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Original Article

# THE COMPARATIVE STUDY OF THE LIVER FUNCTION INDICES AMONG MOTORCYCLE OPERATORS AND NON MOTORCYCLE OPERATORS IN ONDO WEST LOCAL GOVERNMENT AREA, ONDO STATE.

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**ABSTRACT:**

The use of motorcycle (Okada) for carrying passengers from one destination to another for commercial purposes has crept into Nigerian's transportation activities and is now popular, possibly because it is faster especially when there is terrible hold ups and can also drop an individual at his door step. Nevertheless, during the course of their occupation motorcyclist consume and abuse some substances. Among substances that they abuse are alcoholic drinks, tobacco, marijuana, cocaine, heroin, opiates, hallucinogens, inhalants, local psychoactive drugs and stimulants. Due to the unhealthy lifestyle they live during the course of their occupation this may have adverse effect on the physiology of some organs in their body such as the liver. Aim: The aim of this study is to investigate the effect of motorcycle operations on the liver function parameters. Methods: A total of 90 participants were selected using purposive sampling methods having determined the sample size. A cross sectional design and structured questionnaire was adopted for this study and the hypotheses were tested at 0.05 level of significance on the SPSS version 21 window. Results: The study revealed that there was a significant difference ($p<0.05$) in the mean ±SD of some liver enzymes of motorcycle operators (subjects) and controls. Conclusion: It was concluded that unhealthy lifestyle they live during the course of their occupation have adverse effect on the physiology of the liver.

**Keywords:** liver, liver disease, liver enzymes

## INTRODUCTION:

The use of motorcycles as means of public transport became popular in Lagos in 1992, as a result of dearth of other means of public transportation. It was reported that in 1995, an estimated 45,000 motorcycles were in use for public transportation in Lagos metropolis alone [1]. In Nigeria, there is also biting economic depression and high rate of unemployment. A combination of these factors has forced many people to resort to creative means to address their daily travel needs. In the rural areas where the roads are in deplorable conditions, commercial motorcycles complement the services of buses and taxis. Besides being cheap, commercial motorcycles provide on-demand services and are faster. Unfortunately, the rise has been accompanied by increased levels of risk of accidents, bad behaviors, reckless riding, poor attitude of the operators and resistance to laudable government policies among others [2,3]. As a result,



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they have come under heavy scrutiny culminating in legislations restricting and in some instances prohibiting their operations in some cities. This in effect shrinks the economic and social benefits derived from the use of motorcycles for commercial purposes.

During the course of their occupation motorcyclist consume and abuse some substances. Among substance that they abuse are alcoholic drinks, tobacco, marijuana, cocaine, heroin, opiates, hallucinogens, inhalants, local psychoactive drugs and stimulants. Drug abuse is the illegal, non-medical use of a limited number of substances that are capable of changing functions of cells in the body, have properties of altering the mental state that are considered by social norms [4]. The consumption of alcohol, even in small doses is associated with an increased risk of being involved in a crashes and RTIs [5,6]. Alcohol intake affects

judgment, slows down visual information processing and the ability to discriminate traffic signs, impairs psychomotor skills, and prolongs reaction time [7,8]. Some other reported effects of alcohol include excessive or inappropriate speed, inattention, failure to navigate curves, and increased probability of running off the road [9]. The risk of RTIs related to alcohol consumption is linked to both the amount and drinking pattern.

The liver is a critical organ in the human body and comprises of about 2% of an adult's body weight. The liver is a unique organ due to its dual blood supply from the portal vein (approximately 75%) and the hepatic artery (approximately 25%) [10]. The liver is responsible for an array of functions that help support metabolism, immunity, digestion, detoxification, vitamin storage among other functions, some of which includes production of bile,conjugation of direct bilirubin, some enzymes such as alkaline phosphatase (ALP), alanine transaminase (ALT), aspartate transaminase (AST). Apart from these functions, the liver also plays an important role in metabolism of every ingested substance as well as detoxifying drugs and harmful substances that motorcyclist are exposed to, which includes, alcohol and psychoactive drugs, fumes of petroleum products.

## RATIONALE OF STUDY

This informal occupation, commercial motorcycling, has a lot of challenges, one of which is the health related problem. This is due to the fact that commercial motorcyclists (Okada riders) operate under harsh weather conditions which often result in illnesses such as fever, headache, back ache, respiratory diseases, and chest pain to mention but few. These illnesses are harmful and detrimental to their wellbeing. In addition, the unhealthy lifestyle they live during the course of their occupation may have adverse effect on the physiology of some organs in their body such as the liver.

## HYPOTHESIS (NULL) OF STUDY

- There is no significant difference between the serum Alanine aminotransferase (ALT), Asparate aminotransferase (AST), Alkaline phosphates (ALP) and Gamma glutamyltransferase (GGT), Lactate dehydrogenase (LDH) levels among exposed motorcyclist and the non exposed subjects.
- There is no significant correlation between the enzyme values and the duration of motorcycle operations.

## MATERIALS AND METHODOLOGY:

### STUDY LOCATION

This study was undertaken at Ondo West Local Government Area located in Ondo State, Nigeria. It has an area of 950.8 $km^2$.The local government area consists of the Districts and villages of Enuowa, Obolalu, Ajagba Alafia, Gbongbo, Ifore amongst others. Ondo west local government area is a semi-urban area and is host to several banks, restaurants and industries. It is geographically defined by its Latitude and Longitude coordinates which are 7.100005, 4.481694.

### STUDY DESIGN

This is a cross-sectional study. This study was carried out within three months. Motorcycle operators (okada riders) in their local government area were recruited for the study after obtaining their informed consent.

### CONSENT AND ETHICAL CLEARANCE

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Subjects participating in this study were fully briefed through the administration of questionnaire, after which they were required to sign a written consent. Ethical approval was sought and obtained from the Ethical Review Committee of the University of Medical Sciences, Ondo.

## CRITERIA FOR SELECTION OF SUBJECT

### Inclusion criteria

1. Commercial motorcyclists.
2. Healthy individuals who are neither commercial motorcyclist nor exposed to hard drugs and alcohol participated as controls.

### Exclusion criteria

1. Healthy individuals who are neither motorcyclist nor actively exposed to psychoactive drugs and alcohol.
2. Individuals with liver disease or any underlying diseases.

## LABORATORY ANALYSIS

The liver function was accessed by estimating the serum ALT, AST, ALP, GGT and LDH levels in both subjects.

### *Alanine aminotransferase ALT*[11]

Principle

ALT catalyses the transfer of an amino group from L-alanine to 2-oxoglutarate to form pyruvate and L-glutamate. The pyruvate concentration is determined spectrophotometrically in the form of hydrazone, a brown color complex which is produced by reaction with 2,4-dinitrophenylhydrazine in an alkaline medium.

**Procedure:**

| | Blank | Test |
|---|---|---|
| Sample | _ | 100µl |
| Reagent 1 | 500µl | 500µl |
| Incubate at 37ºc for 30mins. | | |
| Reagent 2 | 500µl | 500µl |
| Incubate at 25ºc for 20 mins | | |
| NaOH | 2500µl | 2500µl |
| Incubate at 25ºc for 5 mins. Absorbance was read at 546nm wavelength on the spectrophotometer. The concentration was determined by comparing it with the provided chart. | | |

### *Asparate aminotransferase AST* [11]

Principle

AST catalyses the transfer of an amino group from L-aspartate to 2-oxoglutarate to form oxaloacetate and L-glutamate. The oxaloacetate concentration is determined spectrophotometrically in the form of hydrazone, a brown color complex which is produced by reaction with 2,4-dinitrophenylhydrazine in an alkaline medium and read at 546nm wavelength.

**Procedure:**

| | Blank | Test |
|---|---|---|
| Sample | _ | 100µl |
| Reagent 1 | 500µl | 500µl |

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| | | |
|---|---|---|
| Incubate at 37ºc for 30mins. | | |
| Reagent 2 | 500µl | 500µl |
| Incubate at 25ºc for 20 mins | | |
| NaOH | 2500µl | 2500µl |
| Incubate at 25ºc for 5 mins. Absorbance was read at 546nm wavelength on the spectrophotometer. The concentration was determined by comparing it with the provided chart. | | |

***Gamma-glutamyltransferaseγ-gt*[12]**

Principle

The substrate L-γ-glutamyl-3-carboxy-4-nitroanilide, in the presence of glycylglycine is converted by γ-GT in the sample to 5-amino-2-nitrobenzoate which can be measured at 405nm wavelength.

Procedure

| | Blank | Test |
|---|---|---|
| Sample | _ | 100µl |
| Reagent | 1000µl | 1000µl |
| The absorbance was read on the spectrophotometer for 3mins at 1min interval at 405nm wavelength. The average absorbance difference per minute was calculated (A/min) and the activity of GGT was obtained by using the formula; U/l = 1158 x A 405 nm/min | | |

***Alkaline phoshatase ALP*[11]**

Principle

Alkaline phosphatase catalyses the hydrolysis of p-nitrophenyl phosphate to yield inorganic phosphate and p- nitrophenol in the presence of magnesium ions. The rate of formation of p- nitrophenol is monitored kinetically and proportional to the activity of ALP in the sample which is measured at 405nm wavelength on the spectrophotometer.

Procedure

| | Blank | Test |
|---|---|---|
| Sample | _ | 20µl |
| Reagent | 1000µl | 1000µl |
| The absorbance was read on the spectrophotometer for 3mins at 1min interval at 405nm wavelength. The average absorbance difference per minute was calculated (A/min) and the activity of ALP was obtained by using the formula; 2760 x A 405 nm/min | | |

***3.8.5 Lactate dehydrogenase LDH*[13]**

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Principle

Lactate dehydrogenase catalyzes the interconversion of pyruvate and lactate. LDH catalyzes the formation of lactate and Nicotinamide adenine dinucleotide ($NAD^+$) from pyruvate and reduced Nicotinamide adenine dinucleotide (NADH) in a reversible biochemical reaction. The rate of increase in the concentration of NADH measured photometerically at 340nm wavelength is directly proportional to the catalytic activity of LDH.

**Procedure:**

| | Blank | Test |
|---|---|---|
| Sample | _ | 10µl |
| Reagent | 1000µl | 1000µl |
| The absorbance was read on the spectrophotometer for 3mins at 1min interval at 340nm wavelength. The average absorbance difference per minute was calculated (A/min) and the activity of LDH was obtained by using the formula; LDH-P activity (U/L) = ( A/min) x 16030. | | |

**Statistical analysis**

A Statistical Package for Social Scientist (SPSS) 21.0 was used for the analysis of the data. Results were analyzed using the Student's t-test and correlation studies using Pearson's correlation coefficient to obtain relationship between quantitative variables. Results were presented as mean ± SD and taken as significant at $p<0.05$.

**RESULTS:**

This study was carried out to compare the activities of liver enzymes and activity of lactate dehydrogenase (LDH) enzyme of motorcycle operators (Okada riders) with non motorcycle operators in Ondo metropolis, Ondo State. A total of ninety (90) male individuals comprising fifty (50) motor cycle operators (subjects) and forty (40) non-motorcycle operators (controls) were recruited for this study. The results of the study were reported in the tables below.

Of fifty commercial motorcyclists interviewed majority (38%) were in the age group 20-30 years, while the minority (28%) were in the age group 41 and above. All the motorcyclists were males. Among the respondents 8% had no formal education, 18% had primary education. Majority had tertiary education 54% and the rest 20% had secondary education. Majority of the respondents 70% were Christians and 30% were in the monthly income group 20,000-40,000 naira and 81,000 naira-above, while minority 6% were traditional worshippers and 10% earned less than 20,000 naira (Table 1).

**TABLE 1:BIO-PHYSICAL CHARACTERISTIC OF MOTORCYCLE OPERATORS**

| | VARIABLES | FREQUENCY | PERCENTAGE |
|---|---|---|---|
| AGE | Less than 20 | 0 | 0.0 |
| | 20-30 | 19 | 38.0 |
| | 31-40 | 17 | 34.0 |

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| | | | |
|---|---|---|---|
| | 41 and above | 14 | 28.0 |
| **MARITAL STATUS** | Single | 12 | 24.0 |
| | Married | 38 | 76.0 |
| | Divorced/separated | 0 | 0.0 |
| | Widow | 0 | 0.0 |
| **EDUCATION STATUS** | No formal education | 4 | 8.0 |
| | Primary | 9 | 18.0 |
| | Secondary | 10 | 20.0 |
| | Tertiary | 27 | 54.0 |
| **RELIGION** | Christianity | 35 | 70.0 |
| | Islam | 12 | 24.0 |
| | African traditional religion | 3 | 6.0 |
| **FAMILY MONTHLYINCOME** | Less than 20,000 | 5 | 10.0 |
| | 20,000-40,000 naira | 15 | 30.0 |
| | 41,000-60,000 naira | 9 | 18.0 |
| | 61,000- 80,000 naira<br>81,000 naira-ABOVE | 6<br>15 | 12.0<br>30.0 |
| | | | |
| | | | |

Table 2 showed the mean±SD of alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), gamma-glutamyltransferase (GGT) and lactate dehydrogenase (LDH) of motorcycle operators (subjects) and controls. The mean±SD ALT of motorcycle operators (subjects) and controls were 6.02±4.14 and 4.46±3.06 respectively. There was a significant difference ($p<0.05$) with increase in the activity of ALT of motorcycle operators when compared with the controls. The mean±SD AST of motorcycle operators (subjects) and controls were 11.51±7.09 and 9.67±5.37 respectively. There was no significant difference ($p>0.05$) between the groups. The mean±SD ALP of motorcycle operators

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(subjects) and controls were 106.17±43.66 and 111.10±37.09 respectively. There was no significant difference (p>0.05) between the groups. The mean±SD GGT of motorcycle operators (subjects) and controls were 27.32±22.53 and 13.12±5.10 respectively. There was a significant difference (p<0.05) with increase in the activity of GGT of motorcycle operators when compared with the controls. The mean±SD LDH of motorcycle operators (subjects) and controls were 9.46±5.04 and 10.03±6.16 respectively. There was no significant difference (p>0.05) between the groups.

**TABLE 2: Mean±SD ACTIVITIES OF LIVER ENZYMES OF MOTOR-CYCLE OPERATORS (SUBJECTS) AND THE CONTROLS**

| PARAMETER | TEST SUBJECTS Mean±SD N=50 | CONTROLS Mean±SD N=40 | t-value | p-value | REMARKS |
|---|---|---|---|---|---|
| ALT | 6.02±4.14 | 4.46±3.06 | 1.983 | 0.050 | S |
| AST | 11.51±7.09 | 9.67±5.37 | 1.355 | 0.179 | NS |
| ALP | 106.17±43.66 | 111.10±37.09 | 0.569 | 0.571 | NS |
| GGT | 27.32±22.53 | 13.12±5.10 | 3.900 | 0.000 | S |
| LDH | 9.46±5.04 | 10.03±6.16 | -0.480 | 0.640 | NS |

P-value ≤ 0.05 is statistically significant

ALT: Alanine aminotransferase ALP: Alkaline phosphatase

GGT: Gamma-glutamyltransferase LDH: Lactate dehydrogenase

S: Significant NS: Not significant

Table 3 showed the mean±SD BMI of motorcycle operators (subjects) and controls. The mean±SD BMI of motorcycle operators (subjects) and controls were 20.89±3.22 and 23.34±4.78

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respectively. There was a significant difference ($p<0.05$) with decrease the BMI of motorcycle operators when compared with the controls.

**TABLE 3: Mean±SD BMI OF MOTOR-CYCLE OPERATORS (SUBJECTS) AND THE CONTROLS**

| PARAMETER | TEST SUBJECTS Mean±SD N=50 | CONTROLS Mean±SD N=40 | t-value | p-value | REMARKS |
|---|---|---|---|---|---|
| BMI | 20.89±3.22 | 23.34±4.78 | -2.615 | 0.011 | S |

P-value ≤ 0.05 is statistically significant

Keys

BMI: Body mass index

S: Significant

Table 4 showed the correlation between the age of motorcycle operators and the activities of the liver enzymes. There was no significant correlation ($p>0.05$) between the age and the activities of liver enzymes of motor cycle operators but there was a significant correlation ($p<0.05$) when age was correlated with LDH.

**TABLE 4: CORRELATION OF AGE WITH ACTIVITIES OF LIVER ENZYMES AND LDH OF MOTORCYCLE OPERATORS**

| | PARAMETERS | CORRELATION COEFFICIENT (r) | P-value | REMARK |
|---|---|---|---|---|
| AGE | ALT | 0.059 | 0.684 | NS |
| | AST | -0.066 | 0.648 | NS |
| | ALP | 0.225 | 0.117 | NS |
| | GGT | 0.158 | 0.272 | NS |

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| | | | | |
|---|---|---|---|---|
| | LDH | 0.439 | 0.001 | S |

P-value ≤ 0.05 is statistically significant

Table 5 showed the correlation between the BMI of motorcycle operators and the activities of the liver enzymes and LDH. There was no significant correlation (p>0.05) between the BMI and the activities of liver enzymes and LDH of motor cycle operators

**TABLE 5: CORRELATION OF BMI WITH ACTIVITIES OF LIVER ENZYMES AND LDH OF MOTORCYCLE OPERATORS**

| | **PARAMETERS** | **CORRELATION COEFFICIENT (r)** | **P-value** | **REMARK** |
|---|---|---|---|---|
| BMI | ALT | 0.154 | 0.285 | NS |
| | AST | 0.022 | 0.881 | NS |
| | ALP | -0.065 | 0.657 | NS |
| | GGT | 0.189 | 0.188 | NS |
| | LDH | 0.134 | 0.352 | NS |

P-value ≤ 0.05 is statistically significant

Table 6 showed the correlation between the activity of LDH of motorcycle operators and the activities of the liver enzymes. There was no significant correlation (p>0.05) between the LDH and the activities of ALT, ALP and GGT of motor cycle operators but there was a significant correlation (p<0.05) when LDH was correlated with AST

**TABLE 6: CORRELATION OF ACTIVITY OF LDH WITH ACTIVITIES OF LIVER ENZYMES OF MOTORCYCLE OPERATORS**

| | **PARAMETERS** | **CORRELATION COEFFICIENT (r)** | **P-value** | **REMARK** |
|---|---|---|---|---|

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| | | | | |
|---|---|---|---|---|
| LDH | ALT | -0.144 | 0.317 | NS |
| | AST | -0.293 | 0.039 | S |
| | ALP | -0.149 | 0.302 | NS |
| | GGT | 0.134 | 0.353 | NS |

P-value ≤ 0.05 is statistically significant

**TABLE 7: CORRELATION OF YEARS ON THE JOB WITH ACTIVITIES OF LIVER ENZYMES AND LDH OF MOTORCYCLE OPERATORS**

| | **PARAMETERS** | **CORRELATION COEFFICIENT (r)** | **P-value** | **REMARK** |
|---|---|---|---|---|
| YEARS ON THE JOB | ALT | 0.053 | 0.713 | NS |
| | AST | -0.008 | 0.955 | NS |
| | ALP | 0.139 | 0.336 | NS |
| | GGT | -0.028 | 0.849 | NS |
| | LDH | 0.442 | 0.001 | S |

P-value ≤ 0.05 is statistically significant

Table 8 showed the correlation between the working hour per day of motorcycle operators and the activities of the liver enzymes and LDH. There was no significant correlation (p>0.05) between the working hours per day and the activities of ALT, AST and ALP of motor cycle operators but

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there was a significant correlation ($p<0.05$) when working hours per day was correlated with GGT and LDH

**TABLE 8: CORRELATION OF WORKING HOURS PER DAY WITH ACTIVITIES OF LIVER ENZYMES AND LDH OF MOTORCYCLE OPERATORS**

| | PARAMETERS | CORRELATION COEFFICIENT (r) | P-value | REMARK |
|---|---|---|---|---|
| WORKING HOURS PER DAY | ALT | -0.122 | 0.442 | NS |
| | AST | -0.193 | 0.183 | NS |
| | ALP | 0.175 | 0.223 | NS |
| | GGT | 0.366 | 0.009 | S |
| | LDH | 0.437 | 0.002 | S |

P-value ≤ 0.05 is statistically significant

## DISCUSSION:

The aim of this study is to investigate the effect of motorcycle operations on the liver function parameters. The assay of liver enzymes such as ALT, AST, ALP, GGT and LDH are important biomarkers of liver function and are of highly clinical values in assessment of this organ.

In this study, it was found that the mean value of BMI of motorcycle operators was considerably lower ($p<0.05$) than that of the control subjects. This study is at variance with that of [14], who reported that obesity is a determinant of low basal metabolic rate and low levels of physical activity. Variation in these studies could be the energy-intensive motorcycling activities of motorcycle operators that result in fat loss as compared to non-motorcyclists. The association between BMI and ALT, AST, GGT, and LDH activity is positive but not statistically significant ($p>0.05$). This indicates that ALT, AST, GGT and LDH activity increases with increasing BMI. This is consistent with [15], who found elevated ALT, AST, and GGT levels in obese people. Increased BMI are found in obese individuals whose body composition is characterized by an increase in fat mass and a decrease in muscle mass [14]. This increased fat mass causes excess fat to be stored in the liver (fatty liver) which can subsequently lead to non-alcoholic fatty liver disease (NAFLD) characterized by elevated liver enzymes.

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LDH and GGT activity showed a direct association in this study ($p>0.05$), it is not statistically significant. This finding aligns with [16]. LDH is an enzyme that shows signs of cellular harm [17]. GGT is crucial for the detoxification of xenobioticsand carcinogens [16]. Free radicals are frequently produced during the metabolism of harmful drugs like alcohol, which can result in oxidative stress, which then damages cells by releasing intracellular enzymes like LDH. However, the body makes up for this by increasing GGT activity, which is required for maintaining glutathione levels, and reducing oxidative stress. In this study, LDH and ALT, AST, and ALP activity showed an inverse relationship. This relationship is only significant ($p<0.05$) with AST and insignificant ($p>0.05$) with ALT and ALP activity. This study is in variance with [18]. Possible reason could be consumption of herbal remedies which is a common practice among commercial motorcyclists.

Motorcycle riders' working hours/day and their ALP, GGT, and LDH activity were found to be positively correlated ($p>0.05$, $p<0.05$, and $p<0.05$, respectively). This finding is consistent with that of Solaja*et al*. [18] who reported that long working hours directly correlates with liver enzymes. One explanation could be that prolonged working hours increases the risk of non-alcoholic fatty liver disease (NAFLD), which is linked to unhealthy eating habits like skipping breakfast, dining out, and consuming fast food during extended working hours. Additionally, long workdays could negatively impact the liver and produce psychosocial job stress.

Some of the liver enzymes (ALT, ALP, and LDH) revealed a positive association with the years spent riding motorcycles at $p>0.05$, $p>0.05$, and $p<0.05$, respectively. Motorcycle riders utilize psychoactive drugs to enable them to operate for more than 10 hours each day [1]. Upon exposure to this substance during the years spent in motorcycle, the liver may experience increased oxidative stress during metabolism of this compound when exposure to these substances is prolonged.

## CONCLUSION:

This study shows that the ALT and GGT levels in motorcycle operators significantly increased in comparison to the test subjects. Significant differences were observed in the BMI of motorcycle operators in comparison the controls. It was observed that an increase in the BMI of motorcycle operators causes an increase in ALT, AST and GGT levels. An increase in the duration of working hours has an effect on the ALP, GGT and LDH levels.

## RECOMMEDATION

The prolonged working hours of commercial motorcycle operators should be reduced in order to minimize stress brought about by prolong motorcycling. This also encourages rest that the body needs to recuperate energy and discourages the use of stimulants and alcohol to relieve stress. When alcohol consumption is reduced, is reduces the risk of obesity and increased BMI, which also increases liver enzymes. Healthy life styles should be encouraged among commercial motorcyclist. There should be public health awareness on the benefits of routine check up among motorcycle operators.

## CONFLICT OF INTEREST STATEMENT

I certify that I have no affiliation with or involvement in any organization or entity with any financial interest, or non-financial interest in the subject matter or materials discussed in this manuscript.

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