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Abstract

Background: Driving buses exposes the drivers to many stressors that can increase their cardiovascular risk factors.

Aims: The objective of this study was to measure the prevalence of workplace stress and its association with cardiovascular risk factors among bus drivers in Egypt.

Methods: A cross-sectional study was conducted on 234 bus drivers in Cairo, Egypt. Data were collected over a period of 6 months from August 2016 to January 2017. For all drivers, blood pressure, body weight and height and random blood sugar were measured. Professional driving duration/age ratio was calculated. Comparison between cardiovascular risk factors and workplace stress score was made. Unadjusted and adjusted odds ratios and 95% confidence intervals were calculated using logistic regression models.

Results: A high prevalence of workplace stress (83.3%) was observed among bus drivers. Moreover, a high prevalence of cardiovascular risk factors, particularly tobacco smoking (65.0%), physical inactivity (93.6%) and hypertension (33.3%), was noted. After adjustment for age and other confounding factors, the risk factors associated with workplace stress were overweight/obesity and hypertension.

Conclusions: There is a positive association between workplace stress and some

cardiovascular risk factors, such as hypertension and overweight/obesity, among bus drivers in Egypt.

Keywords: tobacco, cardiovascular risk, hypertension, occupational stress, prevalence.

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Introduction

Work stress is usually related to an occupational environment with high demands and little control in addition to low social support (1). All these factors are present in the daily working life of bus drivers. Bus or truck driving is considered one of the most stressful occupations and is associated with increased risk of chronic diseases, in particular, cardiovascular risk factors and diseases (2). Occupational risk factors to which professional drivers are exposed may be shift work, long working hours, loud noise, carbon monoxide and chemical materials that may lead to cardiovascular diseases (CVD). Also, bus drivers face stressors such as inadequate cabin ergonomics, violence from passengers, and traffic congestion (3). Bus drivers are more prone to daily behavioural risk factors such as obesity, poor irregular diets, and working while sitting for long periods of time (4). These factors when accompanied with job stress may worsen nonbehavioural risk factors such as blood pressure, lipid profile and diabetes, leading to a higher risk of cardiovascular events among professional drivers (5).

In Egypt, few studies have investigated the relationship between environmental hazards and CVD. Negm et al. (6) found that different occupational environmental hazards might increase the incidence of coronary artery disease in young Egyptian male workers. In another study

among Egyptian workers in a cigarette factory, the findings revealed that hypertension was the most prevalent stress-related disease (7). The Egyptian National Health Issues Survey in 2015 (8) showed that smoking was more prevalent in men, with 46% of men being current cigarette smokers, 34.3% were overweight and 26.4% were obese. The prevalence of hypertension among men aged 15–59 years was 16.7% and this increased to 26.8% among men aged 35–59 years. It is estimated that the prevalence of diabetes among Egyptians is around 15% among adults aged 20–70 years (9). The most common causes of death in Egypt are CVDs, mainly ischemic heart disease and cerebrovascular disease, which represent 46% of total deaths (10).

No research in Egypt has addressed both occupational and personal risk factors when investigating the association between occupational stress and CVD among bus drivers. Thus, the present study assessed the prevalence of workplace stress and its relation to CVD risk factors among bus drivers in Egypt.

Methods

Study design and population

This was a cross-sectional study of 234 bus drivers who attended periodic medical examination at a health insurance hospital in Cairo, Egypt. Data were collected for a period of 6 months from August 2016 to January 2017.

Sample size

Sample size was calculated using Epi Info version 7. Hypertension was used as an indicator for CVD risk factors. The following assumptions were made: the prevalence of hypertension among bus drivers with low score of stress was 20% (as reported in the National Health Issues Survey of Egypt for a similar age group [8]); prevalence of hypertension for drivers with high stress was 40% (11); 95% confidence interval (CI) and 90% study power. Accordingly, a sample of 234 bus drivers was required. This number was taken out of a total of 420 bus drivers attending for annual medical examination at the health insurance hospital. All bus drivers attending the clinic every Tuesday (10–12 drivers) for 6 months were included until the required sample size was recruited.

Tools and definition of variables

Bus drivers were interviewed by a questionnaire that included items about sociodemographic factors, occupational characteristics, behavioural risk factors (smoking, low fruit/vegetable consumption and physical inactivity) and workplace stress. In addition, nonbehavioural risk factors as blood pressure, body mass index and random blood sugar were measured.

Two blood pressure readings were taken at an interval of 10–15 minutes. High blood pressure was defined as average systolic pressure ≥140 mmHg or diastolic pressure ≥90 mmHg. Bus drivers were considered to have hypertension if they had been diagnosed previously by a medical professional and were taking antihypertensive drugs (8).

According to World Health Organization classification, individuals with body mass index (BMI) ≥ 25 but

Tobacco use included those who currently smoked any type of tobacco product daily (e.g., cigarettes, cigars or pipes). Low fruit and vegetable consumption was defined as consumption of

The workplace stress survey questionnaire was composed by the American Institute of Stress (13). The survey consisted of 10 questions, and the answers ranged from 1 (strongly disagree) to 10 (strongly agree). If the total score was 10–30, the participant handled stress well; if the score was 40–60, the participant handled stress moderately well; and if the score was 70–100, the participant encountered problems that needed to be resolved.

We used an operational definition for social conflict in the form of a simple question. Persons who perceived any social problems (e.g., struggles/disagreements) with any family members (wife, children, parents or parents-in-law) or neighbours at least once per week were considered to have social conflict.

Professional driving duration and age ratio (PDAR) was calculated as follows: duration of professional driving divided by age (14). PDAR reflected the extent of professional driving experience. PDAR was coded into ≥ 0.5 (more risk exposure) and **Ethical considerations**

All participants were informed about the study objectives and signed informed consent before participating in the study. Participant confidentiality was assured by having an anonymous questionnaire. Before conducting the study, the protocol was approved by the Research Ethics Committee of the Faculty of Medicine, Ain Shams University, Cairo, Egypt.

Statistical analysis

Descriptive analyses for all study variables were conducted. The $\chi 2$ test or Fisher's exact test was applied for bivariate analysis. Fisher's exact test was applied when any expected value in the 2 × 2 contingency table was **Results**

All the bus drivers were male. The mean age was 37.4 ± 9.0 years and > 60% of them were aged 30–49 years (Table 1). Around two thirds were married and 61.1% achieved a low educational level. Social conflict reported was by 47%. One quarter of the drivers had worked as professional drivers for > 20 years while one fifth had a PDAR ≥ 0.5. Around one third had reported 3–5 during the past 12 months. Regarding behavioural risk factors, 65% of bus drivers were current smokers, only 6.4% regularly practiced physical exercise, and only around 9.0% ate ≥ 5 portions of fruits and vegetables per day. As for nonbehavioural risk factors, 61.5% of drivers were overweight or obese, one third experienced high blood pressure, and 8.1% had hyperglycaemia. Around 17% of bus drivers could handle stress well, 66.2% moderately well and 17.1% encountered problems.

Occupational stress was significantly associated with age, as the percentage of bus drivers aged ≥ 50 years who encountered stress problems was 17.5% compared to none of those who handled stress well and 10.3% of those who handled stress moderately well (Table 2). The percentage of divorced/widowed drivers was higher among drivers who encountered stress problems compared to those who handled stress well or moderately well, but the difference was not significant. The percentage of those with low educational level (77.5%) who encountered problems was significantly higher than the corresponding figure among those who handled stress well (28.2%). The results revealed a strong association between social problems and workplace stress. Among those who encountered problems, the percentage of those working > 20 years was significantly higher (42.5%) than that among those who handled stress well (10.2%). A significant association was found between PDAR and occupational stress score. There was an insignificant association between the number of accidents related to driving during the past year and occupational stress score.

There was an insignificant association between tobacco smoking and workplace stress (Table 3).
The highest percentage of overweight/obesity (77.5%) was observed among bus drivers who encountered problems, while the corresponding figures among drivers who handled stress well and moderately well was 53.8% and 57.4%, respectively. The relationship between physical activity, consumption of fruit/vegetables, hyperglycaemia and stress score was insignificant. The prevalence of high blood pressure among bus drivers who encountered problems was 4 times higher than the corresponding figure among drivers who handled stress well and around 1.5 times the figure among those who handled stress moderately well.

After adjustment for age and other occupational confounding variables and considering bus drivers who handled stress well as the reference group, the following results were obtained (Table 4
). Only bus drivers who encountered stress problems were more prone to be overweight or obese. The prevalence of high blood pressure was strongly associated with workplace stress.

Bus drivers who handled stress moderately well were around 4 times more likely to have high blood pressure, while those who encountered stress problems were nearly 16 times more likely.

Discussion

In this study over 80% of the bus drivers showed varying degrees of workplace stress. In comparison to other studies, lower rates of moderate to high stress were reported among city bus drivers in the Islamic Republic of Iran (74.5%), Mumbai, India (66.2%), and Colombia (40.5%) (15–17). Bus drivers who encountered stress problems in the present study were characterized by being older, having lower educational achievement, facing more social conflicts and having more experience in driving

(> 10 years and PDAR ≥ 0.5). Similar findings were reported by Biglari et al. (15) but other studies reported greater strains among younger drivers and those with

We found more reported accidents during the past 12 months (3 of 4) among bus drivers with high stress scores. Other studies have reported a positive association between occupational stress/strain and number of accidents (16,17). Workplace stress and unsafe driving behaviour are among the most important factors associated with the occurrence of work-related accidents among bus drivers (20). Social conflict was markedly high among bus drivers with high stress scores. The combined effect of workplace stress and social problems of bus drivers could explain the high percentage of reported accidents among those with stress problems. The methodology of our study could not explain the cause of the complex association between workplace stress, social conflicts and road accidents.

Regarding behavioural risk factors, we revealed that the majority of participants did not practice any regular physical activities. However, our results showed an insignificant association between workplace stress and physical inactivity. Previous studies using prospective data revealed that job stress is strongly associated with higher risk of physical inactivity (21–23).

Our findings revealed low daily consumption of fruit and vegetables (i.e.,

As for nonbehavioural factors, it was found that 61.5% of bus drivers were overweight or obese, which is similar to the national figure (60.7%) (8) in adult Egyptians. There was a significant association between workplace stress and BMI such that bus drivers with high stress scores were more prone to be overweight/obese, even after adjustment for other confounding variables. Our results are in agreement with other studies (14,□22,□23–25). Prolonged sitting and long daily duty hours, physical inactivity, lack of break times, and unhealthy diet are among the risk factors associated with overweight/obesity.

Our results showed a lower prevalence of diagnosed hyperglycaemia (8.1%) among bus drivers than the estimated national figure 14.2% (27). However, the association between workplace stress and hyperglycaemia (diabetes) was insignificant. In agreement with our findings, Sui et al. (28) reported no association between occupational stress and risk of diabetes, while other studies confirmed such an association (22,29). Job stress may disturb glucose metabolism, which in turn increases the risk of diabetes directly, or indirectly through its effects on lifestyle, for example, obesity and physical inactivity (21,30).

Our results revealed that one third of participants had high blood pressure, which is higher than the national figure (26.8%) (8), and there was a significant association between workplace stress and high blood pressure, even after adjustment for other confounding factors. This finding was similar to others studies (11,16,31,32). The reason why there has been a high prevalence of high blood pressure in the current work may be related to higher percentages of lifestyle risk factors among study participants. Moreover, workplace stress is associated with increased thickness of the arterial intima media, which is found in men but not women, and this could explain the link between stress and hypertension (33).

The current work showed that two thirds of bus drivers were current smokers, which exceeds the national figure (46.4%) (8). However, the relationship between occupational stress and smoking was insignificant. This finding is similar to the studies of Biglari et al. (15) and Kouvonen et al. (34), but contrary to those of Nyberg et al. (22) and Cunradi et al. (35) who reported a positive association. The relationship between occupational stress and smoking could be explained by the fact that bus drivers feel it is a way to relieve tension (36) or as a result of neuroendocrine elevations associated with this stressful occupation.

The present study had some limitations. This was a cross-sectional study with the inherent limitation of not being able to determine the causal relationship between workplace stress and cardiovascular risk factors. Also, in this study we did not measure the lipid profile of bus drivers and this is considered to be one of the important cardiovascular risk factors. Furthermore, some cardiovascular risk factors, such as exercise, smoking, and fruit and vegetable consumption, were assessed by self-reporting. The study included only a sample of bus drivers that was not representative of all professional bus drivers in Cairo. Therefore, we recommend larger studies on all professional bus drivers in Cairo with full investigations of all cardiovascular risk factors.

In conclusion, the current study revealed high prevalence of workplace stress among bus drivers. The final adjusted model of logistic regression analysis included only high blood

pressure and overweight/obesity as independent cardiovascular risk factors associated with workplace stress. Accordingly, we recommend implementing a tailored risk management approach that focuses on hypertension and weight reduction for bus drivers who encounter stress problems.

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Competing interests: None declared.

Évaluation du stress au travail et de sa relation avec les facteurs de risque de maladies cardio-vasculaires dans un échantillon de conducteurs de bus en Égypte

Résumé

Contexte : La conduite de bus expose les conducteurs à de nombreux éléments stressants qui augmentent les facteurs de risque cardio-vasculaire.

Objectif : La présente étude avait pour objectif de mesurer la prévalence du stress au travail et son association avec les facteurs de risque des maladies cardio-vasculaires chez les conducteurs de bus en Égypte.

Méthodes : Une étude transversale a été menée auprès de 234 conducteurs de bus au Caire (Égypte). Les données ont été recueillies sur une période de six mois, d'août 2016 à janvier 2017. La tension artérielle, le poids, la taille et la glycémie aléatoire ont été mesurés pour tous les conducteurs de l'étude. Le ratio durée/âge de conduite professionnelle a été calculé. Une comparaison entre les facteurs de risque cardio-vasculaire et le score de stress en milieu de travail a été établie. Les odds ratios non ajustés et ajustés et les intervalles de confiance à 95 % ont été calculés à l'aide de modèles de régression logistique.

Résultats : Une forte prévalence du stress au travail (83,3 %) a été constatée chez les conducteurs de bus. De plus, une prévalence élevée de facteurs de risque cardio-vasculaire, notamment le tabagisme (65,0 %), la sédentarité (93,6 %) et l'hypertension (33,3 %) a été observée. Après ajustement en fonction de l'âge et d'autres facteurs de confusion, les facteurs de risque associés au stress en milieu de travail étaient le surpoids ou l'obésité et

l'hypertension.

Conclusion : Il existe une association positive entre le stress en milieu de travail et un certain nombre de facteurs de risque cardio-vasculaire chez les conducteurs de bus en Égypte, notamment l'hypertension et le surpoids ou l'obésité.

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