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Overweight as hypertension risk prediction in bus drivers

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ABSTRACT. Blood pressure (BP) has been currently associated with several risk markers in cardiovascular diseases and excess body weight although there is only slight evidence on the association of Body Mass Index (BMI) with BP in bus drivers. Current analysis verified the association of BMI with BP in bus drivers and the risk of individuals with excess weight within the context of high blood pressure. The sample consisted of 75 bus drivers who had their BMI and BP evaluated. Statistical analysis was descriptive and Pearson correlation and odds-ratio were $p < 0.05$. A significant relationship between BMI and blood pressure, namely, $r = 0.438$ ($p < 0.05$) was evident. Individuals with weight excess weight were 4.04 times more likely to have high blood pressure ($p < 0.05$). Results showed individuals with excess weight were more likely to develop high blood pressure conditions.

Keywords: overweight, blood pressure, bus drivers.

O excesso de peso como preditor de risco para hipertensão em motoristas de ônibus

RESUMO. O excesso de peso (EP) vem sendo associado atualmente com diversos marcadores de riscos a doenças cardiovasculares, dentre eles a pressão arterial (PA), porém ainda há poucas evidências sobre a associação do índice de massa corporal (IMC) com a PA. Neste sentido, o objetivo do presente estudo foi verificar qual a associação do IMC com a PA em motoristas de ônibus, e em um segundo momento verificar qual o risco de indivíduos com excesso de peso apresentar quadros de hipertensão. A amostra foi constituída de 75 motoristas de ônibus, foram avaliados o IMC e a pressão arterial. A análise estatística empregada foi a descritiva, correlação de Pearson e Odds-ratio com um $p < 0,05$. Foi encontrada uma relação significativa entre o IMC e a pressão arterial $r = 0,438$ ($p < 0,05$). Além disso, foi constatado que indivíduos com excesso de peso apresentam 4,04 vezes mais chances de apresentarem pressão arterial elevada ($p < 0,05$). Pelos resultados apresentados concluiu-se que indivíduos que apresentam excesso de peso possuem maiores chances de desenvolverem quadros de pressão arterial elevada.

Palavras-chave: excesso de peso, hipertensão, motoristas de ônibus.

Introduction

There are currently increasing concerns on the problem of overweight in populations. In fact, it is considered a severe public health problem that also affects public transport drivers (VIEGAS; OLIVEIRA, 2006). These factors are related to bus drivers' lifestyle and the activities carried out during working hours (GIROTTO et al., 2009; ROCHA et al., 2002).

According to Ko et al. (2007), there is a trend for fat accumulation among Chinese workers. This is due to the various situations and concerns that the job demands from bus driver (BD), as a rule. In fact, activities during the day feature very few movements and many are not prepared to raise the rates of energy expenditure (LANDIM; VICTOR, 2006). Contrastingly, the literature shows that subjects classified as physically active coupled to good heart conditions are associated with low risk factor levels for hypertension (RANKINEN et al., 2007; CHASE et al., 2009; KRUEGER; FRIEDMAN, 2009; KNUTSON; CAUTER, 2008; VIEGAS; OLIVEIRA, 2006).

When the measurement of blood pressure (BP) to detect hypertension is used, the variable has in fact been associated with several risk markers caused by sedentary lifestyle adopted by BDs (ASAYAMA et al., 2009; SARNO et al., 2008). Body fat accumulation is considered the main factor that may trigger high BP, because its prevalence has reached large proportions also in BDs. In fact, there is a continuous risk in developing metabolic and cardiovascular disorders that may actually lead to death (GUSTAVSSON et al., 1996).

Fuchs et al. (2005) and Feijão et al. (2005) identified significant associations ($p < 0.05$) between

BMI and hypertension. However, few studies have been undertaken in Brazil on the risk for the development of hypertension conditions in eutrophic and overweight bus drivers (CORDEIRO et al., 1993; SANTANA et al., 2001).

Current analysis determines the prevalence of overweight and hypertension, and verifies the odds ratio for overweight BD with hypertension.

Material and methods

Sample Description

The sample consisted of 75 bus drivers, males, mean age 38.6 ± 5.7, in Ponta Grossa, Paraná State, Brazil. They all worked in the same firm and had the same 8-hour day^{-1} schedule. The study included only those who were interest in the investigation and who voluntarily signed the consent form, following Law 196/1996 for human research approved by the Ethics Committee of the Federal University of Paraná, Curitiba, Paraná State, Brazil, no. 200.401.518.7.

Instruments and procedures

A digital scale Filizola® with a capacity of 200 kg and resolution of 100 grams, calibrated only by an expert to avoid errors, was used for weighting. Subjects were instructed to attend the first evaluation clothed in shorts and shirt (GORDON et al., 1988). A stadiometer Gofeka / Cardiomed®, capacity 220 cm and 0.1 mm resolution, was employed for measuring the length of subjects who were evaluated barefooted, with the head within the Frankfurt plane (GORDON et al., 1988).

The body mass index (BMI) was calculated by dividing the body mass by the square of the height. Individuals with BMI < 25 (kg m^{-2}) were classified as normal and subjects with BMI ≥ 25 (kg m^{-2}) were classified as overweight (OW) (WHO, 1995).

Systolic (SBP) and diastolic (DBP) blood pressure was measured by using a mercury sphygmomanometer MOD/PLUS® for adults. SBP was determined by the first sound (Korotkoff phase I) and DBP when the sound disappeared (Korotkoff phase V).

Subjects were classified as hypertensive if SBP was greater than or equal to 130 mm Hg and DBP greater than or equal to 85 mm Hg, or when the use of anti-hypertension drugs was reported (NCEP, 2001). Hypertensive subjects were classified when evaluated three times a week and the subject's three measurements were above 130 by 85 mm Hg during this period.

Average blood pressure (ABP) was given by the formula: ABP = SBP + (DBP x 2) 3^{-1}.

Data analysis

Statistical analysis consisted of mean descriptive statistics, standard deviation and relative frequency. Relationships between variables were then checked by establishing Pearson correlation 'r'. A logistic regression was undertaken to estimate odds ratios, or rather, to verify the chances an overweight person had to exhibit blood pressure levels considered a risk to health. Confidence interval was 95% and significance level $p < 0.05$.

Results

Table 1 presents sample description, with special reference to mean BMI of BDs classified as overweight.

Table 1. Sample description.

Variables	Mean	SD
Age (years)	38.60	± 5.70
Weight (kg)	79.44	± 14.70
Height (cm)	168.79	± 8.53
BMI (kg m^{-2})	27.87	± 4.35
Systolic blood pressure (mm Hg)	121.33	± 15.71
Diastolic blood pressure (mm Hg)	79.66	± 11.80
Average blood pressure (mm Hg)	93.55	± 12.35

According to criteria adopted by current study, Figure 1 shows the subjects' behavior with regard to BMI and BP, checking the proportion of normal subjects and those who are at risk.

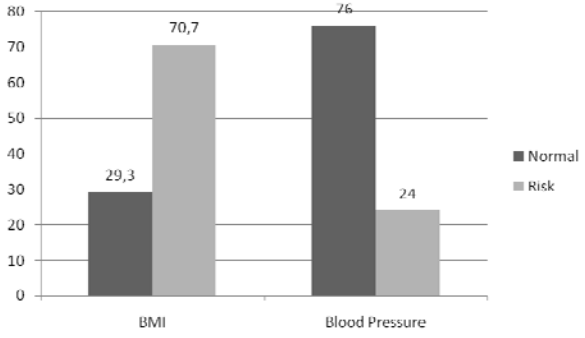

Figure 1. Proportional distribution of normal individuals and those at risk.

Results show a prevalence of individuals (70.7%) with high BMI and, in the case of hypertension, a prevalence of 24% was detected which, although lower than BMI, was nevertheless high.

Pearson correlation verified the relationship between BMI and mean blood pressure of bus drivers, where $r = 0.414$ with $p < 0.05$. The above reinforces the hypothesis that BMI is directly related to BP, or rather, the greater the BMI, the higher is the BP.

Since most overweight subjects already exhibited hypertension, as Table 2 shows, the fact that

overweight people have more chances to be committed to this disorder is underscored.

Table 2. Incidence of odds ratio estimated hypertension according to nutritional status.

	Hypertension		Total		
	NO	YES	N	OR (IC 95%)	p
Normal	20	2	22	1	-
Overweight	37	16	53	4.32 (1.043 – 20.731)	0.04

Discussion

Current analysis shows results with regard to the health of BDs. Since average BMI is above 25 kg m^{-2} (the overweight limit point) and thus BDs' overweight is underscored, an immediate intervention should be implemented to reduce and control weight to prevent risks caused by the permanence of the index levels found in current study. The literature suggests that losing weight also reduces the chances of developing cardiovascular diseases (CV) and coronary artery (CA) diseases because weight excess is closely associated with several factors that contribute to the onset of CAD (BITSKINASHVILI, 2006; ASAYAMA et al., 2009).

Owing to the high mean BMI of the subjects, a high prevalence of overweight was also detected. Sarno et al. (2008) conducted a study on workers in São Paulo, Brazil, and found a 55.9% overweight prevalence for males, whereas Cavagioni et al. (2008) found an 85% prevalence in truck drivers, with BMI above 25 kg m^{-2}. The above corroborates current analysis and demonstrates a 70.7% prevalence of OW. The particular fact is highly significant since all reports were based on the same working condition, albeit in different types of traffic events. These data reinforce the theory that drivers' OW may be considered the most serious indicator of health risk. In fact, several studies indicate that the higher the total body mass, the greater is the chance in CVD and CAD (BITSKINASHVILI, 2006; NGUYEN et al., 2009).

Current analysis on the prevalence of hypertension showed that 24% of individuals were found with the disorder. Similarly, Cassani et al. (2009) reported a prevalence of high blood pressure (HBP) in 28% of industrial workers, whereas Sarno et al, (2008) recorded a prevalence of 38.1% for males (HBP). Contrastingly, Correa Filho et al. (2002) reported a prevalence of 13.2% among BDs with hypertension conditions, although the limit was established at 140 and 90 mm Hg. In current study, the limit followed criterion by NCEP (2001) for the diagnosis of hypertension and it may have been the main reason for the disease's high rate.

In the case of anthropometric characteristics for CVD and CAD risks, BMI is a strong indicator for these disorders, as studies by Nguyen et al. (2009), Mishra et al. (2006), Mufunda et al. (2005) and Fuchs et al. (2005) show. These authors reported a positive association ($p < 0.01$) between BMI and blood pressure, indicating rate increase when BMI rates are increased. Nevertheless, the literature is still highly divergent since in studies by Cassani et al. (2009) there is no significant association between BMI and blood pressure.

In response to a possible cause of the association between BMI and blood pressure, Bitskinashvili (2006) showed a significant correlation of LDL-c with BMI. LDL causes the irritation of blood vessel wall which may cause atherosclerosis and which, in turn, decreases the vessel's lumen, obstructing the passage of blood and requiring an increase in the blood volume so that it may pass through the sites with the greatest resistance. Consequently, an increase in blood pressure, systolic and diastolic, is required. In this sense, Fuchs et al. (2005) add that the correct use of indicators may provide important insights for the research or for predicting the onset of coronary artery disease (CAD).

A linear regression model is required to show the relationship between BMI and blood pressure, as has been shown by Kshirsagar et al. (2006). The above study reported that subjects with high BMI are 3.54 more likely to develop coronary heart disease than normal ones, which is highly similar to current study. In fact, there is an odds ratio of 4.04 for overweight BDs to have high blood pressure.

Mishra et al. (2006) reported that obese males and females are three times more likely ($p < 0.05$) of developing hypertension when compared to those with normal weight. This fact supports the hypothesis that weight control programs should be frequent on the workplace, especially when, as in current study, 70.7% of the population were overweight.

Sarno et al. (2008) reported an odds ratio of 3.9 for subjects with excess weight. The above result is collaborated by the literature, since it presents the epidemiological association between overweight and high blood pressure.

The adverse effects of overweight on blood pressure and even on cholesterol levels reach approximately 45% of increased risk by CAD, even for overweight. There is actually a significantly risk increase for the developing of these diseases regardless of the traditional risk factors (BOGERS et al., 2007). In the above study, however, the lipid profile had not been studied, which constitutes a limitation.

Bitskinashvili (2006) reports that rates of systolic and diastolic blood pressure depend on fat concentration in the subject's abdominal region. BMI increase in BMI is associated to the resistance of insulin that activates the sympathetic nervous system and enhances sodium re-absorption. The increase in BP rates, especially in obese patients with hypertension, may be thus explained (MOAN et al., 1995). However, in current study the concentrations of insulin and abdominal fat were not evaluated and thus the study's range was limited.

Conclusion

The nutritional status of bus drivers provided by BMI may be an important indicator of health risks mainly with regard to blood pressure. In fact, statistically significant associations were reported in overweight subjects. Data suggest that the higher the nutritional status of the bus drivers, the more chances they have in being hypertension. Further studies involving this issue should be undertaken comprising indicators of cardiovascular risk in workers and improving their lifestyle and health within the working milieu.

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