Hypertension and Obesity in Male Bus Drivers

Erkek Belediye Otobüsü Sürücülerinde Hipertansiyon ve Obezite

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ABSTRACT Objective: The purpose of this study was to investigate the prevalence of hypertension, obesity and associated factors in male bus drivers working in Istanbul, Turkey. **Material and Methods:** This study was designed as a cross-sectional survey. All the bus drivers (n= 4261) employed by the municipality of Istanbul were examined by primary care physicians and were referred to specialists when necessary. A questionnaire regarding the socio-demographic characteristics, health history and lifestyle factors was filled by face-to-face interviews and health data were collected through detailed physical examinations, lab tests, blood pressure and height-weight measurements. **Results:** The overall prevalence of hypertension in the study group was 31.4%. Hypertension prevalence increased significantly with age and body mass index (BMI) of the drivers. Prevalence rate was 23.6% among younger bus drivers (< 35 years old), and 42.2% among older participants (≥ 50 years old). Crude prevalence rate was significantly lower among the underweight than among obese bus drivers (14.8% and 47.1% respectively, p< 0.001). However, age-adjusted prevalence rates were not significantly different (30.4% and 31.8% respectively, p> 0.05). Multivariate analysis of the survey data indicated that BMI and age were the most significant predictors of hypertension among male bus drivers. **Conclusion:** The hypertension prevalence in our study group was slightly higher than the prevalence rates estimated for the global adult male population and the male hypertension rate found in a recent national survey in Turkey. We concluded that weight control and health education could be helpful to reduce hypertension in this high-risk group.

Key Words: Epidemiology; hypertension; obesity; prevalence

ÖZET Amaç: Bu araştırmanın amacı, İstanbul'da belediye otobüslerini kullanan erkek sürücülerde hipertansiyon ve obezite görülme sıklığı ile ilişkili olabilecek etkenleri incelemektir. **Gereç ve Yöntemler:** Kesitsel olarak yürütülen bu çalışmada, İstanbul'da belediye otobüslerinde görev yapan erkek sürücüler incelenmiştir. Araştırmaya katılmayı kabul eden tüm sürücüler (n= 4261), pratisyen hekimler tarafından muayene edilmiş, gereken durumlarda uzman hekimlere sevk edilmiştir. Her sürücüden, yüz yüze görüşme yöntemi ile uygulanan anket ile sosyodemografik özellikleri, öz geçmişleri ve yaşam biçimleri hakkında veri toplanmış, sürücülerin kan basınçları, boy ve ağırlıkları ölçülmüş, yapılan ayrıntılı fizik muayene ve laboratuvar inceleme sonuçları kaydedilmiştir. **Bulgular:** Araştırma grubundaki hipertansiyon prevalansı %31.4 olarak bulunmuştur. Hipertansiyon prevalansının yaş ve beden kitle indeksi (BKİ)'nin artışına paralel olarak anlamlı şekilde artış gösterdiği, 35 yaşın altındaki grupta %23.6 olan prevalansın, 50 yaş ve üzeri grupta %42.2'ye çıktığı saptanmıştır. BKİ yönünden zayıf olanlarda hipertansiyonun kaba prevalans hızı, obez olanlara kıyasla önemli ölçüde düşük olmakla birlikte (sırasıyla %14.8 ve %47.1, p< 0.001), yaşa göre standardize edilmiş hızlar arasında önemli bir fark bulunmamıştır (sırasıyla %30.4 ve %31.8, p> 0.05). Çoklu regresyon analizi sonucunda, hipertansiyon üzerinde en belirleyici değişkenlerin BKİ ve yaş olduğu saptanmıştır. **Sonuç:** Araştırma grubundaki hipertansiyon prevalansı genel erkek toplumundaki hipertansiyon prevalansından daha yüksek, diğer ülkelerde yapılan benzer araştırma bulgularından ise daha düşük bulunmuştur. Kilo kontrolü ve sağlık eğitiminin hipertansiyon prevalansını azaltmada yararlı olabileceği sonucuna varılmıştır

Anahtar Kelimeler: Epidemiyoloji; hipertansiyon; obezite; prevalans

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Driving a public bus in an urban environment can be an extremely stressful occupation. The drivers' physical workload, psycho-social job factors and postural stress resulting from the sedentary position while driving may not only contribute to various diseases of the circulatory and locomotor system, but may also play a role in the etiology of psychological disorders.[1-3]

Increased risk of coronary heart diseases (CHD) and hypertension in urban bus drivers is well documented in literature.[4-8] However, the explanation for this high prevalence is still a matter of debate. In a study of bus drivers in Taipei, Taiwan, the prevalence of CHD risk factors, including hypertension, obesity, hypercholesterolemia and hyperglyceridemia was significantly higher in bus drivers than that of the skilled workers working in the same environment.[6] Results of a study investigating the prevalence of hypertension as a result of exposure to years of bus driving showed that prolonged exposure to operating a transit vehicle might be associated with increased hypertension.[9]

On the other hand, in a retrospective cohort study of Montreal bus drivers, only a small and non-significant excess of ischaemic heart disease mortality was found in the bus drivers, compared to the general population of greater Montreal.[10] In another study on Californian bus drivers, no significant association was found between occupational stress and hypertension.[11] These contradictory results in the literature may arise from the differences between the study populations, research methodologies or the "healthy worker effect" in which individuals employed as bus drivers are believed to be in better health and have lower disease rates than individuals who are not employed at all.[12]

İstanbul is one of the most crowded and largest metropolitan cities of the world with a population of approximately 15 millions. Traffic is usually heavy and public bus transportation is the most popular means of mass transportation. The municipality of İstanbul employs more than 5000 bus drivers. Since no data exists regarding the cardiovascular risk factors in bus drivers, we planned this study as a prospective cohort study to monitor the health status of bus drivers. Here, we presented the baseline data regarding the current distribution of various cardiovascular risk factors among bus drivers.

MATERIAL AND METHODS

STUDY POPULATION

This study was conducted as a cross-sectional survey among the bus drivers, all of whom were male, in İstanbul in collaboration with the İstanbul Municipality. The study started in September 2004. The total number of registered bus drivers then was 5040. After the completion of bureaucratic formalities and getting the necessary permission from the Ethical Committee of the Marmara University Faculty of Health Education, we conducted a general health survey including all the bus drivers registered (n= 4261, response rate= 84.5%).

During this baseline survey, data regarding the physical examination and the medical history of the bus drivers were collected by family physicians of the municipal health centre. After informing each driver about the purpose of the study and getting his consent, a questionnaire was filled-up, the weight and height of each participant was measured by trained students of the Faculty of Health Education, and total blood cholesterol level was measured at the municipal health centre laboratory.

Any individual who presented with a significant history or a symptom of a disease was referred to the specialist physicians of the municipal health centre. A survey database was prepared to store and analyze the collected data. Questionnaire results and physical examinations were analyzed using SPSS 11.5.

SURVEY QUESTIONNAIRE

We developed a multi-item questionnaire to elicit the following information from the participants: demographic characteristics (e.g., age, marital status, education); medical history of the participant; lifestyle related information (specifically smoking

and alcohol consumption). This questionnaire was filled by face-to-face interviews conducted by trained interviewers (students of the Faculty of Health Education) before the bus drivers were physically examined.

MEASUREMENT OF BLOOD PRESSURE AND ANTHROPOMETRY

Survey physicians made 2 separate measurements of blood pressure on each participant with an aneroid sphygmomanometer using a standardized technique.[13] Both measurements were obtained after a 5-minute rest while sitting. The former measurement was recorded after obtaining sociodemographic information from the study subject, while the latter was recorded after a brief clinical examination. Both blood pressure measurements were made on the left arm of each study subject, using a cuff of appropriate size at the level of the heart. The cuff pressure was inflated 30 mmHg above the level at which the radial pulse disappeared, then was deflated slowly at a rate of about 2 mm per second; and the readings were recorded to the nearest 2 mmHg. The first (appearance) and the fifth (disappearance) Korotkoff sounds were recorded as indicative of the systolic (SBP) and the diastolic blood pressure (DBP), respectively. The average of the 2 measurements of SBP and DBP was considered the blood pressure of each participant. In cases where the two measurements differed by over 10 mmHg, the examiner obtained a third measurement and the 3 measurements were averaged.

Body weight was measured (to the nearest 0.5 kg) with the subject standing motionless on the weighing scale, feet about 15 cm apart, balanced on each leg. Subjects were instructed to dress lightly and to remove their footwear at the time of the measurement. The height was measured (to the nearest 0.5 cm) with the subject standing in an erect position against a vertical surface, with the head positioned such that the top of the external auditory meatus was leveled with the inferior margin of the bony orbit. BMI was computed as weight in kilograms divided by height in meters squared. Overweight was expressed as a BMI between 25 and 29.9 kg/m^2, and obesity was expressed as a BMI of 30 kg/m^2 or more.[14]

TRAINING OF PERSONNEL AND OTHER QUALITY CONTROL MEASURES

In order to ensure the accuracy, completeness, and comparability of blood pressures, anthropometric measurements, and interviewee responses across the study sites, several quality control measures were included in our survey design and protocol. All physicians and the students of the Faculty of Health Education underwent a training program regarding the filling of the forms and questionnaires and measuring the blood pressure, weight and height of participants.

DEFINITIONS OF HYPERTENSION

The hypertension status and blood pressure distribution of the study sample were assessed using standard criteria formulated by the World Health Organization International Society of Hypertension (WHO-ISH) and the US Seventh Joint National Committee on Detection, Evaluation and Treatment of Hypertension (JNC-VII). We defined hypertension either as a SBP ≥ 140 mmHg, and/or a DBP ≥ 90 mmHg and/or treatment with antihypertensive medication.[15,16]

DATA ANALYSIS

Statistical analysis of the collected data was performed using SPSS 11.5 (SPSS Inc., Chicago, IL, USA). Percentage distribution of hypertension according to sociodemographic variables and lifestyle factors was analyzed by Chi-square tests. Age-adjusted hypertension prevalence rates according to BMI were computed and were concluded. Multivariate logistic regression was used to analyze the predictors of hypertension. Age (grouped as: 1: < 35 yrs, 2: 35-39 yrs, 3: 40-44 yrs, 4: 45-49 yrs, 5: ≥ 50 yrs), years of driving (1: <5, 2: 5-9, 3: 10-14, 4: 15-19, 5: ≥20), BMI (1: underweight, 2: normal, 3: overweight, 4: obese), current smoking (0: no, 1: current smoker), alcohol consumption (0: no, 1: yes) and total blood cholesterol levels (1: < 170, 2: 170-199, 3: ≥ 200) were the independent variables in the regression equation. All hypothesis tests were rejected or accepted at the traditional level of significance of 0.05%.

RESULTS

The overall prevalence of hypertension in our study group was 31.4%. Hypertension prevalence by age, number of years of driving, BMI, smoking, drinking habits and total blood cholesterol level was presented in Table 1.

Analysis of the data indicated that hypertension prevalence varied significantly according to all variables, except for "smoking and alcohol consumption". As seen in Table 1, hypertension prevalence increased with age. The prevalence rate was 23.6% in drivers < 35 years, while it increased to 42.2% in the ≥ 50 years group. Prevalence differed according to the years of driving, which was also associated with age. While it was 27.4% for the drivers who had less than 5 years of driving experience, it increased to 36.9% for the "≥ 20 years of driving" group.

TABLE 1: Hypertension prevalence by independent variables.

	Hypertension		Normal		Total	X^2
	n	%	n	%	n	p
Age group						
< 35	107	23.6	347	76.4	454	52.46
35-39	293	27.2	786	72.8	1079	< 0.001
40-44	529	31.4	1155	68.6	1684	
45-49	281	37.8	462	62.2	743	
≥ 50	127	42.2	174	57.8	301	
Total	1337	31.4	2924	68.6	4261	
Years of driving						
< 5	415	27.4	1097	72.6	1512	26.31
5-9	355	30.4	813	69.6	1168	< 0.001
10-14	413	36	734	64	1147	
15-19	116	35	215	65	331	
≥ 20	38	36.9	65	63.1	103	
Total	1337	31.4	2924	68.6	4261	
Body mass index						
Underweight (< 18.50)	9	14.8	52	85.2	61	149.67
Normal (18.50-24.99)	241	20.5	932	79.5	1173	< 0.001
Overweight (25.00-29.99)	775	32.8	1587	67.2	2362	
Obese (≥ 30.00)	312	47.1	351	52.9	663	
Total	1337	31.4	2922	68.6	4259	
Currently smoking						
No	694	34.8	1302	65.2	1996	20.06
Yes	643	28.4	1622	71.6	2265	< 0.001
Total	1337	31.4	2924	68.6	4261	
Alcohol consumption						
No	1170	30.7	2640	69.3	3810	7.48
Yes	167	37	284	63	451	< 0.01
Total	1337	31.4	2924	68.6	4261	
Smoking + alcohol consumption						
No	1228	31	2728	69	3956	2.90
Yes	109	35.7	196	64.3	305	ns
Total	1337	31.4	2924	68.6	4261	
Total cholesterol (g/dL)						
<170	395	27.5	1042	72.5	1437	25.37
170-199	407	30.4	933	69.6	1340	< 0.001
≥200	531	36	944	64.0	1475	
Total	1333	31.3	2919	68.7	4252	

BMI-related results showed the most striking differences in hypertension prevalence rates. The prevalence rate was as low as 14.8% among underweight bus drivers, yet it increased to 47.1% among obese participants. However, when the age-adjusted hypertension rates were considered, the results were similar (age-adjusted prevalence rates were 30.4%, 30.9%, 31.6% and 31.8% for underweight, normal, overweight and obese groups, respectively; p> 0.05). Hypertension prevalence was significantly higher among non-smokers in smokers (34.8% and 28.4%, respectively) and was higher among regular alcohol drinkers than in non-drinkers (37.0% and 30.7%, respectively).

Furthermore, the hypertension prevalence was significantly higher among the bus drivers who had total blood cholesterol levels ≥ 200, as compared to those with lower cholesterol levels.

Multivariate analysis results of the data were presented in Table 2. Because our dependent variable was dichotomous, we performed logistic regression analysis to identify the most significant predictors of hypertension in the study group.

As seen in Table 2, BMI, age, smoking and total cholesterol levels were statistically significant predictors of hypertension. Forward conditional logistic regression analysis indicated that BMI was the most significant predictor. It was followed by age, smoking and hypercholesterolemiae. Odds ratio of hypertension for obese drivers was 4.57 times higher than that of the underweight group. The duration of driving was not a significant predictor of hypertension, while smoking was inversely associated with the presence of hypertension.

TABLE 2: Predictors of hypertension by logistic regression analysis.

Variable	p	Odds ratio (95% CI)
Age		
< 35 (n= 454)		1
35-39 (n= 1079)	ns	1.16 (0.89-1.42)
40-44 (n= 1684)	< 0.05	1.38 (1.10-1.65)
45-49 (n= 743)	< 0.001	1.76 (1.44-2.07)
≥50 (n= 301)	< 0.001	2.19 (1.81-2.56)
Years of driving		
< 5 (n= 1512)		1
5-9 (n= 1168)	ns	0.88 (0.68-1.07)
10-14 (n= 1147)	ns	1.04 (0.83-1.23)
15-19 (n= 331)	ns	0.95 (0.65-1.24)
≥ 20 (n= 103)	ns	0.85 (0.37-1.32)
Body mass index		
Underweight (< 18.50) (n= 61)		1
Normal (18.50-24.99) (n= 1173)	ns	1.41 (0.68-2.13)
Overweight (25.00-29.99) (n= 2362)	< 0.05	2.55 (1.83-3.26)
Obese (≥ 30.00) (n= 663)	< 0.001	4.57 (3.83-5.30)
Currently smoking		
No (n= 1996)		1
Current smoker (n= 2265)	< 0.001	0.78 (0.63-0.92)
Alcohol consumption		
No (n= 3810)		1
Yes (n= 451)	ns	1.15 (0.79-1.50)
Smoking+alcohol consumption		
No (n= 3956)		1
Yes (n= 305)	ns	1.30 (0.85-1.74)
Total cholesterol		
< 170 (n= 1437)		1
170-199 (n= 1340)	ns	1.02 (0.99-1.04)
≥ 200 (n= 1475)	< 0.05	1.23 (1.06-1.39)

ns: not significant.

DISCUSSION

The overall prevalence rate of hypertension (31.4%) found in our study group was slightly higher than the prevalence rates estimated for the global adult male population and the male hypertension rate reported in a recent national survey in Turkey (26.6% and 27.5% respectively).[17,18] On the other hand, it was lower than the rates computed for bus drivers in other countries (56% in Taipei, 38.9% in California).[6,9] The difference in prevalence rates might be due to the varying distribution of risk factors as well as racial and ethnic differences. Nonetheless, this is a crude rate and it would not be correct to draw conclusions from it before making the necessary adjustments.

Hypertension prevalence increased with age and BMI in our study group. Age is a well-known correlate of blood pressure. Analyses of worldwide data extracted from published literature from 1980 to 2002 indicated that hypertension prevalence rates increased with age in every region of the world. Meanwhile, epidemiologic data, cross-sectional studies, and longitudinal follow-ups have suggested a causal relationship between obesity and hypertension.[19-25] A study reported that obese people had a five-fold risk of hypertension compared to normal weight people.[26] In a large scale community survey in China, overweight and obese males had significantly higher levels of systolic and diastolic blood pressure than normal weight males.[27] A cross-sectional survey on Finland adult population suggested that more than 85% of hypertension occurred in subjects with a BMI> 25 kg/m^2.[28] In our study group, the odds ratio was 3.01 for the obese group compared to the underweight group and 79.1% of hypertension occurred in subjects with a BMI> 25 kg/m^2. Despite the fact that prevalence increased with BMI in our group, age-adjusted hypertension rates were not significantly different for the underweight, normal, overweight and obese participants. However, we conclude that efforts for weight control should be encouraged for controlling hypertension, since aging can not be controlled.[29]

Alcohol consumption was not a significant predictor of hypertension in our study group. Epidemiological studies have firmly established a relationship between regular, heavier alcohol consumption and hypertension, but no mechanism has been demonstrated for this alcohol/blood pressure effect.[30] We did not ask participants what their frequency or amount of alcohol consumption was because of the stigma of heavy drinking in our culture. This, in fact, may be the reason why alcohol consumption was not a predictor of hypertension in our study group.

The duration of driving was not associated with hypertension in our study group. Although

some studies indicate an association between the duration of driving and hypertension prevalence, we conclude that the duration of driving is confounded by age and is not an independent predictor of hypertension on its own.

Hypertension prevalence was higher in non-smoker bus drivers than in smokers and the estimated relative risk of hypertension was significantly lower among smokers, compared to non-smokers. Parallel to our findings, smoking was associated with a lower prevalence of hypertension in several other studies.[22,28-34] Nevertheless, it is not correct to conclude that smoking may be protective against hypertension, because smoking is associated with coronary heart diseases. Causing cardiovascular diseases and cancer, smoking contributes to considerable rates of mortality.

Bus drivers with total blood cholesterol levels of ≥ 200 had higher rates of hypertension than those with cholesterol levels of < 200, which is consistent with other studies.[6]

CONCLUSIONS

Our study findings indicate that male bus drivers in İstanbul have higher rates of hypertension than the general population. BMI and age are the most significant factors associated with high prevalence rates. The percentage of obesity and overweight in bus drivers was 17.3% and 50.5% respectively, similar to the rates computed for the Turkish male population in other studies.[35,36] As a result, despite the limitations of our study, due to its cross-sectional nature, we conclude that preventive measures for weight control and periodic follow-ups of the individuals in this high-risk group would be effective in reducing the prevalence of hypertension. Bus drivers should be closely monitored for cardiovascular diseases, since hypertension is a well-known risk factor for future coronary heart events.

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