.4	85.0–91.1	86.7	86.0–87.4
Former smokers of tobacco products	37.1	35.9–38.3	30.5	28.9–32.2	39.4	37.4–41.4	30.8	27.0–34.9	22.6	21.8–23.5

\*On the day prior to the study; \*\*At the recommended level: for 150 minutes in moderate physical activities or 75 minutes in vigorous physical activities; \*\*\*15 doses or more of alcohol among men and 8 doses or more among women per week. CI: confidence intervals; AH: arterial hypertension; DM: diabetes mellitus; NCD: chronic non-communicable disease.

among individuals who were not diagnosed with NCD, to 96.7% (95%CI 95.9–97.3) among those with DM, and for not smoking, ranging from 86.7% (95%CI 86,0–87,4) to 89.6% (95%CI 88.2–90,9) in the same groups, respectively.

The lowest prevalence rates corresponded to the practice of physical activity at the recommended level, with minimum value of 20.2% (95%CI 18.6–21.9) among diabetic individuals, and maximum value of 31.1% (95%CI 30.1–32.1) among those with no NCD. As to dietary habits, the highest prevalence rates were found for not having drunk soft drinks on the day prior to the study, which reached 76.6% (95%CI 72.2–80.5) among those with only DM, whereas the lowest prevalence rates corresponded to not having consumed ultra-processed foods, ranging from 15.5% (95%CI 14.8–16.2), among those with no NCD, to 21.9% (95%CI 20.3–23.5) of the total number of diabetic individuals. The prevalence of the intake of fruits and vegetables  $\geq 5$  days a week reached the maximum value of 44.3% (95%CI 39.9–48.8) among those with only DM.

The comparison of prevalence rates of healthy behaviors among hypertensive individuals and those with no NCD was presented in Table 2. The crude and adjusted PR were significant for the consumption of fruits and vegetables, not having drunk soft drinks and being a former smoker (for the total number of hypertensive individuals), perception of salt consumption in small/adequate amounts, and not smoking in both groups. Once the habit of measuring weight is more common among people with higher schooling, PR became significant and higher than 1 only after the control of sociodemographic variables.

Table 3 shows the PR of healthy behaviors among individuals aged 30 years or more diagnosed with diabetes (total and only diabetes) compared to those with no NCD. For the total of diabetic individuals, the PR of all habits was significantly higher than 1, before and after the control of sociodemographic factors, except for not consuming ultra-processed foods, not drinking soft drinks and the practice of physical activity at the recommended level. For individuals with DM only, the adjusted PR was significant for the intake of fruits and vegetables on five or more weekdays, for not drinking soft drinks and for not having the habit of heavy drinking. The perception of adequate/low salt consumption stood out, whose crude PR was much lower than that in the total of diabetic individuals and whose adjusted PR was not significant, showing the influence of comorbidities in the adoption of healthy habits.

The prevalence rates of healthy behaviors among individuals diagnosed only with AH and DM are presented in Table 4. Prevalence of the intake of fruits and vegetables  $\geq 5$  days on the week was statistically higher than that of individuals without NCD, but after the control of sociodemographic variables, PR was not significant (PR=1.07; 95%CI 0.96–1.19). The prevalence rates of not having consumed ultra-processed foods (23.9% - 95%CI 20.8–27.4) and not having drunk 78.5% (95%CI 74.9–81.8) were higher than the estimates of all the other groups. As to the comparison with individuals without NCD, crude and adjusted PRs were significant for not having consumed ultra-processed foods, sweets, soft drinks, for the perception of adequate salt consumption and for not currently smoking. For weight measurement in the past month, only the adjusted PR was statistically significant.

Table 2. Prevalence ratio of the adoption of healthy behaviors among individuals aged 30 years or more with self-reported diagnosis of arterial hypertension and only arterial hypertension in comparison to those with no self-reported diagnosis of chronic non-communicable disease (NCD). Brazil, 2019.

Behaviors	AH				Only AH			
	PR	95%CI	PR <sup>#</sup>	95%CI	PR	95%CI	PR <sup>*</sup>	95%CI
Consumption of fruits and vegetables $\geq 5$ weekdays	1.22 <sup>a</sup>	1.18–1.27	1.05 <sup>a</sup>	1.00–1.10	1.15 <sup>a</sup>	1.09–1.22	1.03	0.97–1.09
Did not consume ultra-processed foods *	1.27 <sup>a</sup>	1.20–1.35	1.01	0.95–1.44	1.27 <sup>a</sup>	1.16–1.40	1.05	0.95–1.17
Did not consume sweets*	1.08 <sup>a</sup>	1.04–1.11	1.00	0.96–1.04	1.06 <sup>a</sup>	1.01–1.10	0.98	0.93–1.03
Did not drink soft drinks*	1.25 <sup>a</sup>	1.22–1.29	1.06 <sup>a</sup>	1.01–1.12	1.18 <sup>a</sup>	1.12–1.24	1.05	0.98–1.12
Adequate/low perception of salt consumption	1.81 <sup>a</sup>	1.73–1.89	1.43 <sup>a</sup>	1.36–1.51	1.68 <sup>a</sup>	1.59–1.78	1.39 <sup>a</sup>	1.30–1.48
Weight verification for at least 1 month	0.97	0.95–1.00	1.11 <sup>a</sup>	1.08–1.14	0.97	0.94–1.01	1.08 <sup>a</sup>	1.04–1.12
Practice of physical activity**	0.73 <sup>a</sup>	0.69–0.76	0.95	0.90–1.01	0.87 <sup>a</sup>	0.81–0.93	1.04	0.97–1.12
Not drinking heavily***	1.33 <sup>a</sup>	1.24–1.41	0.87	0.70–1.02	1.14	1.01–1.26	0.83 <sup>a</sup>	0.64–1.00
Currently not smoking tobacco products	1.17 <sup>a</sup>	1.10–1.24	1.19 <sup>a</sup>	1.11–1.27	1.15 <sup>a</sup>	1.03–1.27	1.23 <sup>a</sup>	1.10–1.34
Former smokers of tobacco products	1.64 <sup>a</sup>	1.56–1.72	1.22 <sup>a</sup>	1.15–1.29	1.34 <sup>a</sup>	1.26–1.44	1.04	0.97–1.11

\*On the day prior to the study; \*\*For 150 minutes in moderate physical activities or 75 minutes in vigorous physical activities; \*\*\*15 doses or more of alcohol among men, and 8 doses or more among women a week; <sup>#</sup>PR adjusted by sex, age group and schooling; <sup>a</sup>Significant at 5%. CI: confidence intervals; AH: arterial hypertension; PR: prevalence ratio; DM: diabetes *mellitus*; NCD: chronic non-communicable disease.

Table 5 shows the proportions of recommendations in the past health appointment carried out less than three years before the interview with individuals who reported a medical diagnosis of AH or DM. As to the recommendations of healthy diet and maintenance of adequate weight, the proportions were higher than 80% among hypertensive individuals and 90% among diabetic individuals. As to the specific recommendations for each disease, the proportion of hypertensive individuals who were advised to consume less salt was



Table 3. Prevalence ratio of the adoption of healthy behaviors among individuals aged 30 years or more, with self-reported diagnosis of diabetes mellitus and only diabetes mellitus in comparison to those with no self-reported diagnosis of chronic non-communicable disease (NCD), 2019.

Behaviors	DM				Only DM			
	PR	95%CI	PR <sup>#</sup>	95%CI	PR	95%CI	PR <sup>*</sup>	95%CI
Consumption of fruits and vegetables ≥5 days a week	1.31 <sup>a</sup>	1.24–1.39	1.16 <sup>a</sup>	1.09–1.24	1.36 <sup>a</sup>	1.22–1.51	1.26 <sup>a</sup>	1.13–1.40
Did not consume ultra-processed foods <sup>*</sup>	1.41 <sup>a</sup>	1.30–1.53	1.08	0.99–1.19	1.39 <sup>a</sup>	1.18–1.63	1.15	0.97–1.35
Did not consume sweets <sup>*</sup>	1.17 <sup>a</sup>	1.12–1.22	1.09 <sup>a</sup>	1.03–1.14	1.17 <sup>a</sup>	1.07–1.26	1.10	0.99–1.20
Did not consume soft drinks <sup>*</sup>	1.29 <sup>a</sup>	1.23–1.35	1.09	1.00–1.17	1.30 <sup>a</sup>	1.16–1.41	1.19 <sup>a</sup>	1.04–1.33
Adequate/low perception of salt consumption	1.80 <sup>a</sup>	1.70–1.90	1.34 <sup>a</sup>	1.25–1.43	1.25 <sup>a</sup>	1.09–1.43	1.03	0.90–1.18
Weight verification for at least 1 month	1.00	0.97–1.04	1.19 <sup>a</sup>	1.14–1.24	1.03 <sup>a</sup>	0.96–1.11	1.15	1.07–1.24
Practice of physical activity at the recommended level <sup>**</sup>	0.65 <sup>a</sup>	0.60–0.71	0.92	0.84–1.01	0.77 <sup>a</sup>	0.66–0.89	0.94	0.80–1.10
Not drinking heavily <sup>***</sup>	1.57 <sup>a</sup>	1.47–1.65	1.26 <sup>a</sup>	1.06–1.41	1.50 <sup>a</sup>	1.25–1.67	1.34 <sup>a</sup>	1.00–1.56
Currently not smoking tobacco products	1.22 <sup>a</sup>	1.10–1.32	1.29 <sup>a</sup>	1.18–1.40	1.23 <sup>a</sup>	1.11–1.35	1.06	0.90–1.20
Former smokers of tobacco products	1.74 <sup>a</sup>	1.63–1.85	1.22 <sup>a</sup>	1.14–1.32	1.36 <sup>a</sup>	1.19–1.56	1.05	0.92–1.20

\*On the day prior to the study; \*\*For 150 minutes in moderate physical activities or 75 minutes in vigorous physical activities; \*\*\*15 doses or more of alcohol among men, and 8 doses or more among women per week; <sup>#</sup>PR adjusted by sex, age group and schooling; <sup>a</sup>Significant at 5%. CI: confidence interval; AH: arterial hypertension; PR: prevalence ratio; DM: diabetes *mellitus*; NCD: chronic non-communicable disease.

87.8%, and the proportion of diabetic individuals who were advised to avoid the intake of sugar and reduce the consumption of pasta among diabetic individuals was 98.8 and 88.8%, respectively. As to the recommendations of not smoking and not drinking heavily, the proportions had lower values, close to 70%. Generally, the proportions were a little lower in the services provided by SUS.

Table 4. Prevalence and prevalence ratio of the adoption of healthy behaviors among individuals aged 30 years or more with self-reported diagnosis of only arterial hypertension and diabetes mellitus in comparison to those with no self-reported diagnosis of chronic non-communicable disease. Brazil, 2019.

Behaviors	Prevalence (%)		Prevalence ratio			
	%	95%CI	RP	95%CI	RP*	95%CI
Consumption of fruits and vegetables $\geq 5$ days a week	39.2	35.3–43.3	1.20 <sup>a</sup>	1.08–1.33	1.07	0.96–1.19
Did not consume ultra-processed foods*	23.9	20.8–27.4	1.55 <sup>a</sup>	1.34–1.78	1.17 <sup>a</sup>	1.00–1.36
Did not consume sweets*	67.8	64.1–71.2	1.31 <sup>a</sup>	1.23–1.38	1.24 <sup>a</sup>	1.14–1.32
Did not consume soft drinks*	78.5	74.9–81.8	1.35 <sup>a</sup>	1.24–1.45	1.18 <sup>a</sup>	1.03–1.31
Adequate/low perception of salt consumption	43.5	39.5–47.6	1.92 <sup>a</sup>	1.74–2.11	1.40 <sup>a</sup>	1.26–1.56
Weight verification for at least 1 month	54.3	50.5–58.1	0.93	0.86–1.00	1.12 <sup>a</sup>	1.04–1.21
Practice of physical activity at the recommended level**	2.5	18.5–24.9	0.69 <sup>a</sup>	0.59–0.80	0.99	0.85–1.56
Not drinking heavily***	95.4	93.3–96.9	1.42 <sup>a</sup>	1.14–1.60	1.00	0.52–1.33
Currently not smoking tobacco products	89.1	86.0–91.7	1.18	1.20–1.37	1.31 <sup>a</sup>	1.09–1.48
Former smokers of tobacco products	34.0	30.4–37.7	1.50 <sup>a</sup>	1.34–1.68	1.02	0.90–1.14

\*On the day prior to the study; \*\*For 150 minutes in moderate physical activities or 75 minutes in vigorous physical activities; \*\*\*15 doses or more of alcohol among men and 8 doses or more among women per; #PR adjusted by sex, age group and schooling. <sup>a</sup>Significant at 5%. CI: confidence intervals; PR: prevalence ratio.

## DISCUSSION

This study used information from PNS-2019 to analyze the adoption of healthy behaviors by hypertensive and diabetic individuals in comparison to people aged 30 years or more without any diagnosis of NCD. The results showed, in general, more healthy behaviors among hypertensive and diabetic individuals, but there was no significant difference for the practice of regular physical activity. After the adjustment for sociodemographic factors, among hypertensive people, the differentials occurred for behaviors related to salt intake and smoke indicators; among diabetics, some dietary habits, such as the consumption of fruits and vegetables on five or more days of the week, and not having consumed sweets on the day prior to the study were also significant.

Considering the groups of individuals with only AH and only DM, we observed the influence of comorbidities on the adoption of healthy behaviors. For the total number of

Table 5. Prevalence (%) of recommendations about healthy behaviors in the past health appointment per type of service (Unified Health System / Not - Unified Health System) to hypertensive and diabetic individuals aged 30 years or more. Brazil, 2019.

Recommendations	Type of Service	Hypertensive		Diabetics	
		%	95%CI	%	95%CI
Healthy diet	SUS	85.6	84.4–86.8	93.9	92.6–95.0
	Not SUS	90.4	89.0–91.7	96.6	95.4–97.5
	Total	87.3	86.3–88.2	94.8	93.9–95.6
Keeping an adequate weight	SUS	82.5	81.2–83.7	91.3	89.9–92.5
	Not SUS	88.2	86.7–89.5	93.7	91.8–95.2
	Total	84.4	83.4–85.4	92.1	91.0–93.1
Consuming less salt	SUS	87.3	86.0–88.5	–	–
	Not SUS	88.8	87.0–90.4	–	–
	Total	87.8	86.8–88.8	–	–
Avoiding sugar	SUS	–	–	92.1	90.7–93.2
	Not SUS	–	–	94.3	92.6–95.7
	Total	–	–	92.8	91.7–93.8
Reducing the intake of pasta and bread	SUS	–	–	88.3	86.6–89.7
	Not SUS	–	–	89.7	87.4–91.7
	Total	–	–	88.8	87.4–90.0
Practicing physical activities	SUS	78.9	77.5–80.2	82.6	80.6–84.5
	Not SUS	86.8	85.2–88.2	89.1	86.5–91.3
	Total	81.6	80.6–82.6	84.8	83.2–86.3
Not smoking	SUS	66.1	64.3–67.7	70.6	68.0–73.1
	Not SUS	69.1	66.9–71.2	73.1	69.7–76.3
	Total	67.1	65.7–68.5	71.4	69.4–73.4
Not drinking heavily	SUS	64.9	63.2–66.6	69.8	67.2–72.2
	Not SUS	69.2	67.0–71.2	74.8	71.5–77.7
	Total	66.4	65.0–67.8	71.5	69.5–73.4
Regular follow-up with a health professional	SUS	84.0	82.7–85.2	76.8	74.8–78.7
	Not SUS	87.9	86.4–89.4	81.8	78.8–84.3
	Total	85.3	84.3–86.3	78.5	76.8–80.1

CI: confidence intervals; SUS: Unified Health System.

diabetics, the prevalence in the perception of adequate/low salt intake was significantly higher than that for individuals without NCD, which was not true for individuals who are diabetic and have no other NCD. Likewise, for the ones with only AH and DM, the adjusted PR of not consuming processed foods was statistically significant, unlike what was observed for individuals with only AH.

Similarly to the findings in a previous article that used information from PNS-2013<sup>28</sup>, the fact of having a diagnosis of AH or DM showed significant differences for the habit of smoking, the perception of low salt intake, for not having consumed soft drinks and sweets, but both for individuals with AH or those with DM there was no significantly higher adherence to the practice of physical activity. A national study also showed low prevalence of physical activity during leisure activities among the elderly with diabetes (32.4%), even though the practice of physical activity was associated with lower use of insulin<sup>29</sup>.

Physical activities at the recommended level were also little prevalent in the population aged 30 years or more, since less than one third had this habit. Thanks to the positive impact of physical activity on quality of life, this behavior should not be simply seen as a leisure activity, but instead, a necessary habit for the healthy body and minds<sup>30,31</sup>. On the other hand, the involvement of young adults and adolescents with the social media has increased the use of screens (cell phones, computers, tablets, television) and the number of sedentary hours<sup>32</sup>. Therefore, it is essential that the recommendations about the practice of physical activity be emphasized and address the health problems related to physical inactivity<sup>33</sup>.

The proportion of hypertensive and diabetic individuals who were advised to adopt healthy behaviors was high, both in health services at SUS and in the private sector. The proportions were, in general, higher than 80% and higher than those found in a similar study in the United States<sup>34</sup>. The improvement of healthy behaviors in the Brazilian population between 2013 and 2019 (available at <https://www.pns.icict.fiocruz.br/>) corroborates the results of previous studies that show that health promotion actions have been successful against NCDs<sup>35-36</sup>. However, orientations that only regard healthy behaviors may not be sufficient to promote concrete change in the adoption of healthy habits. The strategies transcend the health sector and require intersectoral interventions that include economic, social and cultural aspects<sup>19</sup>.

Findings that are similar to ours were found in a longitudinal study in China, with people aged 45 years or more, which showed that participants who referred a diagnosis of hypertension, high cholesterol or diabetes were less prone to smoking, but had higher chances of being physically inactive<sup>37</sup>. In Chile, an analysis of healthy behaviors in people aged from 18 to 65 years with three or more health problems (hypertension, diabetes, high triglycerides, high abdominal circumference or reduced HDL cholesterol) showed prevalence of current smokers of 39.3%, much higher than that found in Brazil; however, about 70% of the interviewees practiced physical activities (in all domains) at the recommended level<sup>38</sup>. In the United States, it was possible to observe poorer eating habits among people aged 45 year or more who had one or more health issues (arterial hypertension, diabetes, obesity

and hypercholesterolemia), with lower intake of fruits per day and higher consumption of ultra-processed foods, saturated fat and added sugars<sup>39</sup>.

In Brazil, between 2013 and 2019, there was progress in terms of healthy dietary habits<sup>28</sup>. The prevalence rates of the consumption of fruits and vegetables  $\geq 5$  days a week were significantly higher among hypertensive and diabetic individuals than among those without NCD, possibly due to the increasing awareness about the benefits of a healthy diet<sup>40</sup>. The prevalence rates of periodically verifying the weight also increased and reflect the important role of dietary and nutritional surveillance in primary care<sup>41</sup>. However, in 2019, the prevalence rates regarding the consumption of one or more ultra-processed foods on the day prior to the study were very high. In fact, studies have shown the increasing use of industrialized foods in the Brazilian diet, which can be chosen by cost, palatability, convenience and quick preparation<sup>42,43</sup>.

About smoking indicators, the prevalence rates were significantly higher among hypertensive and diabetic individuals, probably due to the recognition of the harmful effects of smoking by the Brazilian population<sup>44</sup>. However, in comparison to the results of 2013, the proportion of recommendations of not smoking was lower than in 2019, probably because these recommendations are mainly addressed to individuals who already smoke. Even though the reduction of smoking in Brazil has been successful<sup>45</sup>, the recommendations regarding the harmful consequences of smoking should not be neglected, even among those who do not currently smoke, especially due to the deceleration in the decreasing tendency of the prevalence of smoking after the beginning of the economic crisis<sup>46</sup>.

The limitations of this study concern the self-report of healthy habits and the diagnosis of NCDs, which are subjected to memory bias and access to diagnosis. Additionally, the self-report of a behavior can be influenced by what society desires after the recommendations about this habit. As to dietary habits, due to changes in the PNS-2019 survey, it was not possible to estimate the number of portions of fruits, greens and vegetables consumed per day. The list of items consumed on the day prior to the survey does not enable the calculation of the amount consumed for each food, but instead, only if a specific item was consumed or not. Regarding statistical inference, differences in the sample size of the groups may lead to the consideration of PR close to 1 as statistically significant, whereas in small samples high PR may not be statistically significant. Besides, the interpretation of results should be conducted considering the limitations of the cross-sectional design of the study.

The results presented here indicated that the adoption of healthy behaviors by hypertensive and diabetic individuals had considerable advances in 2013 and 2019, especially concerning the prevalence rates of former smokers, the lower intake of soft drinks and the increased consumption of fruits and vegetables. Even though insufficient, the practice of physical activities in leisure time also had progress. The findings showed that it is necessary to stimulate the practice of healthy lifestyles and promote information about the benefits of physical activity<sup>47</sup>, besides the harmful effects of unhealthy eating<sup>48</sup> in the different social population groups for the well-being and aging with quality.

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