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Association between health behaviors and depression: findings from the 2019 Brazilian National Health Survey

Associação entre comportamentos de saúde e depressão: resultados da Pesquisa Nacional de Saúde de 2019

Marilisa Berti de Azevedo Barros[I], Lhais de Paula Barbosa Medina[I], Margareth Guimarães Lima[I], Renata Cruz Soares de Azevedo[I], Neuciani Ferreira da Silva Sousa[II], Deborah Carvalho Malta[III]

ABSTRACT: ***Objective:*** To analyze the association of depression with various health behaviors and to verify if they differ according to gender or income. ***Methods:*** This is a cross-sectional study based on data of 65,803 Brazilian adults (18–59 years old) interviewed in the National Health Survey, conducted in 2019. Presence or absence of depression was evaluated using the Patient Health Questionnaire (PHQ)-9. The prevalence of smoking, alcohol consumption, physical activity, sedentary lifestyle and food indicators were estimated according to the presence of depression. Stratified analyses were made according to sex and income, and prevalence ratios were estimated using the Poisson Regression. ***Results:*** We found a significant association between depression and all indicators studied, except occasional alcohol consumption. Depression was associated with heavy episodic drinking and insufficient consumption of fruits and vegetables only in women. In men, the associations of depression with sedentary lifestyle and with being a former smoker were stronger than in women. The occasional consumption of alcohol was more prevalent only in men without depression. The analysis stratified by income showed that the association of depression with physical inactivity is stronger in the higher-income group, while with heavy episodic drinking is only significant in the lower-income stratum. ***Conclusion:*** The results point to the need to consider mental health in programs aimed at reducing harmful health behaviors and the specificity of sociodemographic groups.

Keywords: Depression. Health behavior. Tobacco use disorder. Alcohol drinking. Eating. Sedentary behavior.

[I]Universidade Estadual de Campinas – Campinas (SP), Brazil.
[II]Universidade Federal de Mato Grosso – Cuiabá (MT), Brazil.
[III]Universidade Federal de Minas Gerais – Belo Horizonte (MG), Brazil.
Corresponding author: Marilisa Berti de Azevedo Barros. Rua Tessália Vieira de Camargo, 126, Cidade Universitária Zeferino Vaz, CEP: 13083-894, Campinas (SP), Brazil. E-mail: marilisa@unicamp.br
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RESUMO: ***Objetivo:*** Analisar a associação da depressão com comportamentos de saúde e verificar se as associações diferem segundo sexo e renda. ***Métodos:*** Estudo transversal com dados de 65.803 adultos brasileiros (18–59 anos) da Pesquisa Nacional de Saúde realizada em 2019. A presença de depressão foi avaliada com o uso do *Patient Health Questionnaire-9* (PHQ-9). As prevalências de tabagismo, consumo de álcool, atividade física, sedentarismo e indicadores de alimentação foram estimadas segundo a presença de depressão. Foram desenvolvidas análises estratificadas por sexo e renda e estimadas as razões de prevalência com a regressão de Poisson. ***Resultados:*** Verificou-se associação significativa da depressão com todos os indicadores estudados, exceto com o consumo eventual de álcool. Apenas nas mulheres a depressão se mostrou associada com *heavy episodic drinking* e com o consumo insuficiente de frutas, legumes e verduras. Nos homens, as razões de prevalência das associações de depressão com sedentarismo e com ser ex-fumante foram mais elevadas de que nas mulheres e apenas nos homens o consumo eventual de álcool foi mais prevalente naqueles sem depressão. A análise estratificada segundo a renda mostrou que a associação da depressão com a inatividade física foi mais forte no segmento de renda superior e a associação com *heavy episodic drinking* só foi significativa no estrato de renda inferior. ***Conclusão:*** Os resultados apontam a necessidade de considerar a saúde mental nos programas que visam à redução de comportamentos nocivos à saúde e também de levar em conta as especificidades dessas associações nos diferentes estratos sociodemográficos.

Palavras-chave: Depressão. Comportamentos relacionados com a saúde. Tabagismo. Consumo de bebidas alcoólicas. Consumo de alimentos. Comportamento sedentário.

INTRODUCTION

The association of health-related behaviors with chronic diseases and early mortality is widely recognized[1,2], and an increase in social inequalities in mortality[3,4] and in health-related behaviors has been detected in recent decades[5,6]. These findings highlight the need to better understand the role of health behaviors in increasing inequalities in morbidity and mortality[7] and draws attention to the importance of the quality of the health programs implemented to prevent unhealthy behaviors.

In addition to the consistent association of lifestyle factors with the incidence of chronic non-communicable diseases (CNCDs), research has shown relations between health behaviors and mental disorders (MD). MDs are very prevalent worldwide[8] and, in Brazil, they account for 9.5% of the total disability-adjusted life years (DALYs), of which 35% are for depressive disorders, 28% for anxiety disorders and 7% for disorders resulting from alcohol use. MDs are the third leading cause of the burden of disease in Brazil[9]. The literature on the associations between health-related behaviors and mental health, a field that has been called *lifestyle psychiatry*, has shown that several psychiatric conditions, including schizophrenia, bipolar disorder, depression, anxiety and stress-related conditions, are associated with harmful health behaviors such as poor diet, low levels of physical activity, high rates of smoking and inadequate sleep patterns[10]. Studies have also shown that the associations differ according to specific behavior, social and cultural contexts, as well as sociodemographic segments analyzed[11,12].

The fight against CNCDs has led to the implementation of programs aimed at reducing unhealthy behaviors. The interventions in most countries have shown different results in terms of effectiveness and success[13]. Deeper knowledge about the associations of different health behaviors with mental disorders in each context is needed so that interventions can be more appropriate and effective.

From this perspective, the aim of this study was to analyze the association between depression and various health-related behaviors in the adult Brazilian population and to verify whether the associations differ according to sex and income.

METHODS

The study was developed with data from the National Health Survey (PNS) 2019, which interviewed a sample of the Brazilian population residing in private households throughout the country. The sampling process included three stages; in the first, the census tracts were drawn and, in the second, the households. In the third stage, one resident aged 15 years or more was drawn from each selected household. The questionnaire applied by the PNS is divided in three parts addressing characteristics of: (1) household, (2) all residents and (3) the selected resident. Details about the sampling process and methods of PNS 2019 are available in other publications[14].

In this study, data from 65,803 adults aged 18–59 years were analyzed. The presence of depression was assessed using the Patient Health Questionnaire-9 (PHQ-9), which measures the frequency of depressive symptoms in the two previous weeks[15]. The score for each question varied according to the frequency of symptoms, from zero (no day) to three (almost every day), which generates a maximum score of 27. The sum of items allows for grading between no depression (0–4), mild depression (5–9), moderate depression (10–14), moderately severe depression (15–19) and severe depression (20–27)[16]. Individuals with ten or more points were considered "with depression". This is the cutoff point that maximizes the PHQ-9 sensitivity and specificity[17].

Variables related to health behaviors included:

- smoking: current smoker (yes/no); former smoker (yes/no) and passive smokers at home (yes/no);
- alcohol consumption: usual frequency of once or more a month (yes/no); frequency of six times or more a week (yes/no) and heavy episodic drinking (HED), that is, five doses or more on a single occasion in the last 30 days (yes/no);
- leisure time physical activity (PA): individuals who performed at least 150 minutes per week of light or moderate PA or at least 75 minutes per week of vigorous PA were considered active; inactive were those who did not perform any PA. The insufficiently active were not considered in the analyses.
- sedentary lifestyle: individuals who watch television for six hours or more a day (yes/no);

- food: consumption of raw or cooked vegetables and fruits (FV) in less than five days a week (yes/no); consumption of soft drinks (excluding diet/zero) and consumption of sweets on five days or more a week (yes/no); practice of substituting lunch for quick snacks three or more days a week (yes/no);
- number of unhealthy behaviors: the behaviors listed above were considered, with the exception of drinking once or more a month and being a former smoker, and categorized into: 0–4 and 5 or more.
- demographic and social variables: gender, age, education (no education to incomplete higher education and complete higher education or more), per capita family income in minimum wages (MW) (<1 MW and 1 MW or more).

The Stata software version 15.0 was used in the analyses, and the sample and post-stratification weights were taken into account. The prevalence of health behaviors was estimated according to the presence of depression. Prevalence ratios (PR) adjusted for sex, age and education, with respective 95% confidence intervals (95%CI) estimated by the Poisson multiple regression with robust variation. Analyses were stratified by sex and per capita family income. To assess possible interactions of sex and income in the associations of depression with health behaviors, Poisson multiple regression models were used including multiplicative interaction terms (sex vs. depression and income vs. depression) adjusted for age, education, depression, sex and income. Significance level was set at 5%.

The PNS project was approved by the National Research Ethics Committee (process No. 3.529,376, of August 23, 2019). All respondents signed an informed consent form.

RESULTS

The results show that, in 2019, 12.9% of Brazilian adults were smokers, 22.3% were former smokers, 16.4% were passive smokers, 32.0% drank alcoholic beverages at least once a month, 4.6% drank six or more times a week, and 20.2% had at least one HED in the month prior to the interview. Also, 63.2% were inactive in the context of leisure and 4.9% watched six or more hours of television per day. Regarding eating habits, 34.9% ingested FV less than five times a week, 6.9 and 11.1% consumed soft drinks and sweets more than five times a week, respectively, and 3.7% replaced lunch with snacks more than three times a week. Approximately 8.0% of the population accumulated five or more unhealthy behaviors (Table 1). Ten or more points on the PHQ-9, with probable presence of depression, were reached by 10.9% (95%CI 10.4–11.3) of Brazilian adults.

The study shows that Brazilian adults with depression, compared to adults without depression, have higher prevalence of smokers (RP 1.55), ex-smokers (RP 1.21), passive smoking (RP 1.56), frequent consumption of alcoholic beverages (RP 2.25), HED (RP 1.13), physical inactivity (RP 1.12), sedentary lifestyle (RP 1.83), replacing lunch with quick snacks (RP 1.92), less frequent consumption of FV (RP 1.16) and more frequent intake of

Table 1. Prevalence and prevalence ratios of health behaviors according to the presence of depression in Brazilian adults (18–59 years). National Health Survey, 2019.

Health behavior	Total 2019		Without depression n=58,787	With depression n=7,016	PR* (95%CI)
	n	%	(1)	(2)	(2/1)
Smoking					
Smoker	8,606	12.9	12.4	17.0	1.55 (1.40–1.70)
Former smoker	14,650	22.3	21.6	27.6	1.21 (1.13–1.30)
Passive smoker[a]	10,157	16.4	15.5	24.2	1.56 (1.43–1.71)
Alcohol					
Drinks ≥1/month	19,372	32.0	32.6	26.8	0.97 (0.90–1.05)
Drinks ≥6/week	952	4.6	4.3	7.0	2.25 (1.67–3.05)
Heavy episodic drinking	13,455	20.2	20.4	17.8	1.13 (1.03–1.24)
Physical activity					
Inactive in leisure time[b]	38,536	63.2	61.7	73.6	1.12 (1.09–1.16)
Sedentary lifestyle[c]	3,130	4.9	4.4	8.5	1.83 (1.54–2.16)
Food					
FV[d] <5/week	24,207	34.9	34.6	37.8	1.16 (1.10–1.23)
Soft drinks ≥5/week	3,617	6.9	6.7	8.9	1.51 (1.25–1.81)
Sweets ≥5/week	6,084	11.1	10.6	14.8	1.37 (1.21–1.55)
Replacing lunch[e] ≥3/week	1,943	3.7	3.3	6.5	1.92 (1.61–2.28)
Number of unhealthy behaviors					
≥5	1,420	8.0	7.3	15.0	2.29 (1.78–2.93)

[a]at home; [b]reference category: active; [c]six hours or more watching television; [d]FV: fruits and vegetables (raw or cooked); [e]with quick snacks; *PR: sex-, age- and education-adjusted prevalence ratios; significant values are bolded (p<0.05).

soft drinks (RP 1.51) and sweets (RP 1.37), and five or more unhealthy behaviors (RP 2.29; 95%CI 1.78–2.93) (Table 1).

In the analyses stratified by sex, some associations were only present in females, such as the association of depression with HED and with a lower frequency of consumption of FV. The associations of sedentary lifestyle, being a former smoker and the presence of five

or more unhealthy behaviors with depression have a significant higher PR in men than in women. Only in men, alcohol consumption at least once a month was a protective factor against depression, with a significant interaction (Table 2).

Considering the analyses stratified by income, the association of depression with HED was significant only in the low-income segment, but the interaction was not significant. The association of depression with physical inactivity had a higher PR in the higher-income stratum, while the association of depression with having five or more unhealthy behaviors was stronger in the lower-income segment (Table 3).

Table 2. Prevalence ratios* of health behaviors according to the presence of depression in Brazilian adults (18–59 years) per sex. National Health Survey, 2019.

Health behaviors	Females n=34,334	Males n=34,469	Interaction
Smoking			
Smoker	1.58 (1.38–1.80)	1.49 (1.28–1.74)	0.92 (0.75–1.14)
Former smoker	1.15 (1.06–1.25)	1.37 (1.18–1.60)	1.19 (1.00–1.42)
Passive smoker[a]	1.49 (1.33–1.66)	1.72 (1.47–2.00)	1.14 (0.94–1.39)
Alcohol			
Drinks ≥1/month	1.09 (0.99–1.21)	0.82 (0.73–0.92)	0.76 (0.65–0.88)
Drinks ≥6/week	2.09 (1.28–3.43)	2.35 (1.63–3.40)	1.14 (0.61–2.14)
Heavy episodic drinking	1.33 (1.17–1.51)	0.96 (0.83–1.10)	0.73 (0.60–0.88)
Physical activity			
Inactive in leisure time[b]	1.11 (1.08–1.15)	1.16 (1.09–1.23)	1.05 (0.98–1.13)
Sedentary lifestyle[c]	1.46 (1.22–1.74)	2.93 (2.18–3.94)	1.99 (1.41–2.79)
Food			
FV[d] <5/week	1.24 (1.16–1.33)	1.01 (0.91–1.12)	0.81 (0.71–0.92)
Soft drinks ≥5/week	1.67 (1.32–2.11)	1.28 (0.97–1.69)	0.76 (0.53–1.09)
Sweets ≥5/week	1.44 (1.24–1.67)	1.19 (0.95–1.50)	0.83 (0.63–1.08)
Replacing lunch[e] ≥3/week	1.80 (1.45–2.22)	2.26 (1.66–3.07)	1.24 (0.85–1.81)
Number of unhealthy behaviors			
≥5	1.72 (1.19–2.47)	2.84 (2.10–3.82)	1.63 (1.02–2.61)

[a]at home; [b]reference category: active; [c]six hours or more watching television; [d]FV: fruits and vegetables (raw or cooked); [e]with quick snacks; *PR: age- and education-adjusted prevalence ratios; significant values are bolded ($p<0.05$).

Table 3. Prevalence ratios* of health behaviors according to the presence of depression in Brazilian adults (18–59 years) per income categories. National Health Survey, 2019.

Health behaviors	High income (1 MW or +) n=27,738	Low income (<1 MW) n=38,046	Interaction
Smoking			
Smoker	1.44 (1.21–1.70)	1.60 (1.41–1.81)	1.12 (0.90–1.38)
Former smoker	1.26 (1.12–1.42)	1.18 (1.08–1.30)	0.91 (0.79–1.06)
Passive smoker[a]	1.66 (1.41–1.96)	1.51 (1.35–1.69)	0.89 (0.73–1.08)
Alcohol			
Drinks ≥1/month	0.95 (0.85–1.06)	1.04 (0.94–1.16)	1.02 (0.87–1.20)
Drinks ≥6/week	1.89 (1.20–2.97)	2.64 (1.80–3.89)	1.36 (0.78–2.36)
Heavy episodic drinking	1.11 (0.97–1.28)	1.17 (1.03–1.32)	1.02 (0.85–1.23)
Physical activity			
Inactive in leisure time[b]	1.23 (1.16–1.31)	1.06 (1.03–1.09)	0.86 (0.81–0.92)
Sedentary lifestyle[c]	1.65 (1.20–2.25)	1.94 (1.59–2.35)	1.11 (0.78–1.57)
Food			
FV[d] <5/week	1.18 (1.05–1.32)	1.13 (1.06–1.20)	1.03 (0.91–1.17)
Soft drinks ≥5/week	1.71 (1.30–2.25)	1.41 (1.11–1.78)	0.85 (0.59–1.22)
Sweets ≥5/week	1.40 (1.18–1.66)	1.37 (1.16–1.62)	0.97 (0.78–1.22)
Replacing lunch[e] ≥3/week	1.72 (1.34–2.20)	2.16 (1.68–2.76)	1.21 (0.85–1.72)
Number of unhealthy behaviors			
≥5	1.72 (1.16–2.54)	2.43 (1.78–3.30)	1.65 (1.00–2.71)

[a]at home; [b]reference category: active; [c]six hours or more watching television; [d]FV: fruits and vegetables (raw or cooked); [e]with quick snacks; *PR: age- and sex-adjusted prevalence ratios; significant values are bolded (p<0.05).

DISCUSSION

The results point to the existence of a significant association of depression with all behaviors analyzed, with the exception of alcohol consumption once or more per month, and show that the highest prevalence ratios were observed in: almost daily consumption of alcohol, replacing lunch with quick snacks, sedentary lifestyle, smoking, passive smoking at home, and frequent consumption of soft drinks. The findings also show interactions of sex and income in the associations of depression with some health behaviors.

SMOKING

The association between depression and smoking verified in Brazilian adults has been reported by studies developed elsewhere. A meta-analysis carried out to assess this association showed a 50% greater chance of depression among smokers in cross-sectional studies, and, in longitudinal studies, a 62% greater risk of smokers developing depression[18]. Another meta-analysis assessed the role of lifestyle factors in the prevention and treatment of mental disorders and reported that recent research brings emerging evidence that smoking acts as a causal factor in the incidence of major depression, bipolar disorder and schizophrenia[10]. A recent systematic review[19] reports an association between smoking and major depression and the tendency of people with depression and anxiety to be heavy smokers. A study carried out in the United States found that the use of tobacco, alcohol and other drugs before the age of 18 is associated with an increased risk of depression in adulthood[20]. Additionally, MDs are associated with heavy smoking, greater degree of nicotine dependence, increased withdrawal symptoms, and lower cessation rates. The literature also shows that smoking cessation is associated with a reduction in depression, anxiety and stress, in addition to being related to an improvement in quality of life[21]. These data are corroborated by our study, which shows a reduction in the adjusted prevalence of depression in former smokers when compared to smokers.

An association of current smoking with depression was present for both sexes and in the same intensity, but the association of depression with being a former smoker was significantly stronger among males. Studies have found different results regarding the variable sex. Research carried out in Korea found that the association of depression with current smoking was present for both sexes, but significantly more pronounced among women (odds ratio — OR = 1.99 in women and 1.17 in men)[12], while a study carried out in Canada showed that smoking was associated with depression only among men[22]. It is important to highlight that there has been a relevant reduction in the prevalence of smoking in Brazil. Data from the first and the second National Survey on Alcohol and Drugs (LENAD)[23] show a decrease in smoking prevalence from 20.8% in 2006 to 16.9% in 2012, with a more prominent decline among men (27 to 21%) than among women (15 to 13%). It is argued that the higher prevalence of depression in females could partially explain the lower rate of smoking cessation among them. Measures to address smoking cessation among women should give special attention to comorbidities with depressive conditions and the concern with gaining weight.

In our study, the association between current smoking and depression was significant and with similar magnitude in both income strata analyzed. Studies evaluating the association between depression and smoking per income are scarce, but a survey conducted in Canada found an association between the number of cigarettes smoked per day and psychological stress only in low-income groups[11]. Further studies are needed to clarify the role of income in the association between smoking and depression. The association of depression with smoking detected in this study reinforces the need for attention to mental health conditions in programs aimed at controlling and quitting smoking, especially in the more

vulnerable and marginalized segments of society, in which depression[24] and nicotine dependence rates are higher[25].

ALCOHOL

Among Brazilian adults, depression was particularly associated with very frequent consumption of alcohol (six or seven days a week) and, to a lesser extent, with HED.

Some studies have reported the consumption of alcohol in low or moderate doses as a protective factor against depression[26]. A study carried out in 19 European countries showed that long-term abstainers and those who use alcohol heavily are more likely to have depressive episodes when compared to those who use it moderately. The authors emphasize that, although the literature presents evidence of a bidirectional relation, the strongest one is heavy alcohol consumption predicting the onset of depressive episodes[27]. Moderate, risky and abusive alcohol consumption have different determinants and consequences, and protection against depression associated with moderate consumption would be related to social and cultural contexts known to be protective of mental health[19].

In this study, we report an interaction of sex in the association between alcohol and depression. For both sexes, the almost daily consumption of alcohol was associated with depression, but HED was associated with depression only in women. We also found that only in men the consumption of alcoholic beverages once or more times a month is a protective factor against depression. Studies show that women are 1.5 to twice more likely to have depression throughout their lives when compared to men, and differences between sexes are also observed in the course of depressive disorders[28]. Retrospective studies show that there is a greater chance that depression precedes the problematic use of alcohol among women, while the opposite occurs among men[29]. It should be noted that there has been a considerable increase in the prevalence of alcohol use among women[30] globally and in Brazil. Gender differences related to motivation for use, metabolic specificities, sociocultural factors, physical and psychiatric comorbidities imply particular losses to women, including this gender's different pattern for the association between HED and depression highlighted in this study.

In the analysis per income, it appears that the association of HED with depression is significant only in the lower-income segment, but without significant interaction. International data point to disparities in health care for comorbid conditions of depression with alcohol use disorders, to the detriment of minority ethnic groups[31].

Among people with alcohol consumption problems, depression is the most common mental disorder, and this concurrency tends to worsen the severity and prognosis of both situations[32,33]. The literature shows that the prevalence of depression is higher among individuals who are dependent on alcohol than in those who abuse it[32]. The findings of this study reinforce the need to include mental health in programs to promote healthy behaviors, considering differences in gender and socioeconomic status.

FOOD

This study showed lower intake of FV by individuals with depression, and other studies have confirmed this association[34-36]. Among these, two meta-analyses found that FV consumption is inversely related to depressive symptoms[35,37], with a 14% lower risk of depressive symptoms in segments with higher FV consumption, indicating that each 100 g increment in the intake of these foods per day could reduce the risk of depression by 5%[35]. This association may stem, among other reasons, from the content of minerals, vitamins, amino acids, phytochemicals and antioxidant compounds present in FV and their influence on depression[34,37].

An association of consumption of soft drinks and sweets with depression was found and the literature confirms this relation. Knuppel et al. identified an increased risk of depressive symptoms associated with high intake of foods and beverages containing sugar[38] and, specifically regarding soft drinks, there is evidence that the daily intake of two cups of cola soda would be enough to increase the risk of depression[39]. The consumption of foods with a high glycemic index, such as soft drinks and sweets, is associated with inflammatory markers and oxidative stress. These and the morbidities they cause (obesity, diabetes and other metabolic diseases) are related to depressive symptoms[40-42].

The associations of depression with low consumption of FV and with regular consumption of soft drinks and sweets were observed in both income strata, but in relation to gender, the associations were only significant in females. Studies conducted in Australia and the United Kingdom also found that the association of depression with worse dietary pattern and lower dietary quality index (AHEI), respectively[43,44]. There are, however, studies in which the association of food with depression is reported in both sexes[45,46], indicating that gender differentials in the relationship between food intake and depression need to be further studied.

A strong association was found between depression and the replacement of lunch with quick snacks (or fast food) in the Brazilian adult population, which is in line with studies conducted in other countries[47-49]. The literature also shows that the consumption of ultra-processed foods, usually chosen as a substitute for lunch or dinner, is positively associated with the risk of depression[50]. Again, it is worth noting that metabolic diseases such as obesity are associated with depression and fast-food consumption, indicating a sharing of biological mechanisms between the diseases[51,52]. This association was observed in the two income strata analyzed and was significant for both sexes.

PHYSICAL ACTIVITY AND SEDENTARY LIFESTYLE

The prevalence of physical inactivity and sedentary behavior was, respectively, 12 and 83% higher in individuals with depression—associations also found in other population-based studies[53-55]. A meta-analysis of 111 studies showed that any level of PA attenuates the risk

of depression, but moderate and high levels are more strongly associated with lower risk[56]. Another meta-analysis showed PA as a protective factor against the onset of depression, regardless of age and geographic region[57]. There is also evidence of the importance of PA in the treatment of depressive symptoms[58].

In this study, an association between depression and leisure time physical inactivity was found in both income strata, but PR was higher among those who reported higher monthly earnings—precisely who have greater access to leisure practices—, but these practices would be more affected by the presence of depressive disorders.

The association of depression with physical inactivity portrayed in this study and the existing evidence of the protective effect of mental health by PA[56] emphasize the need to encourage its practice in the care of patients with mental disorders and the consideration of mental health in health promotion programs[59].

The relation between sedentary behavior and depression observed in this study corroborates the findings of two meta-analyses. One shows high level of sedentary lifestyle among people with depression[60] and the other shows a greater chance of depression associated with sedentary behavior—considered as two hours or more of screen time per day (OR 1.28; 95%CI 1.17–1.39)[61]. However, according to a study conducted with 59,401 Brazilians, PA can reduce the association between time spent on television and depressive symptoms[62].

The association between sedentary lifestyle and depression was stronger among men, corroborating the findings of another Brazilian study[55], but differing from what was observed in a meta-analysis carried out by Wang et al. (2019), in which this association was only significant among women. A possible explanation for these divergences is that men and women use different coping strategies when dealing with depression, depending on their sociocultural context[63].

Taken together, the results of this study point to the existence of an important association, in Brazilian adults, between lifestyle factors and depression. Although studies indicate stronger interactions with smoking and physical activity[64], a strong association with indicators of diet, sedentary lifestyle and alcohol consumption was also found.

In view of such research results, the promotion of healthy behaviors, essential for reducing the prevalence and premature deaths caused by CNCDs, requires comprehensive and integrated strategies that take into account the association of depression with health behaviors and the specificities of this association per sex and socioeconomic strata.

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