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# Association Between Occupational Stress and Cardiovascular Disease Risk Factors among Commercial Drivers in North-East Region of Nigeria

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## Abstract

Occupation-related stress is considered a possibly significant risk factor, and as a result many current research have centred on identifying cardiovascular risk factors in certain occupations. Meta-analysis showed that cardiovascular disease risk increased by approximately 50% in relation to high levels of work stress. It is more common for commercial drivers to have CVD because of the high stress they experience. This study examined the relationships between stress levels and CVD risk factors among commercial drivers. It was a cross-sectional study carried out among 924 commercial drivers in northeast Nigeria. Stress level and CVD risk factors related to lifestyle were assessed with the use of a questionnaire. Chi square and Pearson correlation analysis were performed using SPSS version 21. Many of them (47.0%) were at lower stress levels, 44.4% were stressed averagely, 6.9% were stressed moderately higher than average and 1.7% were stressed much higher than average. There was notable inverse relationship ($P < 0.01$) between ($r = -0.120$) smoking, alcohol consumption ($r = -0.112$) and stress level. There was strong correlation ($P < 0.01$) between physical activity (0.112) and the level of stress. A noteworthy inverse relationship ($P < 0.05$) was found between the level of stress ($r = -0.072$) and blood pressure. There was noteworthy positive connection ($P < 0.05$) between the level of stress ($r = 0.118$) and blood glucose levels. No discernible relationship existed between the level of stress and the lipid profile parameters. Low level of stress was recorded in this study and this was implicated in the connection between cardiovascular disease risk factors and stress.

***Keywords:*** *Occupational Stress; Cardiovascular Disease; Commercial Drivers; Nigeria*

## Introduction

An occupational setting with high demands, little control, and little social support is typically linked to work stress [1]. There is a constant growth in occupational stress and it presents a growing medical and economical problem [2]. The body's reactions to stress triggers can range from slight alterations in homeostasis to fatal consequences, based on the nature of stressor's duration, type, and intensity [3].

Since occupational stress has been determined as a potentially significant risk factor, a large number of recent research have concentrated on identifying cardiovascular risk factors in certain occupations [4]. Commercial drivers are likely to suffer from cardiovascular disease (CVD) and its related complications because of the high stress they experience on the job [5]. According to literature, one of the most stressful jobs is driving, which is linked to a higher risk of chronic illnesses, especially cardiovascular risk factors and disorders [6]. The

nature of the commercial driving profession includes physical and psychological stressors such as extended work hours, working shifts, feeling dissatisfied with their job, adopting a sedentary lifestyle, getting too little sleep, unhealthy eating habits, and occupational stress [7]. They get up early in the morning, to leave their homes, and either return late at night or not at all until the following day. These drivers are exhausted ultimately, due to their work schedule.

The primary cause of many disorders among workers is stress at work. A person's profession is a significant socioeconomic component that, when combined with extended exposure to stress at work, possibly directly affect their autonomic nervous system and neuroendocrine activity. This could result in a higher risk of developing lipid disorders, high blood pressure, and diabetes mellitus [8]. A comparative study carried out showed that high levels of occupational stress were linked to a roughly 50% rise in the chance of developing cardiovascular disease (CVD) [4]. The risk of cardiovascular disease (CVD) for people who are subjected to work-related stressors, such as job strain and extended working hours or job insecurity seems to be approximately 10 - 40% in contrast to with that for individuals not under such stress [9]. One of the adverse consequences of ongoing stress on individuals is on cardiovascular health [10,11]. The possible mechanisms by which job stress can enhance the occurrence of cardiovascular events are the amplification of the autonomic tonus and a tendency to risk behaviors, for example, not exercising, bad diet and smoking [12]. The most prevalent type of stress is acute stress and it is generally short-term in duration ranging from a couple of minutes up to a few weeks. Acute stress activates reduced blood supply to the heart; and an irregular heartbeat and makes blood clotting more likely, which can start the process of developing cardiovascular diseases (CVDs). Chronic stress which is often perpetual causes biochemical alterations that exacerbate the susceptibility to disease and impair stress-related adaptive mechanisms [13]. Through the hypothalamic pituitary adrenal (HPA) axis, chronic stress stimulation influences the onset of cardiovascular diseases (CVDs) by causing excessive cortisol secretion [13].

In people with high atherosclerotic plaque density, chronic stress also acts as a disease trigger, increasing the risk of cardiovascular diseases (CVDs) like hypertension, insulin resistance, arrhythmia, myocardial ischemia, cardiac failure, and stroke [14]. Studies in the past have indicated that stress has a substantial influence on a person's wellbeing, safety, as well as health [15,16]. According to [17], chronic stress also contributes to the emergence of cardiovascular diseases (CVDs) for example myocardial ischemia, stroke, insulin resistance, high blood pressure, and heart failure in those who have elevated atherosclerotic plaque density. Commercial drivers due to the stressful nature of their job and physical inactivity are more likely to experience cardiovascular diseases (CVDs). Despite previous studies on the associations between the level of stress and cardiovascular disease risk factors among commercial drivers, in Northeast Nigeria presently, very little is known about commercial drivers' stress levels and their associations with cardiovascular disease risk factors. For this reason, there is a need to examine the level of stress among commercial drivers and how it relates to cardiovascular disease risk factors. Therefore, this study examined the relationships between cardiovascular disease risk factors and stress levels among commercial drivers in the northeastern region of Nigeria.

## Materials and Methods

It was a cross-sectional study carried out in three states in Northeast Nigeria. Participants were selected via simple random sampling from major motor parks in the northeastern Nigeria. The formula described by [18], was employed to determine the sample size. A total of 924 commercial drivers participated in the research. The study received ethical approval from the Ministry of Health in the states where the study was carried out, and informed written consent was acquired from each participant prior to the study.

### Assessment of cardiovascular disease risk factors

Blood pressure was assessed using Omron blood pressure monitor. The average of two readings was recorded. The blood glucose and lipid profiles were assessed with the aid of Accu-Chek Active glucometer and lipid pro kit respectively. Body mass index (BMI) was calculated after height and weight were measured. The stress level was measured with the use of a questionnaire adapted from the Stress

Symptom questionnaire Scale by [19]. Cardiovascular disease risk factors related to lifestyle (smoking, alcohol consumption and physical activity) were assessed with the use of a structured Questionnaire that was designed by the researchers and validated by professionals.

**Stress:** The stress levels of the participants were estimated using the adapted Stress Symptom Questionnaire by [19].

| Score | Comparative Rating |
|---|---|
| 0 - 19 | Lower than average |
| 20 - 39 | Average |
| 40 - 49 | Moderately higher than average |
| 50 and above | Much higher than average |

**Table**

### Statistical analysis

Version 21.0 of the SPSS statistical program was used to conduct the statistical analysis. The statistical association between cardiovascular disease risk factors and stress level was determined by the Pearson product moment correlation (r) test and the chi square ($\chi^2$). P-values less than 0.05 were regarded as statistically significant.

## Ethical approval

The study received ethical approval from the Ministry of Health in the states where the study was carried out. The ethical approval number for the study are: (ADHREC 16/10/2023/086, MOH/ADM/621/V.1/488, and TRSHREC/2023/030).

## Results

A total of 924 commercial drivers from the Northeast Nigeria were involved in the present study. Table 1 Shows that many of them (47.0%) were at lower stress levels, 44.4% were stressed on the average, 6.9% were stressed moderately more than average, and only 1.7% were stressed much more than average.

| Stress level | Frequency | Percentage |
|---|---|---|
| 0 - 19 Lower than average | 434 | 47.0 |
| 20 - 39 Average | 410 | 44.4 |
| 40 - 49 moderately higher than average | 64 | 6.9 |
| ≥ 50 much higher than average | 16 | 1.7 |
| Total | 924 | 100.0 |

***Table 1:*** *Levels of stress among commercial drivers.*

### Correlation between stress levels and cardiovascular disease risk factors

A non-significant negative connection existed between age and the level of stress. There was a significant negative ($P < 0.01$) correlation found between the level of stress ($r = -0.120$) and smoking. Similarly, a noteworthy inverse relationship ($P < 0.01$) was found between alcohol consumption ($r = -0.112$) and the level of stress. A substantial connection ($P < 0.01$) was found between physical activity (0.112) and stress level. There was no correlation between the level of stress and body mass index. A noteworthy inverse relationship ($P < 0.05$)

was found between the level of stress (r = -0.072) and blood pressure. Significantly, there was a negative connection (P < 0.05) between the level of stress (r = 0.118) and blood glucose levels. There existed a noteworthy inverse relationship (P < 0.05) involving the level of stress and all the lipid profile parameters.

| CVD risk factors | r | p-value |
|---|---|---|
| Age | -0.051 | 0.124 |
| Smoking | -0.120 | 0.000** |
| Alcohol consumption | -0.112 | 0.001** |
| Physical activity | 0.112 | 0.001** |
| Body mass index (BMI) | 0.047 | 0.152 |
| Blood pressure | -0.072 | 0.028* |
| Blood glucose level | 0.118 | 0.027* |
| Total cholesterol | -.063 | .396 |
| High density lipoprotein cholesterol (HDL) | .125 | .090 |
| Low density lipoprotein cholesterol (LDL) | -.115 | .120 |
| Triglyceride | -.029 | .692 |

***Table 2:*** *Association between stress levels and cardiovascular disease risk factors.*

***: The correlation is significant at the 0.01 level (2-tailed). *: Correlations are significant at the 0.05 level (2-tailed).*

More (0.6%) of the drivers in the age group of 41 to 50-year old age group experienced stress that was much greater than the average stress, while more (19.2%) of the drivers in the 31 to 40 year old age group experienced stress that was lower than the average stress in the other age groups (Table 3). The findings demonstrated a robust correlation between age and level of stress among the drivers. Among the drivers, the percentages of drivers who were nonsmokers experienced less than average stress (38.7%) than did drivers who smoked (8.2%), and smoking was significantly associated with the level of stress among the drivers. Among the drivers, the percentage of those who did not consume alcohol and who experienced lower than average stress, average stress, moderate higher than average stress and much higher than average stress were not significantly greater than those who consumed alcohol. More (1.1%) of the drivers who did not practice physical activity experienced much greater stress than those who did practice physical activity, while more (24.1%) of the drivers who did not practice physical activity experienced less than average stress than those who did practiced physical activity (22.8%). There was a substantial correlation between physical activity and the level of stress among the drivers. The drivers with a normal weight handled stress well more than the drivers who were underweight, overweight or obese. The connection between body weight index and stress level was not significant. There was an insignificant relationship between the blood pressure of the drivers and the stress level. There was a strong association between plasma glucose levels and stress levels. No significant associations were detected between any of the lipid profile parameters (Total cholesterol, High density lipoprotein cholesterol, Low density lipoprotein cholesterol, and Triglyceride) and stress levels among the drivers in this study.

| CVD risk factors | Stress level | | | | $\chi^2$ test P |
|---|---|---|---|---|---|
| | Lower than average (n = 434) No. (%) | Average (n = 410) No. (%) | Moderately higher than average (n = 64) No. (%) | Much higher than average (n = 16) No. (%) | |
| **Age (years)** | | | | | |
| 18 - 19 | 9 (1.0) | 6 (0.6) | 8 (0.9) | 2 (0.2) | 51.276 |
| 20 - 30 | 71 (7.7) | 70 (7.6) | 10 (1.1) | 4 (0.4) | 0.000* |
| 31 - 40 | 177 (19.2) | 201 (21.8) | 17 (1.8) | 2 (0.2) | |
| 41 - 50 | 141 (15.3) | 97 (10.5) | 23 (2.5) | 6 (0.6) | |
| > 51 | 36 (3.9) | 36 (3.9) | 6 (0.6) | 2 (0.2) | |
| **Smoking** | | | | | |
| Yes | 76 (8.2) | 103 (11.1) | 24 (2.6) | 4 (0.4) | 16.170 |
| No | 358 (38.7) | 307 (33.2) | 40 (4.3) | 12 (1.3) | 0.001* |
| **Alcohol consumption** | | | | | |
| Yes | 52 (5.6) | 72 (7.8) | 17 (1.8) | 4 (0.4) | 12.363 |
| No | 382 (41.3) | 338 (36.6) | 47 (5.1) | 12 (1.3) | 0.006 ns |
| **Physical activity** | | | | | |
| Yes | 211 (22.8) | 134 (14.5) | 26 (2.8) | 6 (0.6) | 22.238 |
| No | 223 (24.1) | 276 (29.9) | 38 (4.1) | 10 (1.1) | 0.000* |
| **BMI (kg/m$^2$)** | | | | | |
| < 18.50 | 65 (7.0) | 40 (4.3) | 9 (1.0) | 2 (0.2) | 17.106 |
| 18.50 - 24.99 | 228 (24.7) | 208 (22.5) | 30 (3.2) | 13 (1.4) | 0.047 ns |
| 25.00 - 29.99 | 116 (12.6) | 124 (13.4) | 18 (1.9) | 1 (0.1) | |
| ≥ 30 | 25 (2.7) | 38 (4.1) | 7 (0.8) | 0 (0.0) | |
| **BP (mmHg)** | | | | | |
| < 120/ < 80 | 145 (15.7) | 174 (18.8) | 26 (2.8) | 8 (0.9) | 16.128 |
| 120 - 129/80 - 89 | 127 (13.7) | 96 (10.4) | 14 (1.5) | 3 (0.3) | 0.064 ns |
| 130 - 139/80 - 89 | 61 (6.6) | 66 (7.1) | 13 (1.4) | 4 (0.4) | |
| ≥ 140/≥ 100 | 101 (10.9) | 74 (8.0) | 11 (1.2) | 1 (0.1) | |
| **Plasma glucose (mg/dl) (n = 352)** | **Lower than average (n = 99) No. (%)** | **Average (n = 217) No. (%)** | **Moderately higher than average (n = 28) No. (%)** | **Much higher than average (n = 8) No. (%)** | **$\chi^2$ test P** |
| < 100 | 84 (23.9) | 129 (36.6) | 21 (6.0) | 6 (1.7) | 21.796 |
| 100 - 126 | 9 (2.6) | 60 (17.0) | 4 (1.1) | 1 (0.3) | 0.001* |
| > 126 | 6 (1.7) | 28 (8.0) | 3 (0.9) | 1 (0.3) | |

| Lipid profile (mg/dl) (n = 185) | Lower than average (n=) No. (%) | Average (n=) No. (%) | Moderately higher than average (n=) No. (%) | Much higher than average (n=) No. (%) | $\chi^2$ test P |
|---|---|---|---|---|---|
| **Total cholesterol** | | | | | |
| < 200 | 64 (34.6) | 68 (36.8) | 16 (8.6) | 7 (3.8) | 2.030 |
| 200 - 299 | 11 (5.9) | 11 (5.9) | 3 (1.6) | 1 (0.5) | 0.917 ns |
| ≥ 240 | 3 (1.6) | 1 (0.5) | 0 (0.0) | 0 (0.0) | |
| **HDL** | | | | | |
| < 40 | 18 (9.7) | 13 (7.0) | 1 (0.5) | 1 (0.5) | 5.516 |
| 41 - 59 | 42 (22.7) | 41 (22.2) | 13 (7.0) | 4 (2.2) | 0.479 ns |
| ≥ 60 | 18 (9.7) | 26 (14.1) | 5 (2.7) | 3 (1.6) | |
| **LDL** | | | | | |
| < 100 | 43 (23.2) | 58 (31.4) | 10 (5.4) | 6 (3.2) | 8.805 |
| 100 - 129 | 30 (16.2) | 20 (10.8) | 9 (4.9) | 2 (1.1) | 0.185 ns |
| 130 - 159 | 5 (2.7) | 2 (1.1) | 0 (0.0) | 0 (0.0) | |
| **Triglyceride** | | | | | |
| < 150 | 66 (35.7) | 76 (41.1) | 17 (9.2) | 6 (3.2) | 6.166 |
| 150 - 199 | 12 (6.5) | 4 (2.2) | 2 (1.1) | 2 (1.1) | 0.104 ns |

***Table 3:*** *Association between stress levels and CVD risk factors.*

*BMI = Body Mass Index; WHR = Waist-Hip-Ratio; BP = Blood Pressure; HDL = High Density Lipoprotein; LDL = Low Density Lipoprotein; n = Number of Subjects; ns = Not Significant, *p < 0.05.*

## Discussion

Lower stress and average stress levels were found for most of the drivers in this study. However, other researchers have reported moderate and high stress levels among commercial drivers in their studies [20;21]. The lower and average level of stress observed among the study's commercial drivers is a sign that they could handle stress well. According to [22], drivers may experience professional stress as a result of schedules, working hours, traffic, weather, and the safety of passengers and cargo. It has been shown that among taxi drivers, a high risk profile for cardiovascular disease is correlated with stress levels [23]. Arterial stiffness can result from permanent elastin fragmentation and collagen deposition in blood vessels caused by mechanical stress [24]. Chronic hypertension raises the risk of myocardial infarction, heart failure, and cardiac hypertrophy [24].

The chi square test revealed that there was a strong association between age and level of stress among the drivers suggesting that age might be a factor in handling and coping with stress. However, according to the Pearson correlation test, there was no correlation between age and the level of stress. In the study conducted by [25], occupational stress was significantly associated with age among bus drivers in Egypt. [26], observed a nonsignificant association between age and stress levels among bus drivers. These differences might be due to the differences in the age of the studied respondents.

Even with the low prevalence of smoking among the drivers, smoking was significantly associated with the level of stress according to the chi square test, while the Pearson correlation revealed a negative but substantial association between smoking and the level of stress.

This finding corroborates previous studies in which significant associations between the level of stress and smoking was reported among commercial drivers [27,28], but disagrees with the outcomes of [29], [30] and [25], who reported an insignificant relationship between occupational stress and smoking. Commercial drivers often engage in smoking to relieve them of stress.

Both the chi square test and Pearson correlation test disclosed a strong link between exercise and the level of stress among the drivers, which agrees with previous studies [31]. However, other researchers have observed an insignificant association between stress and physical activity [25]. The nature of the driving occupation that necessitates spending time seated in a particular position for an extended period of time prevents physical activity among commercial drivers most times.

This investigation discovered that there was a noteworthy significant negative relationship between alcohol consumption and the level of stress while the chi square test revealed nonsignificant association, which differed from the discoveries of [32] and [16], who stated there was a significant relationship between stress and increased alcohol consumption among commercial drivers. These differences may be attributed to the lower-than-average and average level of stress experienced by the subjects in this study. Stress can increase health damaging behaviors like the increase in the consumption of alcohol [33].

There was no correlation between the level of stress and body mass index. Several factors such as young age of the drivers and years of driving, may be responsible for this, given that they may not have been exposed to extended periods of sitting, lengthy workdays, physical inactivity, or poor food for a long time, which is why most of the drivers in this study did not experience a high level of stress, which may have made them less prone to overweight/obesity. This findings, however, do not agree with other studies that have found a noteworthy correlation between occupational stress and body mass index thus that overweight/obesity was more common in drivers who experienced high levels of stress [25,34-36]. Because of the nature of their jobs, poor and inconsistent diets, and prolonged periods of time spent sitting down while driving, drivers are more likely to become obese [34].

However, there was a noteworthy inverse connection amongst the level of stress and blood pressure, while the chi square test revealed there is no connection between the degree of stress and blood pressure. Most of the drivers in this study experienced lower-than-average and average levels of stress which might explain why no discernible relationship existed between the level of stress and blood pressure. [37], [38], [25] and [39], discovered that there was a substantial link between high levels of stress and hypertension. However, [16] discovered no connection between stress and high blood pressure.

In contrast, there was a noteworthy correlation between the level of stress and blood glucose according to both chi square and Pearson correlation analyses. Commercial drivers who experience stress may have problems with glucose metabolism, which might raise their risk of diabetes either directly or indirectly by altering their lifestyle [40]. The noteworthy relationship between stress levels and blood glucose levels among the drivers in this study corresponds with the investigation of [41]. However, [42] and [25], in their study reported a nonsignificant association between stress and blood glucose levels.

The nonsignificant connection between stress level and all the lipid variables in this study corroborates research done with drivers by other researchers in the past [30,43]. However, [44] reported there was significant differences between dyslipidemia and stress among professional drivers. There are numerous causes of dyslipidemia which may have influenced the outcome of these results. Age, smoking, heredity, food, physical activity, and stress are among the risk factors for dyslipidemia [45]. These differences may be due to the lower-than-average and average level of stress among the drivers in this study and differences among the studied groups.

This study's merits included its large sample size, lipid profile testing, and blood glucose and the blood pressure measurement of the commercial drivers as these are considered to be important cardiovascular disease risk factors.

These are a few of the limitations of the study: it was a cross-sectional study; therefore, it was unable to establish a direct link between cardiovascular risk variables and job stress among the studied population. Furthermore, Self-reports were used to evaluate a few cardiovascular disease risk variables, such as smoking status, alcohol consumption, and physical activity. In addition, the stress levels of the drivers was evaluated through self-reports.

## Conclusion

The study's commercial drivers experienced a low level of stress, as the majority of them experienced lower stress and average stress levels. This low stress level was linked to the relationship between stress and cardiovascular disease risk factors.

For further research, the stress levels of driver reports should not be used to evaluate drivers; instead, scientific methods should be used, as drivers' reports may not accurately reflect their circumstances.

## Data Availability

The datasets used and/or analyzed during this study are available from the corresponding author on reasonable request.

## Conflicts of Interest

The author(s) declare(s) that there is no conflict of interest regarding the publication of this paper.

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