

## CORONARY ARTERY DISEASE RISK FACTORS IN DRIVING VERSUS OTHER OCCUPATIONS

H Nasri MD<sup>(1)</sup>, M Moazenzadeh MD<sup>(2)</sup>

### Abstract

**INTRODUCTION:** The link between occupational factors and coronary artery diseases (CAD) has been studied and confirmed in many countries. Conditions associated with driving such as stress, and factors such as long working hours and the environment can increase the risk of CAD. In this study, we measured potential CAD risk factors in bus and taxi drivers and compared them with a control group.

**METHODS:** 135 taxi drivers, 194 bus drivers and 121 non-drivers (control group) were evaluated for CAD risk factors, i.e. age, body mass index (BMI>24), cigarette smoking, hypertension, high-density and low-density lipoprotein cholesterol (HDL, LDL), triglyceride >200, blood sugar >126 and familiar history of CAD. Univariate and multivariate logistic regression tests were used to distinguish major risk factors.

**RESULTS:** Taxi drivers have an increased risk of hypertension compared with the control group (odds ratio: crude=5.94, adjusted=9.09; P<0001). Cigarette smoking in taxi and bus drivers was 1.4 (P<0.3) and 3.24 (P<0001) times greater than the control group, respectively. The risk of increased LDL and decreased HDL in bus drivers was 4.38 and 5.28 (P<0001) times greater than the control group, respectively. The risk of obesity, high blood sugar and high triglyceride was not significantly different among the groups.

**CONCLUSIONS:** Driving is an independent risk factor for hypertension. Known CAD risk factors are also higher in drivers.

**Keywords:** Driving, cardiovascular disease, risk factor.

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### Introduction

The health hazards of bus drivers are well known. Many studies have been carried out on occupational health and its relation with physical and chemical factors related to job and different diseases. Studies performed in various countries on coronary artery disease (CAD) and urban bus drivers have shown an increased risk of developing CAD.<sup>1-4</sup>

Recently, researchers have shown interest in CAD and its relation to different jobs.<sup>5</sup> In the past decade, the effect of psychosocial factors on CAD has been confirmed. In a study, researchers found that those who work more hours a day or have more than one job are at increased risk of CAD.<sup>6</sup>

Bus and taxi driving are among high-risk and stressful jobs in Iran owing to high responsibility, changes in sleeping pattern and long working hours. Accidents are among the most important causes of death in Iran. The possible increased health risk associated with driving is of importance not only to the health and safety of drivers in the transportation system, but also to the public using the service. However, studies published over the past decades on the health of drivers have received relatively little attention in developing countries. This case control study was designed to determine whether bus and taxi drivers in Kerman are at increased risk of CAD compared with the control group, and to identify the factors responsible for any increased risk of CAD.

(1) Hamidreza Nasri MD. Kerman Physiology Research Center, PO Box: 761888368. Tel: +98 (0341) 2113809

Fax: +98 (0341) 2112794. E-mail: dr\_hnasri@yahoo.com

(2) Mansour Moazenzadeh MD. Kerman Physiology Research Center. Kerman Medical Science University. Kerman, Iran

*Corresponding author:* Hamidreza Nasri

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## Materials and methods

The study population included all bus and taxi drivers with more than 5 years in service as in Kerman Transportation Service, which operates buses and taxis. 135 taxi drivers and 194 bus drivers were enrolled as cases and 121 individuals as controls. Data analysis was restricted to male drivers because of the small number of female drivers.

We took history, did physical exam, and measured blood sugar test, serum high-density and low-density lipoprotein cholesterol (HDL, LDL) and serum triglyceride (TG).

Exercise test and electrocardiography (ECG) were conducted if indicated. All measurements were performed by a general physician who was unaware of the study hypothesis.

At the screening examination, blood pressure was measured after five minutes of rest with the subjects seated. Measurements were performed on the right arm using a standard mercury manometer. Hypertension was defined as systolic blood pressure greater than 140 mmHg, diastolic blood pressure greater than 90 mmHg or current use of antihypertensive medication. Obesity was defined as a body mass index (BMI) above 24.

Cholesterolemia and hypertriglyceridemia were defined as  $\geq 200$  mg/dl and  $\geq 200$  mg/dl, respectively, according to standard laboratory procedures. High blood sugar was defined as a fasting blood sugar (FBS) greater than 126 mg/dl.

*Statistical methods:* Data were analyzed by Stata v.8. Univariate and multivariate logistic regression were used for calculating the odds ratio of potential CAD risk factors. Demographics characteristics of different groups were compared by chi square and ANOVA

tests. The study received the approval of Ethics Committee of Kerman Physiology Research Center.

## Results

Table 1 compares crude and adjusted odds ratio (OR) for hypertension in taxi and bus drivers versus controls. Taxi and bus drivers have a significantly increased risk of hypertension (odds ratio for taxi drivers: crude=5.94, adjusted=7.53; odds ratio for bus drivers: crude=5.79, adjusted=9.09;  $P<0001$ ). Table 2 compares the risk factors for CAD between drivers and the control group.

Significant differences were noted in cigarette smoking and serum cholesterol (high LDL, low HDL) in bus drivers compared with the control group (3.24, 4.38 and 5.28, respectively;  $P<0001$ ). These factors did not differ significantly between taxi drivers and the control group. BMI, serum glucose and serum triglyceride were not significantly different among the groups.

## Discussion

Our study showed a higher prevalence of CAD risk factors in drivers, including increased prevalence of high blood pressure, elevated serum triglyceride and cigarette smoking. These findings are in agreement with Ragland study which has shown that hypertension rates for bus drivers were significantly greater than other groups.<sup>7</sup> Also the results of a study in Taipei showed that hypertension rates, body mass index, serum cholesterol, serum triglyceride and ischemic heart disease in bus drivers were significantly greater than in skilled workers.<sup>5</sup> In Morris et al. study in London, the incidence of coronary heart disease in bus drivers was 1.8 times that of bus conductors.

**TABLE 1.** Crude and adjusted odds ratio (OR) for hypertension (taxi and bus drivers versus controls)

Variable	Taxi drivers		Bus drivers	
	Crude	Adjusted	Crude	Adjusted
Smoking	1.4 (0.3)	1.57(0.23)	3.23(<0.0001)	3.93<0.0001
T. Cholesterol	----	----	1.96(0.16)	0.63(0.50)
LDL >160	0.59 (0.25)	0.79 (0.67)	4.38(<0.0001)	3.36(0.004)
FBS >126	0.81(0.61)	0.82(0.66)	0.54(0.12)	0.48(0.21)
Age	1.00(0.56)	1.56(0.23)	0.96(0.004)	0.93(<0.0001)
BMI >24	0.72(0.20)	0.61(0.10)	0.90(0.65)	1.29(0.38)
HDL <60	0.44(0.07)	0.27(0.03)	5.28(<0.0001)	7.63(<0.0001)
Triglyceride >200	0.76(0.32)	0.93(0.85)	0.67(0.12)	0.32(0.003)
CVD in 1 <sup>st</sup> degree relatives	0.69(0.28)	0.69(0.36)	1.94(0.07)	1.60(0.30)

Numbers in parentheses represent P value.

Univariate analysis was done for calculating crude OR.

Variables which have significant crude OR remain in model for multivariable analysis.

**TABLE 2.** Coronary artery disease risk factors in taxi and bus drivers compared to controls

Variable	Control (n=121)	Taxi drivers (n= 135)	Bus drivers (n= 194)	P value
Age(M ± SD) (year)	39.30+ 10.79	40.04+ 11.44	35.74 +9.94	0.001**
Duration of driving (M ± SD) (year)	---	11.47 +7.37	11.59 + 7.87	0.98**
High blood pressure (%)	6(4.96)	32(23.7)	45(23.2)	0.0001*
Systolic (M ± SD)	104.46+16.95	121.81+15.27	118.38+16.91	0.0001**
Diastolic (M ± SD)	63.21+10.10	75.37+9.42	73.25+10.49	0.0001**
Hypercholesterolemia (%)	6(4.96)	0	18(9.28)	0.001*
Cholesterol (M ± SD)	183.35+34.47	172.22+24.51	190.90+36.35	0.0001**
High LDL (%)	13(10.74)	9(6.67)	67(34.54)	0.0001*
LDL (M ± SD)	97.40+28.64	87.44+22.73	115.66+33.56	0.0001**
Low HDL (%)	15(12.4)	8(5.93)	83(42.78)	0.0001*
HDL (M ± SD)	47.50+6.04	49.70+5.51	40.94+7.54	0.0001**
High TG (%)	41(33.88)	38(28.15)	50(25.7)	0.298*
TG (M ± SD)	192.24+88.00	175.41+92.52	171.54+88.10	0.03**
High Glucose (%)	15(12.4)	14(10.37)	14(7.22)	0.292*
Glucose (M ± SD)	101.22+30.59	97.18+31.23	99.44+34.34	0.17**

M ± SD: Mean± Standard Deviation

TG: Triglyceride

\* Chi square

\*\* ANOVA

In the Gothenburg primary prevention study the incidence of coronary heart disease (CHD) was 18.9% in bus and tram drivers compared with 6.9% among the other men in other occupations. A significantly higher body mass index and no significant differences in smoking habits, serum cholesterol and blood pressure were noted between bus and tram drivers and other men.

In their study being a bus or tram driver was an independent predictor of CHD of considerable magnitude, but the increased risk of taxi drivers was not significant.<sup>3</sup> In an analysis of coronary angiography to determine the characteristics of CHD in Japan, the taxi driver patients were characterized by more extensive coronary atherosclerosis associated with higher prevalence of diabetes mellitus and obesity.<sup>8</sup>

Despite all of these studies, Paradis et al., in a historical cohort of Montreal bus drivers, compared them with the general population and found only a small and non-specific excess of ischemic heart disease mortality in bus drivers; however, a significant increase was found in a subgroup of drivers in service for less than 30 years.<sup>9</sup>

Our limitation in this study was the study population which was restricted to male drivers because of the small number of female drivers. Another limitation was addiction of some drivers, which might affect their blood pressure.

Driving a bus differs from other occupations by a high level of pressure to perform a task under a rigid time schedule, high level of responsibility towards passengers and equipment, level of physical activity, the potential for disruptions in diet and sleep habits, and exposure to various elements of physical environment such as carbon monoxide, lead, and noise. Based on our findings, we recommend that drivers' health be better monitored for risk factors of cardiovascular disease. This study was approved by High Council of Kerman Physiology Research Center.

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