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Evaluation of Some Biochemical Stress Markers and Atherogenic Lipid Profile Changes in Automobile Artisans in Port Harcourt

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Abstract

Unsafe working conditions, lack of safety awareness and obvious restricted access to protective gears make artisanal workers highly vulnerable to different forms of occupational risks. Thus, the present study set out to evaluate some biochemical stress markers and atherogenic profile changes in automobile artisans in Port Harcourt. The study adopted a cross-sectional approach to survey automobile repair workers or auto-artisan in various workshops located in Port-Harcourt Metropolis. The purposive and snowball sample size determination tools to recruit the study participants. Eventually, a sample of 60 automobile repair artisans (Automobile Artisans) and 40 control individuals (Non-Automobile Artisans) totaling 100 participants were recruited for the study. Upon ethical approvals and consent issuance by the study participants, blood samples were obtained from the antecubital vessel by phlebotomists, using standard procedures. Quantitative data got from the study were subjected to statistical screening using version 25.0 of the IBM Statistical Product and Service Solutions (SPSS) programme. Statistical significance were determined using one-way analysis of variance (ANOVA) followed by post-Hoc LSD multiple comparison test. The result of the study showed that the automobile artisans' job naturally selected people mainly within their thirties to their forties of age and that the job may not exert adverse effects on the BMI status of the workers as their was only marginal difference in their mean BMI from that of the non-automobile artisans. On the lipid profile examination, there was generally significant ($p<0.05$) elevation of TG and reduction in HDL-C levels in artisans compared to those of non-artisan subjects. The atherogenic indices indicated significant ($p<0.05$) increases in atherogenic coefficient (AC) and Castelli risk index-1 (CRI-1). The levels of GSH, GPx, CAT and SOD were seen to be significantly ($p<0.05$) depressed in virtually all auto-workers when compared to that of the non-artisans (control group). The frequent use of personal protective equipment (PPE) and timely/good health seeking behaviours amongst the automobile artisans are recommended.

Keywords: biochemical stress markers, atherogenic profile changes, Automobile Artisans, Port Harcourt personal protective equipment (PPE).

INTRODUCTION

Artisanal professions are important for the preservation of quality and tradition; and so, it entails skilled craftwork where items are crafted or created, frequently by hand or crude manipulations (Wildschut & Meyer, (2016). Such occupations can involve a variety of crafts, such as woodworking, ceramics, textiles, repairs/maintenance (e.g. automobile repairs/ maintenance) and more. Artisanal works can help maintain cultural heritage and traditions and frequently highlights unique, handcrafted goods (Deb & Molankal, 2013; Wildschut & Meyer, 2016). On the other hand, unsafe working conditions, lack of safety awareness and obvious restricted access to protective gears make artisanal workers, especially those in the informal sector, highly vulnerable to different forms of occupational risks (Saldaña *et al.*, 2023). Numerous illnesses, injuries, and long-term health problems might result from these risks (Afolabi *et al.*, 2021; Adei *et al.*, 2022).

Due to automobile artisans (or auto-artisans)'s exposure to multiple professional hazards, such as mechanical, chemical, and physical threats, they are expected to strictly and continuously use personal protection equipment (PPE) (Adu-Gyamfi, 2025). Then again, the use of PPE may be crucial for safety, it is, however, not a perfect solution and may not completely eliminate all hazards conditions in the workplace. Thus, the predisposition to hazards will be much more in the event of poor compliance of the use of the PPE (Garrigou *et al.,* 2020; Benson *et al.,* 2024). In our locale, it is known that, most auto-artisans demonstrates poor compliance in their use of PPE and thus are at greater risks of occupational hazards and job-related health challenges (Johnson & Motilewa, 2016; Ozomata *et al.*, 2022).

Importantly, in order to identify and reduce the health risks connected with workplace hazards, medical assessments of occupational exposure levels are essential (Lele, 2018). Such investigations, which are frequently a component of a larger health surveillance program, aid in identifying early indicators of negative health impacts, evaluating the efficacy of control measures, and directing preventative efforts. More so, timely treatment and possible reintegration into the workforce are made possible by early detection of work-related illnesses (Lee, 2010; Lele, 2018).

In addition, the assessment of potential diagnostic indicators of acute/chronic stress like antioxidant and atherogenic profiles alongside others stress indicators, offer crucial predictive opportunities for stress-associated disorders and treatment advice (Noushad *et al.,* 2021). Indeed, the screening of such biomarkers in personnel highly prone to occupational hazards may offer critical prognostic value for stress-associated diseases and therapeutic guidance (Knudsen & Hansen, 2007).

Consequently, the present study set out to evaluate some biochemical stress markers and atherogenic profile changes in automobile artisans in Port Harcourt.

MATERIALS AND METHODS

Study Design

The study adopted a cross-sectional approach to evaluate the relationship between occupational exposure, biochemical stress markers and atherogenic profiles of auto-artisans in Port-Harcourt Metropolis. The approach specifically enhanced the collection of data on various health indicators and occupational exposures concurrently, as to understand the nature and depth of workplace hazards on auto-artisans.

Study Area

The study was conducted in Port-Harcourt Metropolis, the capital of Rivers State, Nigeria. The location, being a major commercial center in Nigeria, is densely populated and requires much of industrial explorations. Considering the boom in such activities, the Port Harcourt metropolis has the laden of diverse socio-economic attributes that are capable of adversely impacting on residents and different grades of workers (Tamuno-Opubo *et al.,* 2024). Additionally, PortHarcourt is characterized by high levels of vehicular traffic and associated air pollution (Nkwocha *et al.*, 2017; Ucheje *et al.,* 2022), thus, making it a suitable site for studying the health impacts of occupational exposure in automobile repair workers.

Study Population

The study focused on auto-artisan or automobile repair workers self-employed or employed in various workshops located in Port-Harcourt Metropolis. This population was selected due to its high exposure to hazardous substances from vehicular emissions, solvents, and other chemicals used in repair processes.

SAMPLE SIZE CALCULATION

Sample size and power calculation

The required sample size was estimated to detect a statistically significant correlation between pulmonary function indices and cardiovascular risk markers among automobile repair workers.

Based on findings from a previous study, which reported correlation coefficients ranging from r = 0.30 to r = 0.77 between key variables such as Atherogenic Index of Plasma (AIP), triglycerides, LDL, VLDL, and pulmonary function markers like peak expiratory flow rate (PEFR) (e.g., r = -0.322 between PEFR and 1-HOP; r = 0.774 between AIP and triglycerides) (Olujim *et al.*, 2020), an effect size of r = 0.30 was considered to detect the minimum meaningful correlation.

Using a two-tailed test with α = 0.05 and 80% power (1 - β = 0.80), the required sample size was calculated using the correlation coefficient (r) as the effect size. The formula is based on the Fisher Z-transformation.

The standard formula is; $n = \left(\frac{Z\alpha/2 + Z\beta}{0.5 \times In\left(\frac{1+r}{1-r}\right)}\right)^2 + 3$

Where:

- n = required sample size
- r is the expected correlation coefficient (effect size = 0.3)
- α is significance level (commonly 0.05)
- β is type II error rate (commonly 0.20, i.e., power = 0.80)
- $Z\alpha/2$ is the Z-score for 2-tailed test (1.96 for \alpha = 0.05)
- $Z\beta$ is the Z-score for desired power (0.84 for 80\% power) ln = natural logarithm
- Therefore, the Fisher's Z transformation of the correlation coefficient:
- Zr = 0.5 X ln (1 + 0.30 / 1 - 0.30) = 0.5 X ln (1.30 / 0.70) = 0.5 ln (1.857) = 0.5 X 0.619 = 0.3095

This gives:

- n = [21.96 + 0.84 / 0.3095] ^{2} + 3 = (9.05) ^{2} + 3 = 81.91 + 3 = 85

To account for a potential 10\% dropout or incomplete data rate, the sample size was adjusted using this formula:

$n_{adjusted}$ = n / (1 - attrition rate) = 85 / (1 - 0.10) = 85 / 0.90 = 95

Therefore, the minimum sample size was estimated as 95 participants to detect a correlation of r = 0.30 with 80\% power, 5\% significance level, and a 10\% dropout rate.

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Eligibility Criteria

The study targeted both male and female workers aged 18 years and above and who have been employed in the industry for at least two years, ensuring that participants have had sufficient exposure to the occupational hazards under investigation. Control group participants were recruited using convenience sampling from non-exposed population in same study area with similar demographic characteristics (e.g. age, etc.) to minimize confounding factors.

Methods of Data Collection

Data was collected using a structured questionnaire and standardized measuring tools. The questionnaire assessed demographic information, occupational history, health status, and exposure to hazardous substances. Data was collected via the process of survey administration where trained research assistants were recruited to administer well formulated questionnaires in person to ensure accurate completion and clarify any doubts from participants. Upon approvals and consent issuance by the study participants, blood samples were obtained from the antecubital vessel by phlebotomists, using standard procedures.

The samples were processed and analyzed for some biochemical stress markers and atherogenic profiles using appropriate reagent kits and well calibrated Auto-Biochemical Analyzer.

Methods of Data Analysis

Quantitative data obtained from the present study were subjected to statistical analysis using version 25.0 of the IBM Statistical Product and Service Solutions (SPSS) programme. Statistical significance were determined using one-way analysis of variance (ANOVA) followed by PostHoc LSD multiple comparison test. And P-value less than 0.05 were considered statistically significant. All data were presented as mean ± standard deviation (SD).

Ethical Consideration/Informed Consent

The ethical approval was sought and obtained from the Ethics Committee of the Department of Human Physiology, Faculty of Basic Medical Sciences, Rivers State University, Nigeria and from other relevant agencies. Approvals and consent were equally obtained from the study participants before being recruited into the study.

RESULTS

In Figure 1 the outcome on age distribution of Automobile Artisan in Port Harcourt was represented.

The mean age distribution of the study respondents were 44.10 ± 7.71 for the Control (NonAutomobile Artisans); 46.10 ± 9.33 for the Automobile Mechanics; 46.40 ± 5.17 for the Automobile Welders; 49.10 ± 7.40 for the Automobile Panel Beaters; 43.10 ± 4.04 for the Automobile Spray Painters; 45.50 ± 7.04 for the Automobile Blacksmiths and 39.4 ± 8.49 for the Automobile Electricians. The ages of the various groups varied within 39.4 and 49.1 years.

The data on the comparison of body mass index (BMI) of automobile artisan in Port Harcourt is as presented in Figure 2.

Except the mean BMI of the mechanics, which is marginally higher, all other groups of the automobile artisans had non-significantly lower values when compared to that of the control (Non-Automobile Artisans) group. The BMI changes show that there was significantly ($p<0.05$) higher value for the auto mechanics when compared to those of automobile welders, spray painters, blacksmiths and electricians.

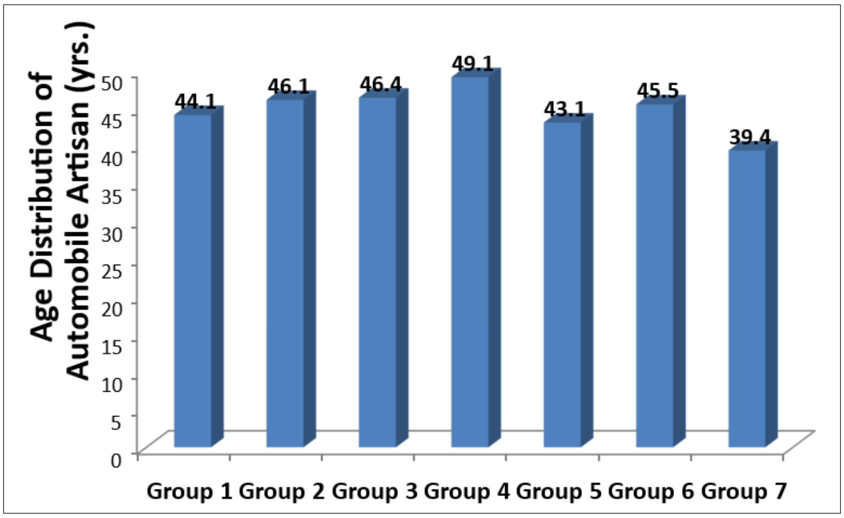

Figure 1: Age Distribution of Automobile Artisan (yrs.) in Port Harcourt

Note: Values are expressed as Mean ± Standard Deviation (SD); n =40(Non-Automobile Artisans) & 10 (Automobile Artisans). [a] Significant at $p<0.05$ when compared to the mean value of control group; [b] Significant at $p<0.05$ when compared to the mean value of Automobile Mechanics; [c] Significant at $p<0.05$ when compared to the mean value of automobile welders; [d] Significant at $p<0.05$ when compared to the mean value of Automobile Panel Beaters; [e] Significant at $p<0.05$ when compared to the mean value of Automobile spray painters; [f] Significant at $p<0.05$ when compared to the mean value of automobile Electricians.

Key:

Group 1:	Control (Non-Automobile Artisans)
Group 2:	Automobile Mechanics
Group 3:	Automobile Welders
Group 4:	Automobile Panel Beaters
Group 5:	Automobile Spray Painters
Group 6:	Automobile Blacksmiths
Group 7:	Automobile Electricians

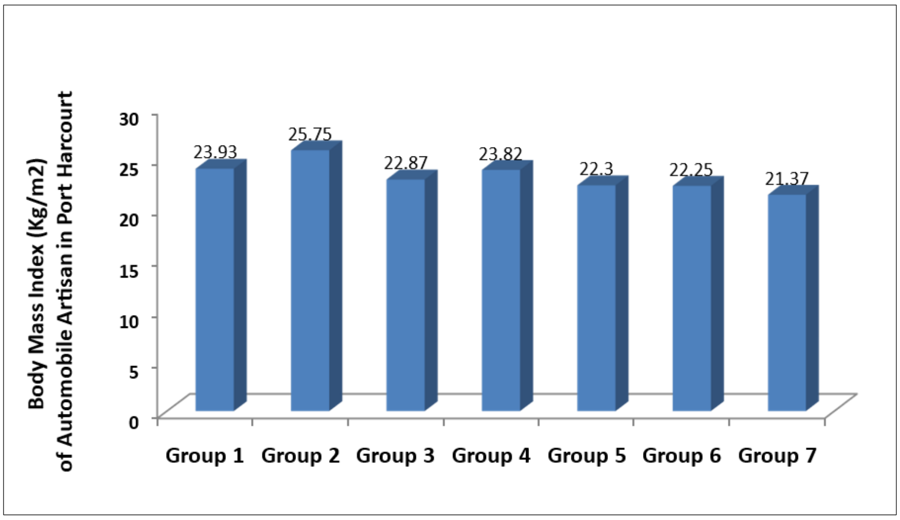

Figure 2: Comparison of Body Mass Index of Automobile Artisan in Port Harcourt

Note: Values are expressed as Mean ± Standard Deviation (SD); n =40(Non-Automobile Artisans) & 10 (Automobile Artisans). [a] Significant at $p<0.05$ when compared to the mean value of control group; [b] Significant at $p<0.05$ when compared to the mean value of Automobile Mechanics; [c] Significant at $p<0.05$ when compared to the mean value of automobile welders; [d] Significant at $p<0.05$ when compared to the mean value of Automobile Panel Beaters; [e] Significant at $p<0.05$ when compared to the mean value of Automobile spray painters; [f] Significant at p<0.05 when compared to the mean value of automobile Electricians.

Key:

Group 1:	Control (Non-Automobile Artisans)
Group 2:	Automobile Mechanics
Group 3:	Automobile Welders
Group 4:	Automobile Panel Beaters
Group 5:	Automobile Spray Painters
Group 6:	Automobile Blacksmiths
Group7:	Automobile Electricians

Table 1: Changes in Lipid Profile Amongst Automobile Artisans in Port Harcourt

Study Groups	**TC (mmol/L) (0.00-5.17)**	**TG (mmol/L) (0.00-1.70)**	**HDL (mmol/L) (1.29-1.55)**	**LDL (mmol/L) (0.50-3.14)**
Control (Non-Automobile Artisans)	5.62 ± 0.88	1.54 ± 0.37	1.54 ± 0.17	3.56 ± 0.85
Automobile Mechanics	5.26 ± 1.26	1.24 ± 0.77	1.40 ± 0.36	3.39 ± 0.98
Automobile Welders	4.97 ± 1.34	2.40 ± 0.60 [a, b]	1.15 ± 0.23 [a]	3.71 ± 1.32
Automobile Panel Beaters	4.57 ± 1.44 [a]	2.05 ± 0.78 [a, b]	1.16 ± 0.29 [a]	3.02 ± 0.98
Automobile Spray Painters	5.80 ± 1.06 [d]	2.44 ± 0.38 [a, b]	1.12 ± 0.17 [a, b]	3.66 ± 0.58
Automobile Blacksmiths	5.63 ± 1.04 [d]	2.31 ± 0.31 [a, b]	1.14 ± 0.27 [a]	3.95 ± 0.76 [d]
Automobile Electricians	4.93 ± 0.60	2.13 ± 0.38 [a, b]	0.97 ± 0.48 [a, b]	3.02 ± 0.39 [f]

Note: Values are expressed as Mean ± Standard Deviation (SD); n =40(Non-Automobile Artisans) & 10 (Automobile Artisans). [a] Significant at p<0.05 when compared to the mean value of control group; [b] Significant at p<0.05 when compared to the mean value of Automobile Mechanics; [c] Significant at p<0.05 when compared to the mean value of automobile welders; [d] Significant at p<0.05 when compared to the mean value of Automobile Panel Beaters; [e] Significant at p<0.05 when compared to the mean value of Automobile spray painters; [f] Significant at p<0.05 when compared to the mean value of automobile Electricians.

Table 1 shows the data on changes in lipid profile amongst automobile artisans in Port Harcourt.

The TC level was significantly (p<0.05) lower in the automobile panel beaters when compared to that of the control group and those of other artisans.

The mean triglyceride levels in all the automobile sub-groups, except that of the mechanics, were seen to be significantly (p<0.05) raised when compared to that of the control.

The HDL-C level in virtually all the automobile subgroups were noticed to be significantly (p<0.05) lower when compared to that of the control group.

The changes in the LDL—C levels across the artisans were not statistically significant (p>0.05) when compared to that of the control.

Table 2: Variations in Atherogenic Indices across Automobile Artisans in Port Harcourt

Study Groups	**AIP (0.1 – 0.24)**	**AC (3.0 – 4.0)**	**CRI-1 (3.5 – 5.0)**
Control (non-automobile Artisans)	0.01 ± 0.11	2.66 ± 0.44	3.66 ± 0.44
Automobile Mechanics	0.17 ± 0.43	3.16 ± 1.97	4.16 ± 1.97
Automobile Welders	0.31 ± 0.19 [a, b]	3.54 ± 1.71	4.54 ± 1.71
Automobile Panel Beaters	0.22 ± 0.22 [a, b]	3.06 ± 1.50	4.06 ± 1.50
Automobile Spray Painters	0.34 ± 0.05 [a, b]	4.20 ± 0.84 [a]	5.20 ± 0.84 [a]
Automobile Blacksmiths	0.31 ± 0.08 [a, b]	4.08 ± 1.10	5.08 ± 1.10
Automobile Electricians	0.39 ± 0.17 [a, b]	5.23 ± 2.92 a, b, c, d	6.23 ± 2.92 a, b, c, d

Note: Values are expressed as Mean ± Standard Deviation (SD); n =40(Non-Automobile Artisans) & 10 (Automobile Artisans). [a] Significant at p<0.05 when compared to the mean value of control group; [b] Significant at p<0.05 when compared to the mean value of Automobile Mechanics; [c] Significant at p<0.05 when compared to the mean value of automobile welders; [d] Significant at p<0.05 when compared to the mean value of Automobile Panel Beaters; [e] Significant at p<0.05 when compared to the mean value of Automobile spray painters; [f] Significant at p<0.05 when compared to the mean value of automobile

Electricians

The data on variations in atherogenic indices across automobile artisans in Port Harcourt is as presented on Table 2.

The atherogenic index of plasma (AIP) levels in all categories of the automobile workers, except for the mechanics, indicated significantly raised ($p<0.05$) mean values when compared to that of the control (non—automobile workers). Similarly, all other groups of the auto-workers had markedly elevated AIP values when compared to that of the mechanic sub-group.

The changes in the levels of atherogenic coefficient (AC) and Castelli risk index-1 (CRI-1) of the study subjects varied similarly. The auto-spray painters and auto-electricians had significantly ($p<0.05$) raised mean values of the both parameter when compared to those of the control groups. In the same vein, the auto-electricians had much more significantly ($p<0.05$) elevated levels of AC and CRI-1 when compared to those of mechanics, welders and panel beaters respectively.

Table 3: Changes in Oxidative Markers amongst Automobile Artisans in Port Harcourt

Study Groups	GSH (ug/ml) (0.5- 5.0)	GPX (ug/ml) (0.1 – 1.0)	CAT (ug/ml) (1.0 – 10.0)	SOD (ug/ml) (0.1 – 0.6)	MDA umol/ml (0.3 – 2.0)
Non-Automobile Artisans (Control)	3.17 ± 0.35	0.64 ± 0.21	6.70 ± 0.72	0.50 ± 0.1	0.20 ± 0.10
Automobile Mechanics	2.38 ± 0.18	0.05 ± 0.00*	3.36 ± 0.80*	0.33 ± 0.08	0.44 ± 0.09*
Automobile Welders	2.43 ± 0.38	0.05 ± 0.01*	3.67 ± 0.86*	0.35 ± 0.09	0.39 ± 0.11
Automobile Panel Beaters	2.41 ± 0.30	0.05 ± 0.01*	4.14 ± 0.94*, a	0.36 ± 0.07	0.42 ± 0.10
Automobile Spray Painters	3.08 ± 0.67 a, b, c	0.06 ± 0.01*	3.49 ± 1.08*	0.19 ± 0.22 *, a, b, c	0.13 ± 0.18 a, b, c
Automobile Blacksmiths	2.67 ± 0.62	0.06 ± 0.03 * b	3.84 ± 0.52*	0.40 ± 0.08 d	0.47 ± 0.11 *, d
Automobile Electricians	3.20 ± 0.70 a, b, c, e	0.05 ± 0.01*	4.32 ± 0.75 *, a, d	0.35 ± 0.12 d	0.48 ± 0.09 *, b, d

Note: Values are expressed as Mean ± Standard Deviation (SD); Significant at $p<0.05$ when compared to the mean [a] Significant at $p<0.05$ when compared to the mean value of control group; [b] Significant at $p<0.05$ value of control; when compared to the mean value of Automobile Mechanics; [c] Significant at $p<0.05$ when compared to the mean value of automobile welders; [d] Significant at $p<0.05$ when compared to the mean value of Automobile Panel Beaters; [e] Significant at $p<0.05$ when compared to the mean value of Automobile spray painters; [f] Significant at $p<0.05$ when compared to the mean value of automobile Electricians.

Table 3 shows the changes in oxidative markers amongst automobile artisans in Port Harcourt.

The mean level of the GSH was seen to be marginally ($p>0.05$) raised in the control subjects when compared to those of the auto-artisans except for that of the auto-electricians. The GPx and CAT levels in the various sub-groups of the auto-artisans were seen to be significantly ($P>0.05$) reduced when compared to that of the control group. The serum levels of CAT in all sub-groups of the auto-artisans were found to be significantly ($P<0.05$) lower when compared to that of the control group. The value of GSH was least in the panel beaters

The SOD level were found to be marginally reduced in all artisan sub-groups (except in the spray painters who had significant ($p<0.05$) reductions) when compared to that of the control group. The SOD level in the spray painters was significantly ($p<0.05$) reduced when compared to all other sub-groups of the artisans.

Regarding the outcome on the levels of MDA, mean values of all auto-artisans were observed to be elevated when compared to that of the control group; the mean values of the mechanics, and blacksmiths and electricians were significant ($p<0.05$).

DISCUSSION

From the socio-demographic outcome of the present study, it was observed that the various subgroups of the automobile workers (including mechanics, welders, panel beaters, spray painters, Blacksmiths and electricians) fell within the age bracket of 39.4 and 49.1 years. All participants were eventually males.

The degree or length of physical effort often needed to carry out job-related tasks (such as longer duration of sitting, standing, lifting, carrying, reaching, pushing, and pulling and even exposure to harsh materials or environment) is referred to as physical demand (Sharkey & Davis, 2008; Bester, 2008). This finding is in line with the notion that there is need for considering younger age in selecting workers for physically demanding jobs (Hodder & Kretsos, 2015; Boström *et al.,* 2016). So with natural selection, this set of workers (automobile artisans) in this study is neither under age nor up to their middle age. As it is known, age is a significant factor when it comes to workplace safety (Sámano-Ríos *et al.*, 2019).

It can thus be concluded that, the demands of the job types of the automobile artisans naturally select people within their thirties to their forties of age.

In a similar finding, the body mass index of the subjects show that except the mean BMI of the mechanics, which is marginally higher, all other groups of the automobile artisans had nonsignificantly lower values when compared to that of the control. It is thus obvious that the nature of the jobs of the automobile artisans may not exert adverse effects on the BMI status of the workers.

On the outcome of lipid profile of the study subjects, there was general elevation of TG and reduction in HDL-C levels.

The above result may be pointing at a possible deranging lipid metabolism. Of course, it is known that the homeostasis of total cholesterol is significantly influenced by HDL-C. HDL-C can do this by preventing the development of arteriosclerosis through a process called reverse cholesterol transport (RCT) (Ahn & Kim, 2016). Thus, a depleting HDL-C level may not be supportive of a good metabolic and cardiovascular health of the subjects. Assadi, (2017) submitted that blood disorders related to lipids are now common around the world and that some of their risk factors, such as mental and physical stress, can be modified in certain settings, such as the workplace. Thus, it can be stated here that the level of stress associated with the working conditions of the auto-artisans may possibly be impacting on above result.

The outcome on the atherogenic indices indicated significant increases in atherogenic coefficient (AC) and Castelli risk index-1 (CRI-1) amongst the auto-workers. Recall that the Castelli risk index-I (CRI-I), also known as cardiac risk ratio (CRR), could be useful in predicting the formation of coronary plaques with a diagnostic value as good as the determination of total cholesterol. Thus the, the auto-electrician may be at a high risk of coronary heart disease (CAD).

The levels of GSH, GPx, CAT and SOD were seen to be raised in the control group when compared to that of auto-workers when compared to that of the mechanics. This implies variously altered antioxidant capacity for the rest groups. The MDA levels were generally elevated in all artisans sub-groups when compared to that of the control group. Again, the MDA level was marginally raised in the blacksmith, electricians and then the mechanics when compared to that of other sub-artisans. The above result is understandable as the auto-workers are known to engage in more physical and aerobic activities.

Decreased levels of antioxidant enzymes cause oxidative stress, the dangerous build-up of free radicals that can harm cells and interfere with normal body processes (Rahman *et al.*, 2012; Zulaikhah *et al.*, 2017), and this imbalance leads to the development and progression of many non-communicable diseases, such as diabetes, cancer, neurodegenerative diseases, and cardiovascular diseases, by damaging essential components such as proteins, lipids, and DNA (Jarosiewicz *et al.,* 2019; Ezema *et al.,* 2024). Thus, the nature of the auto-workers jobs is such that may adversely affect their antioxidant capacities based on their sub-set of activities. Specifically, the blacksmiths, electricians and mechanics must take cautions for the marked levels of MDA; which is contrary to what was found in the rest auto-workers.

CONCLUSIONS

From the outcome of the present study, it is suggestive to state that, the demands of the job types of the automobile artisans naturally selects people mainly within their thirties to their forties of age and that the job may not exert adverse effects on the BMI status of the workers.

On the lipid profile examination, there was general elevation of TG and reduction in HDL-C levels. The atherogenic indices indicated significant increases in atherogenic coefficient (AC) and Castelli risk index-1 (CRI-1). The levels of GSH, GPx, CAT and SOD were seen to be mostly significantly redued in the auto-workers when compared to that of the control group.

There should be promotion of awareness on the regular and proper use of personal protective equipment (PPE) and timely/good health seeking behaviours amongst the automobile artisans in our environment; to prevent wanton exertion by their job nature on their health.

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