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original article

Overweight and obesity and associated factors in technical and administrative staff at a Brazilian Federal University

Excesso de peso, obesidade abdominal e fatores associados em servidores de uma Universidade Federal Brasileira

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Abstract – The objectives of this study were to determine the prevalence rates of excess weight and abdominal obesity among technical and administrative staff at the Universidade Federal de Santa Catarina (UFSC) using a range of different anthropometric indicators and to identify sociodemographic factors associated with these rates. This was a cross-sectional study of 615 members of staff at UFSC (283 men and 332 women). The following anthropometric indicators were analyzed: body mass index (BMI), waist circumference (WC) and waist to height ratio (WHtR). The following sociodemographic variables were also analyzed: age, sex, skin color, marital status, socioeconomic status, educational level and employment grade. Statistical analysis was conducted using Student's *t* test, the Mann-Whitney U test and Poisson regression (with a 95% confidence interval). Prevalence rates for men and women respectively were as follows; excess weight: 63.6% and 49.7% (BMI); abdominal obesity (WC): 33.5% and 42.4%; and abdominal obesity (WHtR): 61.8% and 40.6%. Age greater than 40 years was associated with a higher probability of excess weight and abdominal obesity in men (by BMI and WHtR) and women (by BMI, WC and WHtR). Women who had spent 8 years or fewer in education had lower probabilities of excess weight (PR=0.67; 95%CI=0.49; 0.94) and abdominal obesity, by both WC (PR=0.62; 95%CI=0.44; 0.90) and WHtR (PR=0.49; 95%CI=0.39; 0.64). These results indicate an elevated prevalence of excess weight and abdominal obesity and show that the factors associated with these outcomes vary by sex and depending on the anthropometric indicator analyzed.

Key words: Abdominal obesity; Educational level; Income; Occupational health; Overweight.

Resumo – *O objetivo deste estudo foi verificar a prevalência de excesso de peso e obesidade abdominal, segundo diferentes indicadores antropométricos, e os fatores sociodemográficos associados em servidores técnico-administrativos da Universidade Federal de Santa Catarina. Estudo transversal realizado com 615 servidores da UFSC (283 homens e 332 mulheres). Foram analisados os indicadores antropométricos: índice de massa corporal (IMC), circunferência da cintura (CC) e razão cintura estatura (RCEst) e as variáveis sociodemográficas (idade, sexo, cor da pele, estado civil, nível socioeconômico, nível de escolaridade e nível ocupacional). As análises estatísticas abrangeram o teste t de student, teste U de Mann--Witney e regressão de Poisson (Intervalo de Confiança de 95%). Para homens e mulheres, a prevalência de excesso de peso foi de 63,6% e 49,7% (IMC) e de obesidade abdominal de 33,5%, 42,4% (CC), 61,8% e 40,6% (RCEst), respectivamente. Ter mais de 40 anos identificou maior probabilidade de excesso de peso e obesidade abdominal em homens (IMC e RCEst) e mulheres (IMC, CC e RCEst). A probabilidade de ter excesso de peso (RP=0,67; IC95%=0,49; 0,94) e obesidade abdominal, segundo a CC (RP=0,62; IC95%=0,44; 0,90) e RCEst (RP=0,49; IC95%=0,39; 0,64), foi menor para as mulheres com oito anos de escolaridade ou menos. Esses resultados indicam uma elevada prevalência de excesso de peso e obesidade abdominal e que os fatores associados a esses desfechos diferem segundo o sexo e de acordo com o indicador antropométrico analisado.*

Palavras-chave: *Escolaridade; Obesidade abdominal; Renda; Saúde do trabalhador; Sobrepeso.*

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INTRODUCTION

Obesity is defined as the abnormal or excessive accumulation of fat to the point that it may represent a health risk[1]. Obesity is considered a public health problem, and one that appears to be worsening in a variety of different sociodemographic groups[2].

In Brazil, a telephone survey of chronic disease risk factors and protection factors (VIGITEL) conducted in the country's 26 state capitals and the national capital found that the prevalence of excess body weight among men increased from 47.2% in 2006 to 52.1% in 2010 and that among women it increased from 38.5% in 2006 to 44.3% in 2010[3]. In addition to increases in the prevalence of overweight and obesity, researchers have also found that the prevalence of obesity in any given country can vary depending on the socioeconomic characteristics of the population[4].

Among workers, health problems such as excess weight appear to be associated with the type of work performed and with the working environment[5]. Prevalence rates of overweight varying from 36.6% to 38.9% and of obesity varying from 12.7% to 17.0% have been observed in technical and administrative staff working at public institutions in Brazil[6,7]. These figures are worrying since, among others, diseases such as diabetes, cardiovascular problems and high blood pressure are associated with high levels of body fat.[8] In addition to increased risk for a range of morbidities, obesity in general and abdominal obesity in particular are also associated with mortality[8], and increased risk has also been detected in those who are merely overweight[9].

In addition to excess weight, accumulation of fat in the center of the body has also been associated with increased risk of metabolic and cardiovascular diseases[8,10]. Another factor of relevance is that the both prevalence rates of excess weight and abdominal obesity and the variables associated with these outcomes can differ depending on which anthropometric indicator is analyzed[11-13]. As a result, the literature recommends using several different anthropometric indicators for identification of overweight and obesity[8,14] in order to enable greater understanding of outcomes. Notwithstanding, few Brazilian studies have analyzed the prevalence of excess weight and abdominal obesity using more than one anthropometric indicator[11-13].

The objective of this study was therefore to analyze the prevalence of excess weight and abdominal obesity and their associations with sociodemographic factors in technical and administrative staff at the Universidade Federal de Santa Catarina (UFSC), using several different anthropometric indicators.

METHODOLOGICAL PROCEDURES

This study of excess weight, abdominal obesity and associated sociodemographic factors in technical and administrative staff at UFSC is part of a cross-sectional epidemiological research project entitled "Lifestyle, physical activity, perceived body image and health risk factors in educational technical and administrative staff at the Universidade Federal de Santa Catarina", which was approved by the Human Research Ethics Committee at UFSC, hearing number 95.411, on September 10, 2012.

The target population for this study comprised all technical and administrative staff at UFSC. According to data provided by UFSC, in September of 2012 the university's educational technical and administrative staff numbered 2,993 people, 171 were on the "auxiliary" employment grade, 1,823 on the "intermediate" grade and 999 were employed on the "top" grade.

The following parameters were used for the sample size calculation: unknown prevalence of the outcomes in question (50%), sampling error of 3.5 percentage points and 95% confidence level, resulting in a minimum sample size of 621 people. This figure was increased by 20% to allow for losses and refusals to take part, making a final total of 746 staff members.

A proportional sample frame was used to guarantee representativeness of staff on each of the three employment grades: auxiliary, intermediate or top. As a result, 43 auxiliary staff members, 456 intermediate staff members and 250 top level staff members were selected by systematic random sampling, making a final sample of 749 staff members.

Sampling was conducted with substitution of staff members who were on leave or transfers, who were no longer employed by the university because of voluntary or enforced termination of employment or retirement and of members of staff who could not be located due to inaccurate information on their place of work. A total of 54 staff members were substituted for one of these reasons. Each was substituted by the next staff member on the list.

Inclusion criteria were as follows: all UFSC technical and administrative staff, of either sex, who agreed to take part in the study and signed a free and informed consent form. Staff members were excluded if they did not have anthropometric measurements taken, whether because of some impediment or because they refused. Pregnant women were also excluded. Staff members who were on holiday, on sick leave or who could not be located after confirmation of their place of work were defined as losses.

Data collection was conducted from October to December of 2012 (a total of 10 weeks) at staff members' places of work, during their working hours. The data collection team was made up of teachers and students from the Physical Education degree course and had all been trained in advance. The examiners who collected the anthropometric data calculated technical errors of measurement (TEM)[15,16]. The results were acceptable: intra-observer TEM for Height =0.08 cm; inter-observer TEM for Height =0.58 cm, intra-observer TEM for WC =0.24 cm; and inter-observer TEM for WC =1.98 cm.

Body mass was measured using an *Incoterm*® brand digital balance, with 150 kg capacity and a 100-gram scale. Height was measured using a tape measure with a resolution of 0.1 cm, fixed on a wall vertically at one meter from the floor, in accordance with procedures described by the International Society for the Advancement of Kinanthropometry[17]. Waist circumference (WC) was measured at the subject's smallest circumference using a *Sanny*® brand, non-stretch anthropometric tape, with resolution of 0.1 cm[17]. When the smallest circumference could not be identified, the midpoint between the lowest rib and the iliac crest was used.

Body mass and height were then used to calculate body mass index (BMI), using the formula body mass (kg) divided by the square of height (m), expressed in kg/m^2. Excess body weight was identified using the cutoff points proposed by the World Health Organization[1], collapsing the overweight and obesity categories into a single excess weight category.

Abdominal obesity was diagnosed using two anthropometric indicators: WC and the waist to height ratio (WHtR). The WHtR was calculated by dividing WC by height. Female staff members with WC ≥ 80 cm, male staff members with WC ≥ 94 cm[1] and staff members of either sex with WHtR ≥0.50[18] were classified as having abdominal obesity.

A sociodemographic questionnaire was used to collect data on date of birth, date of assessment, sex, employment grade, skin color, marital status, socioeconomic status and educational level for each staff member. These data were self-reported.

Age was calculated from the date of assessment and date of birth and categorized into the following age groups: 20–29 years, 30–39 years, 40–49 years, 50–59 years or 60–69 years. The skin color response options were those used in Brazilian national surveys, as follows: white (*branca*), brown (*parda*), black (*preta*), yellow (*amarela*) or indigenous (*indígena*)[19]. There were very people who self-identified as brown, yellow or indigenous, so these three categories were collapsed for analysis. Marital status was classified as single, married or separated/widowed.

Socioeconomic status was classified using a questionnaire based on the Brazilian Economic Classification Criteria (Critério de Classificação Econômica Brasil)[20] which has the following categories: A1, A2, B1, B2, C1, C2, D and E. For the purposes of analysis, these categories were collapsed as follows: High (A1 and A2), Intermediate (B1 and B2) and Low (C1, C2, D and E). The staff members' educational level was classified as follows: started primary school; graduated primary school; started secondary school; graduated secondary school; started higher education; or graduated higher education[20]. These data were then categorized as follows: ≤ 8 years in education (started and/or graduated primary school); 9 to 11 years in education (started and/or graduated secondary school) and ≥ 12 years in education (started and/or graduated higher education).

A descriptive analysis was conducted calculating means, standard deviations and distributions of absolute and relative frequencies. Means for variables with normal distribution (Kolmogorov-Smirnov test) were compared by sex using Student's *t* test for independent samples. Variables without normal distribution (age and body mass) were compared using the equivalent nonparametric test: Mann-Whitney's U. Differences between the proportions of categories for sociodemographic variables were identified by non-overlapping confidence intervals (95%CI).

Where outcome prevalence rates were greater than 20%, Poisson regression with robust error variance was used to estimate the prevalence ratios and respective 95%CIs for outcomes (BMI, WC and WHtR) against sociodemographic indicators (age, skin color, marital status, educational level, socioeconomic level and employment grade). On the basis of a temporal relationship that is hypothesized to exist between the variables under analysis, the adjusted model was analyzed by hierarchies in three levels: 1) age and skin color (distal), 2) marital status and educational level (intermediate) and 3) socioeconomic level and employment grade (proximal). Variables were controlled for each other at each level of the hierarchical model and for variables in earlier levels that had p values ≤ 0.20. All analyses were run with a 95%CI. Data were analyzed using the *Statistical Package for the Social Sciences* (SPSS), version 15.0 for Windows and Stata Standard Edition, version 110 for Windows.

RESULTS

A total of 623 UFSC technical and administrative staff took part in the study. There were 83 refusals and 43 losses due to holidays (n=16), sick leave (n=16) or because attempts at contact during the study period were unsuccessful (n=11). Staff members were excluded from the sample if they refused to undergo anthropometric measurement (n=3), were unable to be measured (n=3) or were pregnant (n=2). The final sample therefore comprised 615 staff members: 283 men and 332 women.

Table 1 lists the general characteristics of the sample, by sex. The men had higher mean age, body mass, height, WC, BMI and WHtR than the women ($p<0.001$). There were differences between the sexes for the following indicators of excess weight and abdominal obesity: BMI in the normal category (men: 95%CI=29.84; 41.08; women: 95%CI=43.39; 54.20) and the overweight category (men: 95%CI=40.89; 51.59; women: 95%CI=26.31; 36.34), and WHtR in the normal (men: 95%CI=32.47; 43.86; women: 95%CI=54.03; 64.65) and excessive categories (men: 95%CI=56.14; 67.53; women: 95%CI=35.35; 45.97) (Table 1).

The sociodemographic data showed that the most common age group was 50-59 (40.99% of the men and 31.63% of the women), that the most common socioeconomic levels were B1 for women (35.84%) and B2 for men (32.51% of the men), and that the majority of staff were married (67.14% of the men and 53.61% of the women) had spent at least 12 years in education (65.60% of men and 73.72% of the women), had white skin (86.07% of the men and 90.21% of the women) and were on the intermediate employment grade (65.54% of the men and 59.34% of the women) (Table 2).

Figure 1 shows that the men and women in this sample differed in terms of the prevalence of excess weight and abdominal obesity, as measured by BMI (men: 63.60%, 95%CI=57.96; 69.24; women: 49.70%, 95%CI=44.29;

55.11) and WHtR (men: 61.84%, 95%CI=56.14; 67.53; women: 40.66%, 95%CI=35.35; 45.97). Men had greater prevalence of excess weight and abdominal obesity than women when measured by WHtR, whereas women had greater prevalence then men when measured by WC.

Table 1. Characteristics of the sample, by sex. UFSC, Brazil, 2012.

Variables	Men		Women	
	n	Mean (SD)	n	Mean (SD)
Age (years) ††	283	46.88 (10.28)	332	43.62 (10.49)
Body mass (kg) ††	283	79.81 (14.96)	332	66.89 (12.33)
Height (cm) †	283	172.52 (9.18)	332	161.27 (6.72)
WC (cm) †	283	90.31 (11.36)	332	78.33 (10.67)
BMI (kg/m^2) †	283	27.11 (9.35)	332	25.76 (4.64)
WHtR (cm) †	283	0.53 (0.08)	332	0.49 (0.07)
	n	**% (95%CI)**	**n**	**% (95%CI)**
BMI				
Underweight	3	1.06 (-0.14; 2.26)	5	1.51 (0.19; 2.82)
Normal	100	35.46 (29.84; 41.08)	162	48.80 (43.39; 54.20)
Overweight	129	45.74 (40.89; 51.59)	104	31.33 (26.31; 36.34)
Obesity I	34	12.06 (8.23; 15.88)	48	14.46 (10.66; 18.26)
Obesity II	12	4.26 (1.89; 6.63)	10	3.01 (1.16; 4.86)
Obesity III	4	1.42 (0.03; 2.81)	3	0.90 (-0.12; 1.93)
WC				
Normal	188	66.43 (60.90; 71.97)	191	57.53 (52.19;62.87)
Increased risk	53	18.73 (14.15; 23.30)	82	24.70 (20.04; 29.36)
Greatly increased risk	42	14.84 (10.67;19.01)	59	17.77 (13.64; 21.90)
WHtR				
Normal	108	38.16 (32.47; 43.86)	197	59.34 (54.03; 64.65)
Excessive	175	61.84 (56.14; 67.53)	135	40.66 (35.35; 45.97)

Mean, SD: standard deviation, WC: waist circumference, BMI: body mass index, WHtR: waist to height ratio, kg: kilograms, cm: centimeters, m: meters, min: minutes, 95%CI: 95% confidence interval. †Student's *t* test; ††Mann-Whitney U test.

Figures for prevalence of excess weight and abdominal obesity are shown in Table 3. Among the men, prevalence rates for excess weight in the age groups 40-49 years (95%CI=61.58; 82.01) and 50-59 years (95%CI=56.74; 74.30) were greater than for 20-29 year-olds (95%CI=13.00; 53.67). Prevalence rates of abdominal obesity, according to WHtR, were greater for men in the 40-49 (95%CI=54.59; 76.18), 50-59 (95%CI=61.35; 78.31) and 60-69 age groups (95%CI=60.02; 96.50) than in the 20-29 age group (95%CI=6.32; 43.68). Prevalence of abdominal obesity according to WHtR was greater at the high socioeconomic level (95%CI=65.88; 90.65) than at the intermediate level (95%CI=51.06; 65.60).

Among the women, according to all three indicators analyzed prevalence rates of excess weight and abdominal obesity were higher in the 40-49 years (BMI: 95%CI=44.00; 64.51; WC: 95%CI=36.53; 57.08; WHtR: 95%CI=33.41; 53.83), 50-59 years (BMI: 95%CI=49.49; 68.61; WC:

95%CI=44.60; 63.97; WHtR: 95%CI=43.63; 63.03) and 60-69 years age groups (BMI: 95%CI=57.07; 102.93; WC: 95%CI=57.07; 102.92; WHtR: 95%CI= 57.07; 102.93) than in the 20-29 age group (BMI: 95%CI=12.32; 40.06; WC: 95%CI= 6.66; 31.43; WHtR: 95%CI=4.91; 28.42). In both sexes there was a progressive increase in prevalence rates of excess weight and abdominal obesity as age increased (Table 3).

Table 2. Distribution of sociodemographic indicators and health risk factors in UFSC technical and administrative staff, by sex. Brazil, 2012.

Variables	Men (n=283)		Women (n=332)	
	n	% (95%CI)	n	% (95%CI)
Age (years)				
20-29	24	8.48 (5.21; 11.75)	42	12.65 (9.07; 16.24)
30-39	42	14.84 (10.67; 19.01)	76	22.89 (18.35; 27.23)
40-49	78	27.56 (22.32; 32.80)	94	28.31 (23.44; 33.18)
50-59	116	40.99 (35.22; 46.75)	105	31.63 (26.60; 36.65)
60-69	23	8.13 (4.92; 11.33)	15	4.52 (2.27; 6.76)
Skin color				
White (*Branca*)	241	86.07 (81.99; 90.15)	295	90.21 (86.98; 93.45)
Brown (*Parda*)	21	7.50 (4.40; 10.60)	18	5.50 (3.02; 7.99)
Black (*Negra*)	12	4.29 (1.90; 6.67)	11	3.36 (1.40; 5.33)
Yellow (*Amarela*)	4	1.43 (0.03; 2.83)	3	0.92 (-0.12; 1.96)
Indigenous (*Indígena*)	2	0.71 (-0.28; 1.71)		
Marital status				
Single	58	20.49 (15.76; 25.23)	99	29.82 (24.87; 34.77)
Married	190	67.14 (61.63; 72.64)	178	53.61 (48.22; 59.01)
Separate/Divorced	31	10.95 (7.29;14.61)	49	14.76 (10.92; 18.60)
Widowed	4	1.41 (0.03; 2.80)	6	1.81 (0.37; 3.25)
Socioeconomic level				
A1	11	3.89 (1.62; 6.15)	7	2.11 (0.66; 3.66)
A2	46	16.25 (11.93; 20.58)	54	16.27 (12.27; 20.26)
B1	88	31.10 (25.67; 36.52)	119	35.84 (30.66; 41.03)
B2	92	32.51 (27.02; 38.00)	105	31.63 (26.60; 36.65)
C1	33	11.66 (7.90; 15.42)	37	11.14 (7.74; 14.55)
C2	9	3.18 (1.12; 5.24)	8	2.41 (0.75; 4.07)
D	3	1.06 (-0.14; 2.26)	2	0.60 (-0.23; 1.44)
E	1	0.03 (-0.33; 1.05)		
Educational level				
≤ 8 years	28	9.93 (6.42; 13.44)	8	2.43 (0.75; 4.08)
9 to 11 years	69	24.47 (19.42; 29.62)	79	23.87 (19.25; 28.48)
≥ 12 years	185	65.60 (60.02; 71.18)	244	73.72 (68.95; 78.48)
Employment grade				
Auxiliary	23	8.13 (4.92; 11.33)	17	5.12 (2.74; 7.50)
Intermediate	177	65.54 (56.87; 68.22)	197	59.34 (54.03; 64.65)
Top	83	29.33 (23.99; 34.67)	118	35.54 (30.37; 40.72)

95%CI: 95% confidence interval.

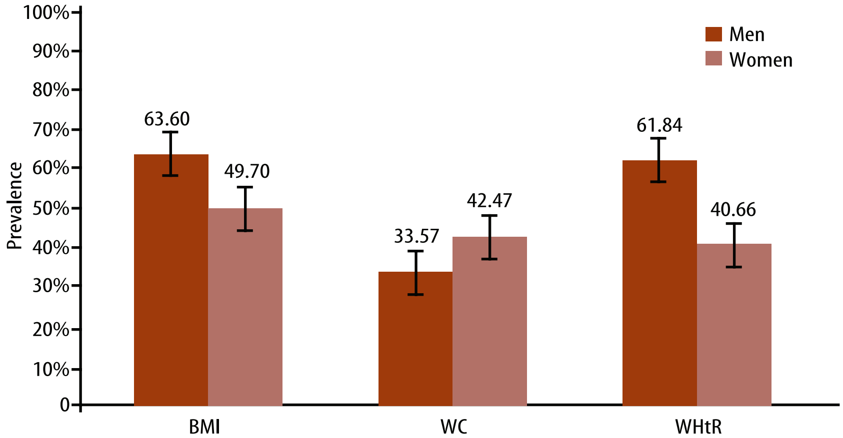

Figure 1. Prevalence of excess weight and abdominal obesity among UFSC technical and administrative staff, by sex. Brazil, 2012.

Women who were married (95%CI=46.54; 61.33) or separated/widowed (95%CI=46.63; 73.37) had higher prevalence for excess weight than single women (95%CI=26.72; 46.01). Women who had spent eight to 12 years in education (BMI: 95%CI=53.77; 73.34; WC: 95%CI=45.80; 68.12) or fewer than 8 years in education (BMI: 95%CI=57.94; 117.06; WC: 95%CI=57.94; 117.06) had higher prevalence rates of excess weight and abdominal obesity than women who had spent more than 12 years in education (BMI: 95%CI=37.18; 47.71; WC: 95%CI=30.00; 42.13). When prevalence of abdominal obesity was classified according to WHtR, women who had spent more than 12 years in education had a higher prevalence rate than women with eight to 12 years' education (95%CI=49.45; 71.77) and women with fewer than 8 years' education (95%CI=26.07; 37.86). Women who had sent eight to 12 years in education had a higher prevalence of obesity than those who had spent fewer than 8 years in education (Table 3).

When analyzed by employment grade, women employed at the intermediate grade (95%CI=39.67; 53.73) had a higher prevalence of abdominal obesity measured by WHtR than women at the top grade (95%CI=21.30; 38.02) (Table 3).

Table 4 lists variables and their associations with excess weight and abdominal obesity. For men, age was the only indicator associated with BMI and WHtR in the hierarchical adjusted analysis. Men aged 40-49 had a 2.15 times greater probability of having excess weight than 20-29-year-old men. The probability of excess weight was 1.95 and 1.97 times greater in the 50-59 and 60-69 age groups, respectively, in relation to the 20-29 age group. For abdominal obesity identified by WHtR, the prevalence rates for 40-49 years (PR=2.62, 95%CI=1.28; 5.36), 50-59 years (PR=2.76, 95%CI=1.37; 5.62) and 60-69 years (PR=3.14, 95%CI=1.51; 6.50) were higher than the prevalence for the 20-29 age group.

After adjustment, only age and educational level remained associated with excess weight among women. Women aged 40-49, 50-59 and 60-69 had 2.11, 2.28 and 3.02 times the probability of having excess weight than women aged 20-29 years. The probability of women who had spent 8 or

Table 3. Prevalence of excess weight and abdominal obesity among male and female technical and administrative staff at UFSC, by sociodemographic factors. Brazil, 2012.

Variables	BMI		WC		WHtR	
	n	% (95%CI)	n	% (95%CI)	n	% (95%CI)
Men						
Age (years)						
20-29	8	33.33 (13.00; 53.67)	5	20.83 (3.31; 38.35)	6	25.00 (6.32; 43.68)
30-39	25	59.52 (44.04; 75.01)	8	19.05 (6.67; 31.43)	19	45.24 (9.54; 60.94)
40-49	56	71.79 (61.58; 82.01)	31	39.74 (28.64; 50.85)	51	65.38 (54.59; 76.18)
50-59	76	65.52 (56.74; 74.30)	44	37.93 (28.97; 46.89)	81	69.83 (61.35; 78.31)
60-69	15	65.21 (44.16; 86.28)	7	30.43(10.08; 50.78)	18	78.26 (60.02; 96.50)
Skin color						
White (Branca)	153	63.49 (57.36; 69.61)	81	33.61 (27.60; 39.62)	147	61.00 (54.79; 67.20)
Black (Negra)	8	66.67 (35.38; 97.95)	4	33.33 (2.05; 64.62)	8	62.96 (43.49; 82.43)
B/Y/I*	16	59.26 (39.45; 79.07)	9	33.33 (14.33; 52.34)	17	66.67 (35.38; 97.95)
Marital status						
Single	32	55.17 (41.98; 68.36)	20	34.48 (21.88; 47.09)	32	55.17 (41.98; 68.36)
Married	125	65.79 (58.98; 72.60)	63	33.16 (26.40; 39.91)	121	63.68 (56.78; 70.58)
Separated/Widowed	23	65.71 (49.17; 82.26)	12	34.28 (17.74; 50.83)	22	62.85 (46.02; 79.70)
Socioeconomic level						
Low	36	63.16 (50.24; 76.07)	22	38.60 (25.56; 51.63)	34	59.65 (46.52; 72.78)
Intermediate	109	60.56 (53.35; 67.76)	54	30.00 (23.24; 36.76)	105	58.33 (51.06; 65.60)
High	35	76.09 (63.28; 88.89)	19	41.30 (26.52; 56.09)	36	78.26 (65.88; 90.65)
Educational level						
≥ 12 years	116	62.70 (55.67; 69.74)	58	31.35 (24.60; 38.10)	107	57.84 (50.66; 65.02)
9 to 11 years	45	65.22 (53.29; 76.74)	28	40.58 (28.70; 52.46)	47	68.12 (56.83; 79.39)
≤ 8 years	18	64.29 (45.36; 83.21)	8	28.57 (10.73; 46.41)	20	71.43 (53.59; 89.27)
Employment grade						
Top	50	60.24 (49.49; 70.99)	25	30.12 (20.04; 40.20)	49	59.04 (48.23; 69.84)
Intermediate	113	63.84 (56.69; 70.99)	61	34.46 (27.39; 41.53)	108	61.02 (53.76; 68.27)
Auxiliary	17	73.91 (54.50; 93.33)	9	39.13 (17.55; 60.71)	18	78.26 (60.02; 96.50)
Women						
Age (years)						
20 – 29	11	26.19 (12.32; 40.06)	8	19.05 (6.66; 31.43)	7	16.67 (4.91; 28.42)
30 – 39	29	38.16 (26.98; 49.33)	20	26.32 (16.19; 36.45)	19	25.00 (15.04; 34.96)
40 – 49	51	54.26 (44.00; 64.51)	44	46.80 (36.53; 57.08)	41	43.62 (33.41; 53.83)
50 – 59	62	59.05 (49.49; 68.61)	57	54.29 (44.60; 63.97)	56	53.33 (43.63; 63.03)
60 – 69	12	80.00 (57.07; 102.93)	12	80.00 (57.07; 102.92)	12	80.00 (57.07; 102.93)
Skin color						
White (Branca)	146	49.49 (43.75; 55.23)	125	42.37 (36.70; 48.04)	119	40.34 (34.71; 45.97)
Black (Negra)	11	52.38 (29.09; 75.68)	9	42.86 (19.77; 65.94)	9	42.86 (19.77; 65.94)
B/Y/I*	7	63.64 (29.74; 97.53)	5	45.45 (10.37; 80.54)	5	45.45 (10.37; 80.54)
Marital status						
Single	36	36.36 (26.72; 46.01)	35	35.35 (25.77; 44.94)	33	33.33 (23.88; 42.78)
Married	96	53.93 (46.54; 61.33)	81	45.51 (38.12; 52.89)	77	43.26 (35.91; 50.61)
Separated/Widowed	33	60.00 (46.63; 73.37)	25	45.45 (31.87; 59.04)	25	45.45 (31.87; 59.04)
Socioeconomic level						
Low	26	42.62 (29.85; 55.39)	21	34.42 (22.16; 46.70)	20	32.79 (20.66; 44.91)
Intermediate	112	50.00 (43.40; 56.60)	99	44.20 (37.64; 50.75)	93	41.52 (35.02; 48.02)
High	27	57.45 (42.77; 72.12)	21	44.68 (29.93; 59.44)	22	46.81 (31.32; 61.62)

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Variables	BMI		WC		WHtR	
	n	% (95%CI)	n	% (95%CI)	n	% (95%CI)
Educational level						
≥ 12 years	106	43.44 (37.18; 47.71)	88	36.07 (30.00; 42.13)	8	100.00
9 to 11 years	51	64.56 (53.77; 73.34)	45	56.96 (45.80; 68.12)	48	60.76 (49.45; 71.77)
≤ 8 years	7	87.50 (57.94; 117.06)	7	87.50 (57.94; 117.06)	8	31.97 (26.07; 37.86)
Employment grade						
Top	48	40.68 (31.68; 49.67)	43	36.44 (27.63; 45.25)	35	29.66 (21.30; 38.02)
Intermediate	106	53.81 (46.78; 60.83)	88	44.67 (37.67; 51.67)	92	46.70 (39.67; 53.73)
Auxiliary	11	64.71 (39.38; 90.03)	10	58.82 (32.74; 84.91)	8	47.06 (20.61; 73.51)

BMI: body mass index, WC: waist circumference, WHtR: waist to height ratio, %: prevalence; *B/Y/I: brown/yellow/indigenous (parda/amarela/indigena); 95%CI: 95% confidence interval. Figures in bold indicate significant differences in prevalence rates.

fewer years in education having excess weight was 0.67 times the probability that women who had spent 12 years or more in education would have excess weight (Table 4).

Only age and educational level remained associated with female WC. The prevalence rates of abdominal obesity for the 40-49 (PR=2.55, 95%CI=1.31; 4.94), 50-59 (PR=2.86, 95%CI=1.49; 5.47) and 60-69 age groups (PR=4.21, 95%CI=2.15; 8.29) were all higher than for with women aged 20–29 years. The probability of abdominal obesity was lower (PR=0.62, 95%CI=0.44; 0.90) for women with 8 or fewer years' education (Table 4).

After hierarchical adjustment, women aged 40-49 years, 50-59 years and 60-69 years respectively had 2.68, 3.19 and 4.80 times greater probability of abdominal obesity according to WHtR than women aged 20-29 years. Women with 8 or fewer years' education had a lower probability (PR=0.49, 95%CI=0.39; 0.64) of abdominal obesity than those who had spent 12 years or more in education (Table 4).

Table 4. Prevalence ratios and confidence intervals after analysis adjusted by hierarchical levels, for indicators of excess weight and abdominal obesity and sociodemographic variables for male and female technical and administrative staff at UFSC, Brazil, 2012.

Variables	BMI		WC		WHtR	
	PR (95%CI)	p	PR (95%CI)	p	PR (95%CI)	p
Men						
Age (years)[1]						
20-29	1		1		1	
30-39	1.76 (0.94; 3.27)	0.074	0.82 (0.29; 2.28)	0.703	1.76 (0.81; 3.81)	0.155
40-49	2.15 (1.20; 3.85)	0.010	1.92 (0.84; 4.41)	0.122	2.62 (1.28; 5.36)	0.008
50-59	1.95 (1.09; 3.49)	0.024	1.86 (0.83; 4.20)	0.135	2.76 (1.37; 5.62)	0.005
60-69	1.97 (1.04; 3.74)	0.037	1.47 (0.54; 3.99)	0.447	3.14 (1.51; 6.50)	0.002
Skin color [1]						
White (Branca)	1		1		1	
Black (Negra)	0.98 (0.64; 1.48)	0.910	0.88 (0.38; 2.02)	0.763	0.86 (0.64; 1.45)	0.856
B/Y/I*	0.94 (0.69; 1.29)	0.708	1.03 (0.59; 1.82)	0.916	1.01 (0.76; 1.36)	0.924
Marital status[2]						
Single	1		1		1	
Married	1.08 (0.84; 1.40)	0.520	0.78 (0.51; 1.19)	0.253	0.97 (0.75; 1.25)	0.813
Separated/Widowed	1.05 (0.75; 1.48)	0.782	0.75 (0.41; 1.36)	0.342	0.88 (0.63; 1.24)	0.471

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Variables	BMI		WC		WHtR	
	PR (95%CI)	p	PR (95%CI)	p	PR (95%CI)	p
Education[2]						
≥ 12 years	1		1		1	
9 to 11 years	1.01 (0.72; 1.41)	0.946	1.52 (0.79; 2.90)	0.204	1.05 (0.79; 1.39)	0.748
≤ 8 years	1.05 (0.77; 1.43)	0.767	1.28 (0.69; 2.41)	0.424	0.99 (0.76; 1.29)	0.933
Socioeconomic level[3]						
Low	1		1		1	
Intermediate	0.82 (0.66; 1.20)	0.250	0.76 (0.49; 1.19)	0.227	0.85 (0.69; 1.05)	0.127
High	0.85 (0.63; 1.46)	0.143	1.04 (0.57; 1.90)	0.890	0.89 (0.66; 1.20)	0.452
Employment grade[3]						
Top	1		1		1	
Intermediate	1.03 (0.82; 1.29)	0.516	1.14 (0.72; 1.80)	0.671	1.01 (0.81; 1.26)	0.930
Auxiliary	1.04 (0.74; 1.47)	0.923	1.19 (0.54; 2.61)	0.582	1.17 (0.85; 1.63)	0.337
Women						
Age (years)[1]						
20-29	1		1		1	
30-39	1.45 (0.81; 2.60)	0.209	1.39 (0.67; 2.88)	0.376	1.50 (0.69; 3.29)	0.306
40-49	2.11 (1.23; 3.63)	0.007	2.55 (1.31; 4.94)	0.006	2.68 (1.31; 5.71)	0.007
50-59	2.28 (1.34; 3.88)	0.002	2.86 (1.49; 5.47)	0.002	3.19 (1.58; 6.44)	0.001
60-69	3.02 (1.71; 5.34)	<0.001	4.21 (2.15; 8.29)	<0.001	4.80 (2.33; 9.92)	<0.001
Skin color[1]						
White (Branca)	1		1		1	
Black (Negra)	0.96 (0.63; 1.46)	0.535	0.93 (0.48; 1.82)	0.851	0.99 (0.51; 1.94)	0.977
B/Y/I*	1.16 (0.73; 1.82)	0.841	0.90 (0.54; 1.49)	0.670	0.94 (0.56; 1.57)	0.816
Marital status[2]						
Single	1		1		1	
Married	1.32 (0.97; 1.79)	0.073	1.08 (0.80; 1.48)	0.610	1.07 (0.79; 1.45)	0.677
Separated/Widowed	1.29 (0.90; 1.84)	0.169	0.86 (0.58; 1.48)	0.449	0.89 (0.59; 1.33)	0.557
Education[2]						
≥ 12 years	1		1		1	
9 to 11 years	0.87 (0.63; 1.21)	0.403	0.81 (0.56; 1.15)	0.240	0.77 (0.62; 0.96)	0.021
≤ 8 years	0.67 (0.49; 0.94)	0.019	0.62 (0.44; 0.90)	0.010	0.49 (0.39; 0.64)	<0.001
Socioeconomic level[3]						
Low	1		1		1	
Intermediate	0.85 (0.65; 1.12)	0.075	1.07 (0.77; 1.47)	0.695	0.97 (0.72; 1.32)	0.862
High	0.74 (0.50; 1.11)	0.282	0.88 (0.56; 1.39)	0.584	0.90 (0.57; 1.41)	0.640
Employment grade[3]						
Top	1		1		1	
Intermediate	1.10 (0.83; 1.46)	0.792	0.95 (0.69; 1.32)	0.764	1.16 (0.82; 1.64)	0.394
Auxiliary	1.02 (0.63; 1.65)	0.828	0.99 (0.55; 1.79)	0.968	0.89 (0.45; 1.76)	0.746

BMI: body mass index; WC: waist circumference, WHtR: waist to height ratio; *B/Y/I: brown/yellow/indigenous (parda/amarela/indígena); PR: prevalence ratio; 95%CI: 95% confidence interval.1: distal level;2: intermediate level;3: proximal level.

DISCUSSION

The results of this study have revealed elevated prevalence rates of excess weight and abdominal obesity among the workers investigated. There were associations between excess weight and abdominal obesity measured by

WHtR and age for both men and women, and associations with educational level for women. Abdominal obesity diagnosed using WC was associated with age and educational level among the women only.

The excess weight prevalence rates were 63.60% for men and 49.70% for women, which are higher than the VIGITEL survey found for Brazil (52.1.5% and 44.3%) and also lower than VIGITEL figures for the city Florianópolis (54.2% e 38.9%), in which UFSC is located[3]. In other words, the UFSC staff are a population subset with at greater health risk than the population of Florianópolis. The 1999 Pró-Saúde survey investigated staff at a university in Rio de Janeiro, Brazil, finding that 59.7% of male staff and 48.6% of female sex had excess weight[6]. However, the time that has passed between the Pró-Saúde survey and this study should be borne in mind, since national Brazilian surveys[3] have shown that the prevalence of overweight and obesity is increasing among both men and women in Brazil.

Abdominal obesity was detected in 33.57% of men using WC and 61.84% using WHtR and in 42.47% of women using WC and 40.66% according to WHtR. The epidemiological study EpiFloripa was also conducted in Florianópolis and found lower prevalence rates of abdominal obesity for both sexes, whether diagnosed by WC (11.6% of men and 19.7% of women) or by WHtR (50.5% of men and 38.9% of women)[13]. However, the EpiFloripa study used higher cutoff points for diagnosing abdominal obesity by WC (88 cm to 102 cm) than were used in the study reported here (80 cm to 94 cm), which reduces the prevalence of abdominal obesity detected by this indicator.

The prevalence rates of excess weight and abdominal obesity observed here are lower than figures for adults in some other countries. In Puerto Rico the proportions of men and women with excess weight were 78.4% and 79.3%[21], in Kuwait they were 77.3% and 77.4%[22] and in the United States 72.3% of men and 64.1% of women had excess weight[23]. Prevalence rates of abdominal obesity diagnosed by WC were 37.6% and 54.4% in Puerto Rico[21], 36.2% and 79.9% in Iran and 57.0% and 56.6% in Australia[24], for men and women, respectively. Using WHtR, 83.7% of men and 78.5% of women in Puerto Rico[21] were diagnosed with abdominal obesity.

There were differences between the sexes in prevalence rates of excess weight and of abdominal obesity diagnosed by WHtR, with a higher proportion of men at risk according to these indicators. These data are similar to what has been observed in metropolitan Belém, PA, Brazil[25], by the national VIGITEL survey[3] and in the United States[23], where men also had a higher prevalence rate of excess weight than women. When sexes are compared for overweight and obesity according to BMI, studies report higher prevalence rates of overweight among men[3,21,22] and of obesity among women[21,22]. Notwithstanding, irrespective of the categorization employed, many studies have failed to identify differences between the sexes in terms of the prevalence rates of overweight, obesity or excess weight, when identified using BMI[3,11,12].

The elevated prevalence rates of excess weight and abdominal obesity that we have observed among technical and administrative workers at UFSC should be a cause of concern for departments responsible for employee health, considering the major impact these risk factors can have on people's health. Excess weight and central accumulation of body fat are associated with metabolic and cardiovascular disorders[21], among other diseases, and are linked with mortality[8]. Cardiovascular disease is the number one obesity-related cause of death in the adult population[8].

Men aged 40-49, 50-59 or 60-69 years had a greater probability of excess weight, and of abdominal obesity according to WHtR, than 20-29-year-old men. Among the women, the proportion of excess weight and abdominal obesity increased from 40-49 years through 60-69 years, according to all three indicators analyzed. The increase in prevalence rates of excess weight and abdominal obesity as age increases is well-documented in the literature and has been observed in several Brazilian cities as well as in international studies[3,12,13,22,25].

For men, the probability of excess weight did not increase through all age groups, but dropped off in the 50-59 age group and then increased once more in the 60-69 group. A study conducted in Salvador, BA, Brazil, reported similar findings, since the probability of excess weight among men reduced in the 40-49 years age group and increased in the 50-59 group and WC was not linked with age among men[12]. In contrast, a study conducted in 2009 in Florianópolis, SC, Brazil, found that abdominal obesity measured using WC was associated with age in both sexes[13].

From the point at which people reach adulthood onwards, metabolic abnormalities caused by aging lead to many changes to the body[26]. Body mass tends to increase, as does waist circumference and total body fat, up to more or less the age of 60. Notwithstanding, the increases in total body fat and the accumulation of fat in specific parts of the body can be detected even in the absence of increase in body mass[27].

Women with lower educational level had a lower probability of excess weight and of abdominal obesity, according to BMI, WC and WHtR, when compared with women who had spent longer in education. This result is in contrast with the findings of a study in the city of Florianópolis, SC, Brazil, which found lower prevalence of abdominal obesity according to WHtR among women with higher educational levels[13]. Other studies have also found an increased probability of overweight, obesity[6,22] and abdominal obesity according to WC[28,29], among women with lower educational levels.

As can be seen in the literature, it is generally expected that prevalence rates of excess weight and abdominal obesity will be lower among people with higher levels of education, on the basis that it is assumed that they know more about the importance of healthy habits[30]. However, since the sample studied here is a population of workers, it can be hypothesized that lower levels of education are reflected in occupations that demand greater physical effort. In Belo Horizonte, MG, Brazil, women whose work involved intense physical activities had lower prevalence of abdominal obesity[29].

The healthy worker effect may be a limiting factor in this study, since workers who were off sick or on sick leave during the study period were not analyzed. Another possible limitation is the cross-sectional design which does not allow for the establishment of causal relationships between excess weight and abdominal obesity and the sociodemographic variables investigated.

Among the study's strong points are the high number of staff members assessed and the fact that employees at all grades took part, which meant that workers who have different occupations and perform different tasks were included in the sample. Additionally, the anthropometric measurement was rigorously standardized and examiners were duly trained in advance to take measurements correctly. Furthermore, as recommended in the literature, more than one anthropometric indicator was used to identify excess weight and abdominal obesity and it was shown that different factors are associated with each outcome.

CONCLUSIONS

There were elevated prevalence rates of excess weight and abdominal obesity among technical and administrative staff at UFSC and rates were higher for men than for women according to BMI and WHtR. Approximately 64 and 62 men in every 100 had unhealthy BMI and WHtR, respectively. Furthermore, different sociodemographic factors were associated with excess weight and abdominal obesity depending on sex and the anthropometric indicator analyzed.

These results identify a need for interventions to prevent and treat excess weight and abdominal obesity specifically targeted at UFSC staff, since they are a population subset with greater exposure to health risk factors than the adult population of the city in which the university is located. Many non-transmissible chronic diseases are associated with unhealthy body composition. Interventions should pay special attention to both men and women over 40 and to women with higher educational levels.

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