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RESEARCH ARTICLE

EFFECTS OF STRESS AS CARDIOVASCULAR RISK FACTOR IN DRIVERS

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ABSTRACT

Introduction: Stress is essentially the body's reaction to a threatening impulse. The drivers are worst affected because of the more congested roads that leads on to stress which is having huge impact on their health.

Aim and Objectives: To estimate the Blood Pressure and blood lipid profile for professional lorry drivers and compare the results with controls.

Materials and Methods: The study design was a cross sectional study. The study was carried out in the Institute of Physiology, Madurai Medical College, Madurai. The study group is divided into two groups. Group A consisted of 25 subjects who were professional lorry drivers and Group B consisted of 25 subjects who were in control group. Blood pressure was measured and blood lipid profiles were estimated for both study and control groups, in fasting blood sample. The test was done in our Biochemistry lab by standard enzymatic technique CHOD-PAP, End point method.

Results: Statistical analysis was done using the student "t" test. In control subjects, Mean \pm SD of the systolic pressure, Diastolic pressure, total cholesterol, Low Density Lipoprotein and High Density Lipoprotein were 111.2 ± 10.92 , 74.32 ± 7.2 mm Hg, 160.76 ± 22.44 , 91.96 ± 20.09 and 41.92 ± 10.87 mg% respectively. In lorry drivers, Mean \pm SD of the systolic pressure, Diastolic pressure, total cholesterol, Low Density Lipoprotein and High Density Lipoprotein were 138.64 ± 20.29 , 89.84 ± 10.13 mm Hg, 233.56 ± 17.72 , 178.97 ± 16.61 and 30.64 ± 4.88 mg% respectively. Compared to the control subjects, there was a highly significant increase in the systolic blood pressure (p value of < 0.001), diastolic pressure (p value of < 0.001), total cholesterol (p value of < 0.001) and Low Density Lipoprotein levels (p value of < 0.001) and there was a highly significant decrease in High Density Lipoprotein level (p value of < 0.001) in lorry drivers.

Conclusion: This study results showed statistically highly significant elevation of systolic pressure, diastolic pressure, total cholesterol and Low Density Lipoprotein levels and statistically significant decrease in High Density Lipoprotein in professional lorry drivers compared to control subjects. These findings indicate that there is increased cardiovascular risk factor for drivers, as driving itself is a major hidden stress. Because of increased health related risks, we have to take necessary steps to improve the health of the drivers.

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INTRODUCTION

STRESS is essentially the body's reaction to a threatening impulse. The word STRESS is a short, emotionally charged word for something that otherwise takes many words to say. Coping with stress is something most of us are forced to deal with every day, especially on our roads. The drivers are worst affected because of the more congested roads that leads on to stress which is having huge impact on their health.

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The drivers are at increased risk for heart disease, as a result of increased job strain resulting from work place demands and the degree of decision making attitude or control experienced by the workers (Michaels *et al.*, 1991). The relative risk for first hospital admissions due to acute myocardial infarction during employment as a driver increased with an increasing number of stress indicators. A significant association was established between the incidence of myocardial infarction and increased workloads and increased work pace (Netterson *et al.*, 1988). STRESS activates the sympatho-adreno medullary and pituitary adreno cortical systems with increases in circulating

cortisol and catecholamines, which in turn increase the cholesterol and decrease HDLs. Chronic administration of Epinephrine has been found capable of inducing a rise in serum cholesterol and phospholipids (Shafir *et al.*, 1959). Catecholamines stimulate hepatic beta-hydroxy-beta-methylglutaryl CoA reductase, the rate-limiting enzyme in cholesterol synthesis (Edwards, 1975, Devere *et al.*, 1986). Repeated treatment with norepinephrine over a two-day period increased the level of plasma triglycerides, VLDLs and LDLs (O' Donnell *et al.*, 1988).

The increase in lipids especially oxidized LDL and the cholesterol predisposes to the development of atherosclerotic changes in the blood vessels. Occupational stressors, including long working hours (Theorell *et al.*, 1972), time paced work (Frankenhauser, 1981), shift work (Alfredsson *et al.*, 1982) and high levels of job responsibility (Kittel *et al.*, 1980) may directly contribute to increased health risks. Such stressors are all associated with the occupation of driving. In such instance stressors may be associated with physiological changes that increase risk of illness and disease (Eisdorfer *et al.*, 1977). In addition to psychological factors, driving differs from other occupation along a variety of dimensions, including the level of physical activity, the potential for disruption in diet and sleep habits and exposure to various elements of the physical environment such as carbon monoxide, lead and noise. These factors may also contribute to the increased health risks experienced by drivers (Tolbet *et al.*, 1985). In this study, the measurement of blood pressure and the estimation of blood lipid profile that give an indication of the alteration in the cardiovascular functions have been carried out in lorry drivers who are prone for STRESS due to time pressure, congestion, jostling and constant increase in traffic.

MATERIALS AND METHODS

The study design was a cross sectional study. This study was carried out in the Institute of Physiology, Madurai Medical College, Madurai. The study group includes only male subjects and was divided into 2 groups, Group A consisted of 25 subjects who were professional lorry drivers and Group B consisted of 25 subjects who were in control group. The drivers were from the private transport system and the controls were age matched people who doesn't know driving.

Before starting our study, we obtained ethical committee approval and clearance from the college. Informed consent was obtained from all the subjects who were participating in the study. Subjects included in our study were healthy individuals. Subjects with the history of diabetes, hypertension, hyperlipidemia, intake of drugs, smoking, alcoholism, pulmonary disease and endocrine disorders were excluded from the study.

Measurement of Blood pressure

With a standard mercury sphygmomanometer and the stethoscope, the systolic and diastolic blood pressure were measured carefully by taking the first and fifth Korotkoff sounds using auscultatory method in sitting position of the individual.

Lipid profile

Blood sample collected in the early morning after 12 hour fast was used for estimation of serum Total Cholesterol (TC), Low density lipoprotein (LDL), High density lipoprotein (HDL), and serum Triglycerides (TGL). CHOD-PAP (Cholesterol oxidase method for cholesterol, GPOTRINDER (Glycerol phosphatase oxidase) method for TGL and Phospho-tungstic acid method for HDL was used.

Serum LDL was calculated using Friedwald's formula:

Serum LDL cholesterol = Total Cholesterol – (HDL cholesterol + Triglyceride/5)

RESULTS

Statistical analysis was done using the student "t" test. Data's were expressed as Mean \pm SD (standard deviation). Results showed with p value. The significance was drawn at p value of 0.001, 0.01, 0.05 that is the results are valid to the extent of 99.9%, 99% & 95% respectively. Compared to control subjects, there was a highly significant increase in both systolic and diastolic blood pressure. Table 1, Figure 1

Table 1. Comparison of blood pressure between study and control group

Variables	Group A study Mean \pm SD	Group B Control Mean \pm SD	p value
Systolic Blood Pressure	138.64 \pm 20.29	111.2 \pm 10.92	< 0.001
Diastolic Blood Pressure	89.84 \pm 10.13	74.2 \pm 7.2	< 0.001

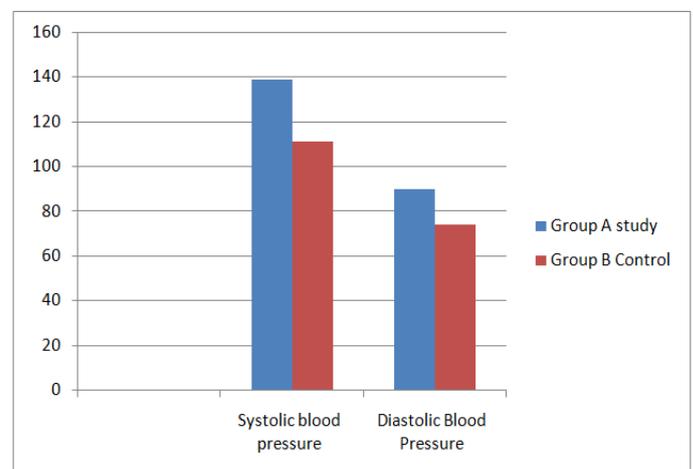


Fig.1.

Table 2. Comparison of blood lipid profile between study and control group

Variable	Group A study Mean \pm SD	Group B Control Mean \pm SD	p value
Total Cholesterol	233.56 \pm 17.72	160.76 \pm 22.44	< 0.001
LDL Cholesterol	178.97 \pm 16.61	91.96 \pm 20.09	< 0.001
Triglyceride	119.76 \pm 28.31	134.32 \pm 33.60	> 0.05
VLDL Cholesterol	23.95 \pm 5.66	26.88 \pm 6.66	> 0.05
HDL Cholesterol	30.64 \pm 4.88	41.92 \pm 10.87	< 0.001

Compared to control subjects, there was a highly significant increase in total cholesterol and Low density lipoprotein levels and there was a highly significant decrease in High density lipoprotein levels in lorry drivers Table 2, Figure 2.

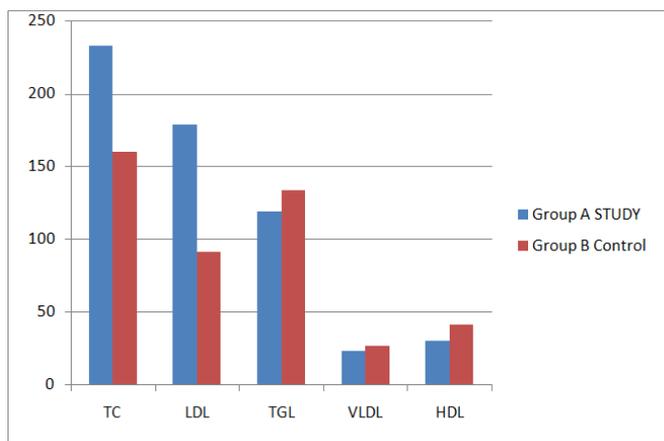


Fig.2.

DISCUSSION

STRESS is an unavoidable consequence of life. According to Belkic-K *et al.* 1988, Professional drivers showed more than twice the overall exposure to stressful work factors compared to the controls. Catecholamine excretion has been reported to be elevated, during driving. Lorry drivers are found to be driving for long distances on multiple days continuously; they are staying out of their family for most of the days in their lifetime. So they are separated from their family members and they feel that, they are not able to handle their responsibility for their family. This creates stress among them. They are taking food outside home, which in turn causes gastrointestinal problems; these are aggravated by inadequate sleep. Continuous driving, without adequate rest, leads musculoskeletal problems. All these factors contribute to their frustration and dissatisfaction in their profession. Thus, the drivers, in general face the different sorts of stress that activates the hypothalamopituitary adrenal system which in turn results in increases in the circulating corticosteroids and catecholamines.

The present study has demonstrated that, there is a significant increase in both systolic and diastolic blood pressure in drivers, which correlates well with the study by Ragland *et al.* 1989 on Prevalence of hypertension in bus drivers. Odds ratio for hypertension, heart diseases and related subjective symptoms among drivers were significantly increased by job career, twisting posture, vibration and driving stress (Koda *et al.*, 2000).

In the present study, we find a highly significant increase in the systolic pressure and diastolic pressure, total cholesterol and LDL levels in drivers as compared to the control group. Similarly, significant reductions in the HDL levels are noted in the plasma of the drivers when compared to the control group. Both catecholamines and corticosteroids that are secreted in excess during the period of stress enhances lipolytic

mechanisms resulting in increase in total cholesterol and LDL levels as well as reduction in HDL levels in the plasma. The increase in the total cholesterol is brought about through the enhancement of Beta – hydroxyl - Beta – Methylglutaryl CoA reductase (HMG-CoA reductase) activity by the catecholamine. A number of investigators have shown that, emotionally stressful life situations transiently elevate serum cholesterol levels. This has been noted in medical students at the time of examinations (Dreyfuss *et al.*, 1959) and Friedman *et al.* (1958) observed it in accountants when they were under professional peak loads. Hartvig *et al.* 1983 have reported that, the systolic blood pressure, diastolic blood pressure and serum cholesterol were higher among drivers. Kuniyama *et al.* 1983; Dimsolale *et al.* 1983 have also explained the increase in total plasma cholesterol level is due to the stress-induced catecholamines. O' Donnell *et al.* (1988) had reported an increase in LDL-Cholesterol level in rabbits after repeated treatment with norepinephrine.

Conclusion

This study results shown statistically highly significant elevation of systolic and diastolic blood pressure which correlates with increase in total cholesterol and Low density lipoprotein levels and statistically significant decrease in High density lipoprotein in professional lorry drivers compared to control subjects. The elevated LDL-cholesterol and lowered HDL-cholesterol levels can predispose the drivers for increased chances of coronary heart disease. Because of increased health risk they are posed to, we have to take necessary steps to improve the health of the drivers. This must be in the form of changing their life style, work pattern and training them with stress management. This kind of change in environment and working style may decrease their stress level.

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Abbreviations used in the study

TC- Total Cholesterol
 TGL- Triglycerides
 LDL- Low Density Lipoprotein
 VLDL- Very Low Density Lipoprotein
 HDL- High Density Lipoprotein
 SD- Standard Deviation

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