

Overweight in Brazilian industry workers: Prevalence and association with demographic and socioeconomic factors and soft drink intake

*Excesso de peso em trabalhadores de indústrias no Brasil:
prevalência e associação com fatores demográficos,
socioeconômicos e consumo de refrigerantes*

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ABSTRACT

Objective

To estimate the prevalence of overweight in industry workers and its association with demographic and socioeconomic factors and soft drink intake (including type).

Methods

This is a nationwide cross-sectional cohort survey of "Lifestyle and leisure habits of industry workers" conducted between 2006 and 2008 in 24 Brazilian federate units. The participants answered a previously tested questionnaire and self-reported their weight and height. Statistical analyses consisted of crude and adjusted Poisson regression.

Results

Males and females had overweight prevalences of 45.7% (95%CI=45.1; 46.2) and 28.1% (95%CI=27.4; 28.9) respectively. Older and married individuals and those working in medium-sized and large factories were more likely to be overweight. Males with higher education levels and gross family incomes were also more likely to be overweight, but not females. Finally, men (PR=1.24; 95%CI=1.13; 1.36) and women (PR=1.40;

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95%CI=1.22; 1.61) who consumed diet/light soft drinks were also more likely to be overweight than those who did not consume soft drinks.

Conclusion

More than one-third of the workers were overweight according to their self-reported weight and height, and the prevalence of overweight was higher in males. Demographic and socioeconomic variables and diet/light soft drink intake were associated with overweight. These data may be helpful for the development of actions that reduce the risk of overweight in this population.

Indexing terms: Adults. Obesity. Overweight. Soft drink. Workers.

RESUMO

Objetivo

Estimar a prevalência de excesso de peso e sua associação com fatores demográficos, socioeconômicos e com o consumo e tipo de refrigerante ingerido.

Métodos

Trata-se de um inquérito nacional, de corte transversal, sobre o "Estilo de vida e hábitos de lazer de trabalhadores da indústria", realizado nos anos de 2006 a 2008, em 24 unidades federativas do Brasil. As informações foram obtidas por meio de um questionário previamente testado, inclusive a informação sobre o excesso de peso (autorrelato do peso e da estatura). Regressões de Poisson bruta e ajustada foram realizadas.

Resultados

A prevalência de excesso de peso foi de 45,7% (IC95%=45,1; 46,2) nos homens e 28,1% (IC95%=27,4; 28,9) nas mulheres. Identificou-se que o aumento da idade, ser casado e o tamanho das empresas (médio e grande porte) associaram-se a maiores probabilidades para o excesso de peso. Quanto maior a escolaridade e a renda familiar bruta entre os homens, maior a probabilidade de excesso de peso, tendo sido observada situação contrária entre as mulheres. Homens (RP=1,24; IC95%=1,13; 1,36) e mulheres (RP=1,40; IC95%: 1,22; 1,61) que relataram consumir refrigerantes diet/light também apresentaram maior excesso de peso quando comparados àqueles que relataram não consumir refrigerantes.

Conclusões

Em seus autorrelatos, mais de um terço dos trabalhadores foram classificados com excesso de peso, com maior prevalência entre os homens. Variáveis demográficas, socioeconômicas e consumo de refrigerantes diet/light se mostraram associados ao excesso de peso. Tais informações podem auxiliar na elaboração de ações direcionadas para redução da probabilidade do excesso de peso nesse grupo.

Termos de Indexação: Adultos. Obesidade. Sobrepeso. Refrigerante. Trabalhadores.

INTRODUCTION

The prevalence of overweight has been increasing as the amount of energy spent working, commuting, and performing house chores decreases¹. This phenomenon tends to affect specific groups², but the current situation is changing, that is, overweight is no longer a risk factor exclusive to high-income individuals³. Excess weight is considered one of the main public health problems in developed and developing countries because of its close relationship with numerous health problems⁴ and its impact on

government funds for the treatment of related diseases⁵.

According to the World Health Organization (WHO), approximately 300 million adults were obese in 2005, and this number is expected to rise to 700 million by 2015⁶. From 1980 to 2008, the prevalence of overweight increased 15.4% (n=1,296 million people) in the study countries. In this 28-year period, the number of obese individuals in the United States (56 million), China (42 million), Brazil (20 million), and Mexico (18 million) increased considerably⁷.

In Brazil the survey showed that the number of obese individuals never ceases to increase⁸. According to the *Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico* (Vigitel, Surveillance of Risk and Protective Factors for Chronic Diseases Telephone Survey) conducted in 2012 by the Ministry of Health, the proportion of overweight people increased from 43.2% in 2006 to 51.0% in 2012. During this same period, the percentage of obese individuals increased from 11.6% to 17.1%⁹.

Studies have shown that the prevalence of overweight increases with age¹⁰ and marriage¹¹⁻¹³. Women are also more vulnerable to overweight, especially those with low income and education level¹⁴. Another important factor that can contribute to the overweight epidemic is the intake of beverages with added sugar, especially soft drinks, given their high added sugar content, low satiety, and incomplete compensation for total energy¹⁵. Malik *et al.*¹⁶ have found a worldwide increase in soft drink intake and obesity prevalence in the last decades. Adult Brazilians have also increased soft drink intake significantly^{17,18}.

This study intends to investigate the relationship between demographic and socioeconomic variables and overweight in industry workers, and whether soft drink intake and type are associated with overweight because of excessive advertising encouraging the intake of specific soft drinks to minimize the negative impact of excess intake on health. Therefore, the study intends to estimate the prevalence of overweight in industry workers and its association with demographic and socioeconomic factors and soft drink intake and type.

METHODS

This study is part of a national survey of "Lifestyle and leisure habits of industry workers" conducted by the *Serviço Social da Indústria* (SESI, Social Service for Industry Workers) and the *Núcleo de Pesquisa em Atividade Física e Saúde* (NuPAF,

Research Center for Physical Activity and Health) of the *Universidade Federal de Santa Catarina* (UFSC) from 2006 to 2008, which included 24 of the 27 Brazilian federate units. The states *Rio de Janeiro*, *Piauí*, and *Sergipe* did not participate in the study in a timely manner.

Sample size was based on an overweight prevalence of 45%, sampling error of 3%, 95% confidence interval, and design effect of 1.5. An extra 20% were added to compensate for losses and refusals. The final sample consisted of 52,774 workers recruited in two phases: 1) the workers were stratified according to industry size, given by the number of workers as follows: small (20-99); medium-sized (100-499), and large (≥ 500); 2) the workers by industry size were also stratified by Brazilian region, subdivisions of a Regional Department. The number of workers by industry size by region was proportional to that found in the reference population. Next, the factories were randomly selected. Each Brazilian region included 10% to 50% of the factories in each size category, according to the number of existing factories and number of workers necessary to compose the sample. Finally, the workers were selected systematically in each selected industry using lists provided by the factories with the workers' names. Further information is available elsewhere¹⁹.

The participants answered a previously validated questionnaire with 58 questions. This study used eleven questions on demographic and socioeconomic aspects and soft drink intake. Chart 1 shows the data collection method and operationalization of the dependent and independent variables.

Initially we used the distribution of relative frequencies with its respective 95% Confidence Intervals (95%CI) to measure the associations between the study variables and overweight. Next, crude and adjusted Poisson regression determined which demographic and socioeconomic variables and soft drink intake and type were associated with overweight. The variables were included in the adjusted model according to the following hierarchic levels: level 1 (age and marital status); level 2 (education level and gross family income); level 3 (industry size

and location); and level 4 (soft drink intake and type). All analyses were stratified by gender. The significance level was set to 5% ($p < 0.05$). The

questionnaire was scanned by the software Sphynx. All statistical analyses were performed by the software Stata version 11.

Chart 1. Study Variables in industry workers, Brazil, 2006-2008.

Variables	Answer options	Operational categories
<i>Dependent</i>		
Excess weight	Self-reported measurements: Body weight (kg) Height (m)	Based on BMI: Normal weight ≤ 24.9 kg/m ² Overweight ≥ 25 kg/m ²
<i>Independent</i>		
Regional Department	All study federate units (24), separated by geographic region.	South Southeast Midwest Northeast North
Industry size	Small: 20 to 99 employees; Medium-sized: 100 to 499 employees; Large: 500 or more employees	Small Medium-sized Large
Gender	Male; Female	Male; Female
Age (years)	<30 years 30-39 years 40-49 years ≥ 50 years	<30 years 30-39 years ≥ 40 years
Marital status	Single Married or living with partner Widowed Divorced/Separated	Married Other (all other categories)
Education level	Incomplete elementary school Complete elementary school Complete high school Complete higher education	Incomplete elementary school Complete elementary school Complete high school Complete higher education
Gross family income* (per month)	Up to 600 reais 601 to 1,500 reais 1,501 to 3,000 reais more than 3,000 reais	Up to 600 reais 601 to 1,500 reais More than 1,500 reais
Soft drink intake**	Never 1 day 2 days 3 days 4 days 5 days 6 days 7 days	Never 1 to 3 days 4 to 6 days 7 days
Type of soft drink	Does not consume soft drinks Regular Diet/Light Any	Does not consume soft drinks Regular Diet/Light Any

Note: *Minimum salaries in 2006 (R\$350,00); 2007 (R\$380,00); 2008 (R\$415,00); **Consumption during a regular week.

BMI: Body Mass Index.

The survey was approved by the Research Ethics Committee of the UFSC, Brazil, under Protocol numbers 306/2005 and 009/2007. The SESI, our survey partner, authorized this secondary data analysis.

RESULTS

This survey had a response rate of 90.6% or 47,886 workers. Of these, 490 (1.0%) did not report their gender, and 1,888 (4.0%) did not

Table 1. Prevalences of overweight in industry workers and respective 95% confidence intervals by demographic and socioeconomic variables. Brazil, 2006-2008 (n= 45,508).

Variables	N	%	Males			Females		
			N	%	95%CI	N	%	95%CI
			31,956	45.70	45.14; 46.23	13,552	28.12	27.36; 28.88
<i>Age (n=45,344)</i>								
Less than 30 years	21,005	46.33	14,495	34.46	33.69; 35.24	6,510	17.88	16.94; 18.81
30-39 years	14,049	30.98	9,730	52.12	51.13; 53.12	4,319	33.47	32.07; 34.88
40 + years	10,290	22.69	7,611	58.83	57.73; 59.94	2,679	44.30	42.42; 46.19
<i>Marital status (n=45,406)</i>								
Other*	19,908	43.85	12,485	35.46	34.62; 36.30	7,423	23.54	22.58; 24.51
Married	25,498	56.15	19,392	52.26	51.56; 52.96	6,106	33.65	32.46; 34.84
<i>Education level (n=45,422)</i>								
Incomplete elementary school	8,359	18.40	6,836	45.04	43.86; 46.22	1,523	40.38	37.91; 42.84
Complete elementary school	7,068	15.56	5,426	42.94	41.62; 44.25	1,642	31.42	29.17; 33.67
Complete high school	23,345	51.40	15,915	44.21	43.44; 44.98	7,430	26.21	25.21; 27.21
Complete higher education	6,650	14.64	3,725	57.04	55.45; 58.63	2,925	24.71	23.15; 26.28
<i>Gross family income* (n=45,135)</i>								
Up to 600 reais	14,268	31.61	10,296	36.55	35.62; 37.48	3,972	29.45	28.03; 30.87
601 to 1,500 reais	18,752	41.55	13,392	46.17	45.33; 47.02	5,360	27.91	26.70; 29.11
≥1,501 reais	12,115	26.84	8,006	56.38	55.29; 57.46	4,109	26.96	25.60; 28.32
<i>Industry size (n=43,058)</i>								
Small	10,598	24.61	7,524	42.75	41.63; 43.87	3,074	25.86	24.31; 27.41
Medium-sized	15,865	36.85	11,636	46.00	45.09; 46.90	4,229	27.71	26.36; 29.06
Large	16,595	38.54	11,254	47.72	46.80; 48.64	5,341	30.16	28.93; 31.39
<i>Region (n=45,508)</i>								
South	6,565	14.43	3,943	45.42	43.86; 46.97	2,622	26.04	24.36; 27.72
Southeast	5,879	12.92	3,996	43.31	41.78; 44.85	1,883	24.58	22.64; 26.53
Midwest	7,762	17.06	5,545	44.47	43.16; 45.78	2,217	26.29	24.46; 28.13
Northeast	14,114	31.01	10,076	48.71	47.74; 49.69	4,038	32.51	31.07; 33.96
North	11,188	24.58	8,396	44.10	43.04; 45.16	2,792	27.54	25.88; 29.20
<i>Consumes soft drinks** (n=45,380)</i>								
Never	5,713	12.59	3,299	49.46	47.76; 51.17	2,414	30.40	28.56; 32.24
1-3 days	25,707	56.65	17,967	45.40	44.67; 46.13	7,740	28.43	27.43; 29.44
4-6 days	9,475	20.88	7,165	44.94	43.78; 46.09	2,310	25.10	23.33; 26.87
7 days	4,485	9.88	3,426	45.30	43.63; 46.96	1,059	27.19	24.51; 29.87
<i>Type of soft drink** (n=42,822)</i>								
Does not consume	4,491	10.49	2,691	49.86	47.97; 51.76	1,800	30.94	28.80; 33.08
Regular	29,417	68.70	21,944	43.43	42.78; 44.09	7,473	25.06	24.08; 26.04
Diet/Light	2,488	5.81	1,282	66.45	63.87; 69.04	1,206	39.88	37.11; 42.65
Any	6,426	15.00	4,342	49.53	48.05; 51.02	2,084	31.28	29.29; 33.27

Note: *Minimum salaries in 2006 (R\$350.00), 2007 (R\$380.00), 2008 (R\$415.00); **Intake during a regular week.

95%CI: 95% Confidence Interval.

report their weight and/or height, so the final sample consisted of 45,508 (95.0%) workers. Table 1 describes the sample. Most workers were male (70.2%), aged more than 30 years (53.9%), married (56.0%), had completed high school (51.3%), and had a gross family income of R\$601.00 to R\$1,500.00 (41.2%).

The general prevalence of overweight was 40.5%, greater in men (45.7%) than women (28.1%). Greater prevalences of overweight were found in married men, older individuals, individuals with higher gross family income, individuals with complete higher education, individuals from medium-sized and large

Table 2. Overweight prevalence ratios and 95% confidence intervals in male industry workers by demographic and socioeconomic variables and soft drink intake. Brazil, 2006-2008.

Variables	Crude PR	95%CI	Adjusted PR	95%CI
<i>Age</i>				
Less than 30 years	1.00		1.00	
30-39 years	1.51	1.45; 1.57	1.40	1.34; 1.46
40 +	1.71	1.64; 1.78	1.55	1.49; 1.62
<i>Marital status</i>				
Other	1.00		1.00	
Married	1.47	1.42; 1.53	1.28	1.23; 1.33
<i>Education level</i>				
Incomplete elementary school	1.00		1.00	
Complete elementary school	0.95	0.90; 1.01	1.04	0.98; 1.10
Complete high school	0.98	0.94; 1.02	1.11	1.06; 1.16
Complete higher education	1.26	1.20; 1.34	1.33	1.26; 1.40
<i>Gross family income*</i>				
Up to 600 reais	1.00		1.00	
601 to 1,500 reais	1.26	1.21; 1.32	1.19	1.14; 1.24
≥1,501 reais	1.54	1.48; 1.61	1.36	1.29; 1.43
<i>Industry size</i>				
Small	1.00		1.00	
Medium-sized	1.08	1.03; 1.12	1.06	1.02; 1.11
Large	1.12	1.07; 1.17	1.07	1.02; 1.12
<i>Region</i>				
South	1.00		1.00	
Southeast	0.95	0.89; 1.02	1.03	0.99; 1.08
Midwest	0.98	0.92; 1.04	0.97	0.92; 1.02
Northeast	1.07	1.02; 1.13	0.90	0.85; 0.95
North	0.97	0.92; 1.03	0.99	0.92; 1.06
<i>Consumes soft drinks**</i>				
Never	1.00		1.00	
1-3 days	0.92	0.87; 0.97	0.99	0.94; 1.05
4-6 days	0.91	0.86; 0.96	1.00	0.94; 1.07
7 days	0.92	0.85; 0.98	1.02	0.95; 1.10
<i>Type of soft drink**</i>				
Does not consume	1.00		1.00	
Regular	0.87	0.82; 0.92	0.94	0.88; 1.00
Diet/Light	1.33	1.22; 1.45	1.24	1.13; 1.36
Any	0.99	0.93; 1.06	1.06	0.98; 1.15

Note: *Minimum salaries in 2006 (R\$350.00), 2007 (R\$380.00), 2008 (R\$415.00); **Intake during a regular week.

PR: Prevalence Ratio; 95%CI: 95% Confidence Interval.

companies, and individuals from the Brazilian Northeast region. The prevalence of overweight was also higher in men and women who did not consume soft drinks during the week than in those who did. Workers who consumed diet/light soft drinks were also more likely to be overweight than those who did not (Table 1).

In the crude regression analysis, marriage, higher age, higher education levels, higher gross family income, and working in large factories increased risk of overweight. There was also an inverse relationship between overweight and soft drink intake. In the adjusted analysis, the variables that remained associated with overweight were

Table 3. Overweight prevalence ratios and respective 95% confidence intervals in female industry workers by demographic and socioeconomic variables and soft drink intake. Brazil, 2006-2008.

Variables	Crude PR	95%CI	Adjusted PR	95%CI
<i>Age</i>				
Less than 30 years	1.00		1.00	
30-39 years	1.87	1.73; 2.02	1.78	1.64; 1.93
40 +	2.48	2.29; 2.69	2.38	2.19; 2.58
<i>Marital status</i>				
Other	1.00		1.00	
Married	1.43	1.34; 1.52	1.26	1.18; 1.34
<i>Education level</i>				
Incomplete elementary school	1.00		1.00	
Complete elementary school	0.78	0.69; 0.87	0.90	0.80; 1.01
Complete high school	0.65	0.59; 0.71	0.84	0.76; 0.92
Complete higher education	0.61	0.55; 0.68	0.73	0.65; 0.81
<i>Gross family income*</i>				
Up to 600 reais	1.00		1.00	
601 to 1,500 reais	0.95	0.88; 1.02	0.95	0.88; 1.03
≥1,501 reais	0.92	0.84; 0.99	0.90	0.82; 0.99
<i>Industry size</i>				
Small	1.00		1.00	
Medium-sized	1.07	0.98; 1.17	1.11	1.01; 1.21
Large	1.17	1.07; 1.27	1.16	1.07; 1.27
<i>Region</i>				
South	1.00		1.00	
Southeast	0.94	0.84; 1.06	1.06	0.97; 1.16
Midwest	1.01	0.90; 1.13	0.91	0.81; 1.01
Northeast	1.25	1.14; 1.37	0.87	0.78; 0.98
North	1.06	0.96; 1.17	0.92	0.82; 1.04
<i>Consumes soft drinks**</i>				
Never	1.00		1.00	
1-3 days	0.94	0.86; 1.02	1.02	0.94; 1.12
4-6 days	0.83	0.74; 0.92	0.99	0.88; 1.11
7 days	0.89	0.78; 1.02	1.07	0.93; 1.24
<i>Type of soft drink**</i>				
Does not consume	1.00		1.00	
Regular	0.81	0.74; 0.89	0.89	0.79; 1.00
Diet/Light	1.29	1.14; 1.46	1.40	1.22; 1.61
Any	1.01	0.90; 1.13	1.12	0.98; 1.28

Note: *Minimum salaries in 2006 (R\$350.00), 2007 (R\$380.00), 2008 (R\$415.00); **Intake during a regular week.

PR: Prevalence Ratio; 95%CI: 95% Confidence Interval.

age ($PR_{\geq 40} = 1.55$; 95%CI=1.49; 1.62); marital status ($PR_{\text{married}} = 1.28$; 95%CI=1.23; 1.33); education level ($PR_{\text{higher}} = 1.33$; 95%CI=1.26; 1.40); gross family income ($PR_{\geq 1.500} = 1.36$; 95%CI=1.29; 1.43); type of soft drink ($PR_{\text{diet/light}} = 1.24$; 95%CI=1.13; 1.36), and industry size, but only slightly. After adjustment, location was also associated with overweight: men from the Northeast region were less likely to be overweight (10%) than those from the Southern Region (Table 2).

In women, crude analysis showed that being married, higher age, lower education level, and lower family income increased the prevalence of overweight. Women working in large factories and from the Brazilian Northeast region also had higher prevalence ratios for obesity. Diet/light soft drink intake was also associated with overweight. On the other hand, soft drink intake on four to six days a week was associated with a smaller risk of overweight. After adjustments, the following variables remained associated with excess weight: age ($PR_{\geq 40} = 2.38$; 95%CI=2.19; 2.58); marital status ($PR_{\text{married}} = 1.26$; 95%CI=1.18; 1.34); industry size ($PR_{\text{large}} = 1.16$; 95%CI=1.07; 1.27); and type of soft drink ($PR_{\text{diet/light}} = 1.40$; 95%CI=1.22; 1.61). Education level ($PR_{\text{higher}} = 0.73$; 95%CI=0.65; 0.81) and gross family income ($PR_{\geq 1.500} = 0.90$; 95%CI=0.82; 0.99) were inversely associated with overweight (Table 3).

DISCUSSION

Demographic and socioeconomic variables are associated with excess weight. While higher education level and gross family income increase the risk of overweight in men, these indicators reduced the risk in women. Also, the frequency of soft drink intake was not associated with overweight. However, type of soft drink (specifically diet/light) increased the risk of overweight in men and women by 24 and 40%, respectively.

The study strengths include the representativeness of the sample for Brazilian

industry workers, the use of a previously tested questionnaire, and the surveyed region (countrywide). On the other hand, self-reported weight and height has limitations, since individuals may underestimate their weight and overestimate their height. However, an epidemiologic study found that the use of self-reported measurements for determining nutritional status has good validity compared with measured weight and height²⁰. Anyway, the prevalences of overweight and the associations with borderline 95%CI, that is, close to 1.00, should be interpreted with caution; the former, because of possible information bias, and the latter, because the sample size allows type 1 error.

Another study also found a positive relationship between overweight prevalence and higher age²¹: individuals aged more than 40 years are four times more likely to be overweight than those aged 20 to 29 years. Married workers also had a higher overweight prevalence than single workers²². A systematic review¹³ reported that marriage is associated with weight gain and can be explained by more shared and regular meals, more portions, and lower physical activity and concern with body weight^{11,12}.

Higher income and education level were positively associated with overweight in the study men and negatively associated in the study women. For McLaren *et al.*²³, obesity seems to be more stigmatized in women¹⁴. Women with higher socioeconomic status are more aware of the causes and consequences of overweight and feel more pressure to stay in shape²¹. Meanwhile, men are not as affected by this social phenomenon despite the belief that larger bodies convey greater dominance and power³.

The Brazilian Northeast region had a higher prevalence of overweight than the Southern region. Another study of adult Brazilians found higher prevalences of overweight in the more developed regions of the country, such as the South, Southeast, and Midwest, but obesity was increasing in the North and Northeast regions and in low-income individuals²⁴. The prevalence

of overweight is also higher in large factories²⁵. Geraldo *et al.*²⁶ analyzed dietetic aspects of the meals served in factories of *São Paulo* city and found that medium-sized and large factories offer higher-energy meals and meals with higher polyunsaturated fatty acid and cholesterol contents than very small and small factories, despite the higher availability of fruits and non-starchy vegetables.

Men who did not consume soft drinks were more likely to be overweight. This finding may stem from retrocausality in the association between soft drink intake frequency and excess weight since people with excess weight can modify their intake as a consequence of their nutritional status. However, no association was found in women despite findings that soft drink intake frequency is positively associated with overweight prevalence^{15,27}. The absence of association may be due to the study not assessing the amount consumed. Another issue is that overweight is caused by many factors, and often, attributing the findings to the direct effect of a single factor may be a mistake.

Studies have found that soft drinks are Brazilians' main source of added sugar^{18,28}. The *Instituto Brasileiro de Geografia e Estatística* (IBGE, Institute of Geography and Statistics) reported that Brazilians consume more than 15 million liters of soft drinks a day, and that regular soft drinks are the sixth most consumed food in Brazil, losing only to coffee, beans, rice, beef, and juices. Intake of beverages with added sugar may be one of the main contributors to overweight because of the high amount of sugar added to these beverages, their low satiety, and incomplete compensation for total energy¹⁵. According to Baak & Astrup²⁹, even more studies have associated beverages with added sugar and obesity. The association is possibly caused by sugar's low effect on satiety, which may increase intake.

Additionally, Fowler *et al.*³⁰ suggest that the intense sweetness of artificial sweeteners may condition individuals to prefer sweets and thereby

stimulate appetite, but this area remains controversial. The present study found a higher prevalence of overweight in diet/light soft drink consumers. Other studies have found a positive association between daily diet soft drink intake and higher waist circumference²⁷, and daily diet soft drink intake may also promote weight gain³¹. Studies less prone to causality thanks to longer follow-ups and more measurements found insignificant associations between overweight and diet soft drink intake³². Some pieces of evidence suggest that a subset of diet soft drink consumers consume them to compensate for the intake of high-energy foods³³.

Overweight adult Brazilians underreport food intake³⁴. In the study sample, those with higher body mass index may have underreported their habitual regular soft drink intake, underestimating the usual intake frequency and masking their real intake. Another recent study has found that advertising and advertising strategies were associated with the increasing prevalences of overweight³⁵. However, more studies are necessary to determine the magnitude of the effect of soft drink intake and type on adults' body weight, thereby maximizing intervention effectiveness.

CONCLUSION

The prevalence of overweight was high in industry workers, especially in males, and increased in males and females with age and marriage. Workers from medium-sized and large factories and those from the Brazilian Northeast region also had a higher prevalence of overweight. Moreover, gross family income and education level were positively associated with overweight in males and negatively associated in females. Consumers of diet/light soft drinks had the highest prevalence of overweight. These results indicate the importance of promoting educational campaigns and interventions in the workplace, encouraging workers to adopt good food habits and practice physical activity at the

workplace to minimize the prevalence of overweight workers and ill health effects caused by this condition. Additionally, new studies are needed to clarify the relationship between overweight and predisposing factors to provide data for the development and implementation of programs that promote healthier lifestyles in industry workers.

CONTRIBUTORS

PM SILVEIRA and JA SILVA helped to conceive the study, review the literature, interpret the data, write and review the article, and approve the final version. KS SILVA helped to conceive the study, analyze and interpret the data, write and review the article, and approve the final version. ESA OLIVEIRA, MVG BARROS, and MV NAHAS created and coordinated the project, managed data collection, helped to outline the manuscript, and reviewed and approved the final article.

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