

**CARDIOVASCULAR DISEASES RISK FACTORS AMONG COMMERCIAL
LONG DISTANCE BUS DRIVERS IN CAPE COAST**

BY

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DECLARATION

I, Heckel Amoabeng Abban (Mrs), author of this thesis, do hereby declare that the entire content of this work was produced by me with the exception of cited references under the able supervision of Prof. Matilda Steiner-Asiedu and Prof. E. Asibey-Berko of the Department of Nutrition and Food Science, University of Ghana, Legon-Accra.

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ABSTRACT

Background: Commercial Long Distance Drivers (CLDDs) are professional drivers who travel a distance of 140km or more on a regular basis. The habit of leaving home early and also driving for hours may all impact on eating practices, stress and overall health. In Ghana, it has been documented that road accidents are on the rise and these have been attributed to over speeding and careless or reckless driving. In the developed world studies have shown that cardiovascular diseases also contribute to road accidents among which are stress and related problems. It is therefore likely that these conditions may be contributing to the rampant road carnage in Ghana, hence this study.

Objective: This research sought to find out if there are any cardiovascular disease risk factors among commercial long distance bus drivers (CLDBDs) in Cape Coast.

Methodology: This was a cross-sectional study which involved 170 commercial long distance bus drivers in Cape Coast who consented to participate in the study. Data collection took place from October – November 2012; 4.30a.m. to 9.30a.m. A pre-tested close ended questionnaire were administered to collect data on backgrounds of the drivers, commercial driving history, lifestyle of drivers, stress level, leisure time activities, dietary pattern and history of disease conditions of drivers and their families. Also anthropometric (body mass index and percentage body fat), clinical (blood pressure) and biochemical (Lipid profile and fasting blood sugar) data of the drivers were collected. Data were statistically analyzed using SPSS 16.0 Software package (Chicago, USA). Descriptive statistics (frequencies and percentages) were used to summarize categorical variables such as level of education while means and standard deviations were used for the continuous variables. Binary logistic regression was used to assess the risk factors of

cardiovascular diseases using high blood pressure, overweight and high ratio of total cholesterol and high density lipoprotein as proxies.

Results: Prevalence of overweight, obesity, high fasting blood sugar level and high density lipoprotein were 36.5%, 14.2%, 72.5%, and 8.8% respectively. Also 22.4% and 21.2% had high diastolic and systolic blood pressure respectively. Drivers drinking alcohol were 45.9% and 64.7% had low physical activity level. Only 8.8% had the desirable level of high density lipoprotein. Drivers who had driven for less than 14years were less likely to develop high systolic and diastolic blood pressure compare to those who had driven for more than 21years (OR = 0.13 CI = 0.04 – 0.39), drivers who drove buses with 20seats or less were at an increased risk of developing high diastolic blood pressure compared to those who drove buses with more than 20 seats (OR = 3.58 CI = 1.09 – 11.75), drivers with turn – around time of 1hour were at an increased risk of becoming overweight compared to drivers whose turn – around time was 24hours, snacking was associated with increased risk of becoming overweight (OR= 1.81 CI= 0.29 – 10.99) and having high ratio of total cholesterol and high density lipoprotein (OR = 2.63 CI = 0.39 – 17.91; OR = 1.48 CI = 0.52 – 4.24), alcohol intake was associated with an increased risk of becoming overweight (OR = 3.02 CI = 0.79 – 11.48; OR = 2.78 CI = 1.49 – 5.18)

Conclusion: The main determinants of cardiovascular diseases among the drivers were snacking, overweight, alcohol intake, low physical activity level, very high percentage body fat and low high density lipoprotein. These observations call for nutrition education campaigns for drivers.

DEDICATION

I dedicate this work to my husband Mr. Edward K. Abban, my parents Mr and Mrs Dokyi Amoabeng and my children Nana Osam Abban, Kofi Dokyi Abban Jnr. and Akua Sika Abban.



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TABLE OF CONTENTS

DECLARATION	i
ABSTRACT.....	ii
DEDICATION	iv
ACKNOWLEDGEMENT	v
TABLE OF CONTENTS.....	vi
LIST OF TABLES	x
LIST OF FIGURES	xii
LIST OF ABBREVIATIONS.....	xiii
CHAPTER ONE.....	1
1.0 INTRODUCTION	1
1.1 Background Information	1
1.2 Research Problem.....	4
1.3 Research Question.....	5
1.3.1 Main Research Question.....	5
1.3.2 Specific Research Question.....	5
1.4 Objectives of the study	6
1.4.1 Main Objective	6
1.4.2 Specific Objectives	6
CHAPTER TWO	7
2.0 LITERATURE REVIEW	7
2.1 Global Trends of Non-Communicable Diseases (NCDs)	7
2.2 Occupation as a risk factor for Cardiovascular Diseases (CVDs)	8
2.2.1 Long working hours	8
2.2.2 Occupationally related stress	9

2.2.3 Shift system of work	10
2.2.4 Exposure to vibration	14
2.3 Non – Communicable Diseases among different occupations	14
2.3.1 Knee and hip osteoarthritis.....	14
2.3.2 Diabetes and hypertension	15
2.3.3 Myocardial Infarction.....	16
2.3.4 Cancer.....	17
2.3.5 Musculoskeletal Disorders	20
2.4 Risk factors of CVD.....	22
2.4.1 Diet.....	22
2.4.2 Abnormal blood lipid level	24
2.4.3 Obesity	25
2.4.4 Excessive alcohol use.....	26
2.4.5 Tobacco use.....	27
2.4.6 Physical Inactivity	28
2.4.7 Stress	29
2.4.8 Hypertension	30
2.4.9 Diabetes	31
CHAPTER THREE	32
3.0 METHODOLOGY	32
3.1 Research Design and setting	32
3.2 Study population and sampling.....	32
3.3 Data collection.....	33
3.4 Data collection procedure.....	33
3.4.1 Questionnaire Interviews.....	33

3.4.2 Anthropometric Data	34
3.4.3 Biochemical indicators (lipid panel and fasting blood sugar)	34
3.4.4 Clinical (blood pressure)	35
3.5 Quality Assurance	35
3.6 Data capture and analysis	36
3.7 Ethical consideration	37
CHAPTER FOUR.....	38
4.0 RESULTS	38
4.1 Preamble	38
4.2 Background characteristics of CLDBDs	38
4.3 Reported medical profile of CLDBDs.....	40
4.4 Stress and lifestyle practices of CLDBDs	41
4.5 Dietary pattern of CLDBDs	42
4.6 Anthropometric indicators and blood profile of CLDBDS	44
4.7 Blood chemistry of CLDBDs	46
4.8 Predictors of CVDs	48
4.8.1 Predictors of HDBP	48
4.8.2 Predictors of HSBP.....	50
4.8.3 Determinants of BMI (Overweight)	53
4.8.4 Predictors of high ratio of TC to HDL	56
CHAPTER FIVE	60
5.0 DISCUSSION	60
5.1 Background information of drivers	60
5.2 Determinants of CVDs	65

CHAPTER SIX.....	71
6.0 CONCLUSIONS AND RECOMMENDATION	71
6.1 Conclusion.....	71
6.2 Recommendation.....	71
REFERENCES	73
APPENDICES	92

LIST OF TABLES

Table 4.1: Background characteristics of commercial long distance bus drivers (CLDBDs)	39
Table 4.2: Stress level and lifestyle practices of CLDBDs.....	42
Table 4.3: Dietary pattern	43
Table 4.4: Blood pressure readings.....	46
Table 4.5: Blood chemistry.....	47
Table 4.6: Logistic regression to show factors that predict high diastolic blood pressure among commercial long distance bus drivers in the study (adjusted and unadjusted).....	49
Table 4.6 cont'd: Logistic regression to show factors that predict high diastolic blood pressure among commercial long distance bus drivers in the study (adjusted and unadjusted).....	50
Table 4.7: Logistic regression to show factors that predict high systolic blood pressure among commercial long distance bus drivers in the study (adjusted and unadjusted).....	52
Table 4.7: cont'd: Logistic regression to show factors that predict high systolic blood pressure commercial long distance bus drivers in the study (adjusted and unadjusted).....	53
Table 4.8: Logistic regression to show factors that predict overweight among commercial long distance bus drivers in the study (adjusted and unadjusted)	55

Table 4.8: cont'd: Logistic regression to show factors that predict high overweight among commercial long distance bus drivers in the study (adjusted and unadjusted)	56
Table 4.9: Logistic regression to show factors that predict high TC/HDL among commercial long distance bus drivers in the study (adjusted and unadjusted).....	58
Table 4.9: cont'd: Logistic regression to show factors that predict high TC/HDL among commercial long distance bus drivers in the study (adjusted and unadjusted).....	59

LIST OF FIGURES

Figure 4.1: Reported medical history profile of CLDBDs	40
Figure 4.2: Reported family disease condition	41
Figure 4.3: Common foods eaten by CLDBDs.....	43
Figure 4.4: Body mass index of CLDBDs	45
Figure 4.5: Percentage body fat of CLDBDs.....	45

LIST OF ABBREVIATIONS

CDC – Center for Disease Control

CLDBDs – Commercial Long – Distance Bus Drivers

DVLA – Driver Vehicle Licensing Authority

WHO – World Health Organization

WHF- World Heart Federation

HBP- High Blood Pressure

HUNT – Nord-Trøndelag Health Study

SBP- Systolic Blood Pressure

DBP- Diastolic Blood Pressure

BMI- Body Mass Index

TC- Total Cholesterol

HDL- High Density Lipoprotein

LDL- Low Density Lipoprotein

HDBP- High Diastolic Blood Pressure

HSBP- High Systolic Blood Pressure

NIH- National Institutes of Health

NIEHS- National Institute of Environmental Health Sciences

VHEEP – Vasternorrland Heart Epidemiology Program

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background information

Occupation is a person's regular work or profession; job or principal activity (Collins English Dictionary, 2009). Studies have shown that people choose a particular occupation based on interest, self image, personality and social background (Rao, 2011; McKay, 2007) but unfortunately some occupations expose workers to hazards which may be physical, chemical, psychosocial or mechanical (NIEHS, 2012). For instance miners by nature of their work are mostly at risk of suffering from pneumocosis due the inhalation of dust, and also they are exposed to excessive noise and vibration (Cho and Lee, 1978). Professional drivers are no exception and a lot have been reported on risks associated with driving such as psychological and psychiatric disorders, disorders resulting from disrupted biological systems, musculoskeletal disorders, cancers and respiratory morbidities (Apostolopoulos, 2010).

Long Distance Drivers are professional drivers who travel a distance of 140km or more on a regular basis (Ghana Metro Mass Transit, 2010). These drivers by nature of their work leaves home early in the morning only to return back late or even do not return until the next day. As a result of their work schedule and irregular sleeping habits these drivers get stressed out at the end of the day. Again some of them have irregular eating habits and also they patronize foods from the fast foods joint which is mostly high in saturated fat and salt. Furthermore these drivers are physically inactive since their work is more sedentary and most of them do not make any effort to exercise when not working (Kurosaka *et al.*, 2000; Kompier, 1996). According to

World Heart Federation (2012a), physical inactivity, stress, dietary intake of saturated fat and high intake of salt are some of the risk factors of Cardiovascular Diseases.

Cardiovascular Diseases (CVDs) are a group of disorders of the heart and blood vessels, and includes coronary heart diseases (heart attacks), cerebrovascular disease (stroke), raised blood pressure (hypertension), peripheral artery disease, rheumatic heart disease, congenital disease and heart failure (WHO, 2012) . Most CVDs are related to atherosclerosis; a condition in which plaque builds up in the artery, narrowing the diameter and hence resisting the blood flow. The resistance to the blood flow builds up pressure within the circulatory system (WHF, 2012b), hence a culprit of elevated blood pressure. Globally, CVDs are the leading cause of death and disabilities (WHO, 2011a). According to WHO (2011), 17.3million people died from CVDs in 2008 and over 80% of the deaths from CVDs takes place in low- middle – income countries. It has been projected that by 2030, 23.6million people will die from CVDs (WHO, 2011a). Cardiovascular disease is the leading cause of death in the developing world, except sub Saharan Africa (WHF,2012a).There are many risk factors associated with CVDs, some of them are modifiable and others are not. However having risk factors for CVDs does not mean that you will automatically develop these diseases but rather the more the risk factors the higher your chances of developing the disease unless you take actions to modify these risk factors (WHF, 2012a).

Behavioral risk factors such as intake of unhealthy diet, physical inactivity, tobacco use and harmful alcohol use account for 80% of coronary heart disease and cerebrovascular disease (WHO, 2011a). In addition unhealthy diet and physical inactivity may lead to intermediary or metabolic risk factors such as raised blood pressure, raised blood glucose, raised blood lipids, overweight and obesity (WHO,

2012). There are also certain underlying determinants of CVDs which include globalization, urbanization, population ageing, stress, hereditary and poverty (WHO, 2012).

Cardiovascular diseases (CVDs) among professional drivers remain an important issue in occupational health research and clinical practice. For decades, occupational epidemiological studies have provided a large body of consistent evidence showing that professional drivers are at a high risk for CVDs (Hannerz and Tuchsén, 2001; Gustavsson *et al.*, 1996; Alfredsson *et al.*, 1993; Bigert *et al.*, 2003). From the research of Bigert *et al.* (2004), taxi drivers and lorry operators were found to have an increased myocardial infarction risk as compare to manual workers. Other studies suggested that conventional risk factors such as smoking and hypercholesterolaemia were more prevalent among professional drivers and accounted for the increased risks for CVDs (Hedberg *et al.*, 1993; Hartvig *et al.*, 1983).

According to Petch (1998), driving is a universal activity in the developed world. It has been estimated that ordinary drivers of private vehicles depending on age and occupation spend 250 hours a year at the wheel. For professional drivers this is even higher. Car driving has been shown to be associated with significant morbidity and mortality. For example, studies from Canada and US suggest that some of the accidents (less than 5%) involving commercial vehicle can be attributed to cardiovascular disease (Epstein *et al.*, 1996; Simpson *et al.*, 2004). Experience from Europe further suggests that 0.1% of reportable road accidents are due to medical causes of which 10 – 25% is due to cardiovascular disease (Petch, 1998; Epstein *et al.*, 1996). In addition, patients with disturbed cardiac function, arrhythmias in particular may experience loss of consciousness threatening their own safety and the

general public when engaged in certain personal and professional activities such as private and especially commercial driving (Petch, 2002). Road traffic accidents also account for significant deaths in developed countries each year; 40000 in USA, 10000 Germany and 4000 in UK (Petch, 1998; National Statistics, 2007).

In Ghana, according to Makama (2011), 1431 deaths due to road accidents were recorded between January and August 2011 and this value indicates an increase from 1181 deaths in 2010 within the same period. It has been estimated that an average of 4 people die daily from road accidents. The major causes known are over speeding and carelessly reckless driving (wrongful overtaking, drunk driving and extreme fatigue). However, studies from Europe suggest that CVDs also contribute to road accidents and the situation might be the same in Ghana.

1.2 Research Problem

Overweight and /or Obesity are well known as risk factors of CVDs globally (WHF, 2012a). In Ghana overweight and obesity have been reported among commercial drivers. In 2000, Kainyah and Owusu, reported a prevalence of overweight and obesity among minibus drivers (*trotro*) to be 24.7% and 5.8% respectively. Also in 2008, Adu-Asare and Steiner-Asiedu, documented overweight and obesity rates among taxi drivers in Accra to be 41.6% and 38.8% respectively. These figures really show that commercial drivers of short distance are at risk and the need to evaluate the long distance drivers cannot be overemphasized. Furthermore, in Ghana it has been documented that road accidents are on the rise and these are due to over speeding and carelessly or reckless driving (Makama, 2011) but in the developed world studies have shown that cardiovascular diseases also contribute to road accidents (Epstein *et al.*, 1996, Petch *et al.*, 1998; Simpson *et al.*, 2004) among which are stress and related

problems. It is therefore likely that these conditions might be contributing to the rampant road carnage. The habit of leaving home early and also driving for hours may all impart on eating practices as well as stress. This research seeks to find out cardiovascular disease risk factors among long distance Bus drivers in Cape Coast. It is envisage that the outcome will provide the impetus for policy makers to plan educational programmes for drivers to improve on nutrition and health and indirectly help curb road accidents.

1.3 Research Question

1.3.1 Main Research Question

What is the relationship between CVDs risk factors and long distance driving?

1.3.2 Specific Research Questions

- i. What are the dietary habits of Commercial Long Distance Bus Drivers (CLDBDs) and the risk of CVDs?
- ii. What is the relationship between nutritional status of CLDBDs and the risk of CVDs?
- iii. What is the relation between lifestyle practices of the CLDBDs and the occurrence of CVDs?
- iv. What are the stress levels of CLDBDs and the relationship with CVDs?

1.4 Objectives of Study

1.4.1 Main Objective

To determine the risk factors associated with CVDs and also the relationship between CVD risk factors and long distance driving among CLDBDs in Cape Coast.

1.4.2 Specific Objectives

- i. To determine the dietary pattern and associated risk factors for CVDs of long distance bus drivers.
- ii. To assess the BMI and percentage Body fat and their relationship with the risk CVDs of long distance bus drivers.
- iii. To estimate the lifestyle practices (smoking, alcohol intake, engagement in exercise) on the occurrence of the risk of developing CVDs.
- iv. To assess stress levels and to quantify the effect of stress due to long distance driving on occurrence of the risk of developing CVD.
- v. To evaluate the lipid panel (Total Cholesterol, Low Density Lipoprotein, and High Density Lipoprotein) and blood pressure level and the associated risk for CVDs among long distance driving.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Global trends of Non Communicable Diseases (NCDs)

Non Communicable diseases (NCDs) also referred to as chronic diseases are of long duration and slow progression (WHO, 2011b). There are four major types of non-communicable diseases namely Cardiovascular diseases (heart attack, strokes and hypertension), cancers, chronic respiratory diseases (chronic obstructed disease and asthma) and diabetes (WHO, 2011b). Globally, NCDs cause more than 36million deaths annually (WHO, 2011b). In the next 20 years, it is expected that NCDs will cost more than US\$ 30 trillion, representing 48% of global GDP in 2010, and pushing millions of people below the poverty line. Mental health conditions alone are expected to account for the loss of an additional US\$ 16.1 trillion over this time span, with dramatic impact on productivity and quality of life. By contrast, mounting evidence highlights how millions of deaths can be prevented and economic losses reduced by billions of dollars if added focus is put on prevention (Bloom *et al.*, 2011). Currently, non communicable diseases are seriously affecting low and middle income countries to the extent that nearly 80% of non-communicable disease deaths (29million deaths) occur in these countries (WHO, 2011b). It has been projected that by 2020, the largest increase in death due to non communicable diseases will occur in Africa and that it is expected to exceed deaths due to communicable and nutritional diseases and maternal and perinatal diseases combined (WHO, 2011b).

In Ghana, according to Ofei (2012) respiratory diseases, cardiovascular diseases, cancers as well as diabetes are among the leading NCDs in Ghana. He further explains that over 86,000 people of which half are below 70years die from NCDs in the country from year to year. In Sekyere West District in Ghana, it is known that,

NCDs are among the ten top prevalent diseases in the area to the extent that not less than 20% of all deaths in the district are attributed to NCDs. The incidence of NCDs is expected to increase if no intervention is carried out. For instance, in 2003, 793 hypertensive cases were recorded, followed by 1259 cases in 2004, 1713 cases in 2005 with a slight decrease in 2006 to 1701 cases and 1698 in 2007 followed by a sharp increase to 1895 cases in 2008 (Sekyere West District Health Management Team, 2008). On the other hand, cases of diabetes showed this increasing trend year after year 34, 63,215, 258 and 666 in 2003, 2004, 2005, 2007 and 2008 respectively (Sekyere West District Health Management Team, 2008) .

2.2 Occupation as a risk factor for CVDs

Occupation exposes workers to different conditions which later on can lead to the development of diseases. CVDs are some of such diseases. According to literature, long working hours (Virtenen *et al.*, 2012), occupational stress (Kivimaki *et al.*, 2006), shift system of work (Tuchsen, 1993) and exposure to vibration (Bjor *et al.*, 2006) are some of the occupational risk factors of CVD.

2.2.1 Long working hours

Working more than eight hours in a day is considered long working hours. Few studies have been reported on the association between long working hours and health of workers. Scientists at Finnish Institute of Occupational Health reported those working more than eight hours a day had a 40-80% chance of developing heart disease (Hagan, 2012). A systematic review and meta-Analysis of twelve different studies (7 case control, 4 prospective and 1 cross sectional) by Virtenen *et al.* (2012)

involving 22,518 participants (2313 coronary heart disease (CHD)), minimally adjusted relative risk of CHD for long working hours was 1.80 (95% confidence interval (CI): 1.42 and 2.29) and in maximally (multivariate-) adjusted analysis relative risk was 1.59 (95% CI: 1.23, 2.07). The 4 prospective studies produced a relative risk of 1.39 (95% CI: 1.12, 1.72) while the corresponding relative risk for the 7 case controls was 2.43 (95% CI: 1.81, 3.26). In conclusion results from prospective observational studies suggested an approximately 40% excess risk of CHD for employees working for long hours.

In a cross sectional analysis of baseline data of taxi drivers Health Study cohort in Taipei, Taiwan, information were retrieved from medical records 1,157 subjects (mean age 44.6 SD \pm 8.6 years). It was found out that the mean haematological marker was 6656 (SD \pm 1656) cells $\times 10^6/L$ for WBC, 47.2(SD \pm 3.5) % for hematocrit and 243 (SD \pm 52) cells $\times 10^9/L$ for platelets. The driving time was 264 (SD \pm 76) hours/month. Drivers who drove more than 208hours/month had a higher WBC count (by $317 \times 10^6/L$; 95% CI 99 to 535), haematocrit (by 0.8%; 95% CI 0.3 to 1.2) and platelets ($7.9 \times 10^9/L$; 95% CI 1.0 to 14.8) as compare to those who travelled for $<$ or $=$ 208 hours/month (Chen *et al.*, 2005b).

2.2.2 Occupationally related stress

Occupational stress is one of the major health hazards faced by workers in the modern workplace and is known to be the cause of many physical illness, substance abuse and family problem experienced by millions of both white and blue collar workers. Also occupational stress and stressful working conditions lead to low productivity, absenteeism and increased rates of accidents on and off the job. When work denies

workers the basic need to accomplish, to create, to feel satisfied and exercise their decision making ability, stress sets in (Communication Workers of America, 2013). A systematic review and meta-Analysis of fourteen prospective studies involving 83,014 employees, the age- and gender-adjusted relative ratio of Coronary Heart Disease for high versus low job strain was 1.43 (95% confidence interval (95% CI) 1.15-1.84) and an observational study suggested an average of 50% excess risk for CHD for employees with work stress (Kivimaki *et al.*, 2006).

A study to evaluate drivers work stress by the measurement of adrenaline and noradrenaline excreted in the urine during one working and one resting day has been done. A total of 32 long distance drivers who had load and unloading as part of their activities were involved in the study. Six samples were required for each of the days. The excretion rates of both catecholamines on the working day were higher than on the resting day except on the first overnight sample. BMI and physical workload during loading and unloading were positively related to noradrenaline excretion rate (both $p < 0.01$) (Van der Beek, 1995).

2.2.3 Shift System of work

Research has shown over the years that shift work increases the risk for high blood pressure, metabolic syndrome, high cholesterol and other ill health conditions (Pfenninger, 2013). In a prospective cohort study (1988- 1990) of shift work and ischemic heart disease among Japanese male workers involving 110,729 participants at baseline from 45 areas between age 40- 79. The analysis was restricted to 17,649 men between the ages of 40-59 who were employed at the time of the baseline survey. During the follow up 1363 deaths were recorded of which 86 were due to ischemic

heart disease of which rotating- staff workers had a significantly higher risk of dying from ischemic heart disease (relative risk = 2.32, 95% CI: 1.37, 3.95; P= 0.002) as compared to day workers whereas fixed- night work is not associated with ischemic heart disease (relative risk = 1.23, 95% CI: 0.49, 3.10; P= 0.658) (Fujino *et al.*, 2006).

A cohort study of 394 shift workers and 110 day workers working at a paper mill demonstrated a dose–response relationship between years of shift work and coronary heart disease (Knutsson *et al.*, 1986). Another study by Knutsson (1989) measured the incidence of Coronary Heart Disease in 504 male day and shift workers from 1968 to 1982/83 in which it was indicated that shift work was associated with CHD and a cross sectional study of two different cohorts of blue – collar workers found a high percentage of smokers and higher concentration of triglyceride in the serum among the shift workers as compared to day workers. In an American study of 79, 000 nurses who were followed for 4years, there was a dose response relationship between years of shift work and coronary heart disease after controlling for confounders such as smoking, hypercholesterolemia, alcohol intake and physical activity (Kawachi *et al.*, 1996).

In a Danish study, the relative risk of being admitted to hospital due to ischemic heart disease was measured in a cohort of 1, 293, 888 economically active men in Denmark aged 20-59years. Information on occupation was used to classify each subject into different shift work exposure categories. The results showed that, compared with occupational groups having day work only, men in occupations with frequent night and early morning work had an excess standardized hospitalization ratio of 193, occupational groups with late evening work had an excess risk of 216, and groups

working in roster covering 24hour services has an excess risk of 174 and groups having other irregular working hours had an excess SHR of 172 (Tuchsen, 1993).

A study by Lo *et al.* (2010) on working the night shift causes increased vascular stress and delayed recovery involving 16 young female nurses working on rotating shifts day (08:00 – 16:00h), evening (16:00 – 00:00h), and night (00:00 – 08:00h) and six others working the regular day shift. Each nurse received simultaneous and repeated 48h ambulatory electrocardiography and BP monitoring during their work day and the following off-duty day. During the night shift, the nurses showed significant increases in vascular stress, with increased SBP of 9.7 mmHg. The changes of SBP and DBP seemed to peak during waking time at the same time on the day off as they did on the working day. Whereas cardiac stress profiles usually returned to baseline level after each shift, the SBP and DBP of night-shift workers did not completely return to baseline levels the following off-duty day ($p < 0.001$).

Robinson and Burnett (2005) had a study on truck drivers and heart disease in the United States of America from 1979-1990 involving Black (998 short haul and 13,241 long haul) truck drivers and White (4,929 short and 74,315 long haul) truck drivers between the ages of 15 to 90. The highest significantly elevated proportionate heart disease (Ischemic heart disease, acute myocardial infarction, and other forms of heart disease) and lung cancer mortality was found for White and Black male long haul truck drivers age 15 – 54. Mortality was not significantly elevated for short haul truck drivers of either race or gender, nor for truck drivers who died after age 65, except for lung cancer among White males.

In a study on myocardial infarction among professional drivers by Bigert *et al.* (2003), involving 1067 cases and 1482 controls all men between the ages of 45-70years in Stockholm county 1992 and 1993. The crude OR among bus drivers was 2.14 (95% confidence interval = 1.34 - 3.41), among taxi drivers 1.88 (1.19 - 2.98) and among truck drivers 1.66 (1.22 - 2.26). Adjustment for potential confounders gave lower ORs: 1.49 (0.90 - 2.45), 1.34 (0.82 - 2.19) and 1.10 (0.79 - 1.53), respectively. Additional adjustment for job strain lowered the ORs only slightly.

An investigation of occupational class difference (higher and lower professionals and administrators, non-manual workers, skilled and unskilled manual workers, and the self-employed) and the incidence of coronary heart disease involving 2964 aged between 25 and 74 men from four Italian population-based cohort who were investigated at baseline and followed up for first fatal or non-fatal incidence. With non- manual workers as the reference group, age-adjusted excess risks were found for professionals and administrators (+84% $p = 0.02$), self- employed (+72% $p = 0.04$) and manual workers (+63% $p = 0.04$) (Ferrario *et al.*, 2010).

Moe *et al.* (2012) prospectively examine independent and the combined effect of occupational physical activity and metabolic syndrome on all-cause and cardiovascular mortality among population-based cohort involving 37,300 men and women participating in a Norwegian HUNT study (1995 - 1997). During a median follow-up of 12.4 years, a total of 1,168 persons died. Of these, 278 died from cardiovascular disease. Persons with metabolic syndrome and much walking/lifting at work had a HR of 1.79 (95% CI 1.20 to 2.66) for cardiovascular death referencing persons without metabolic syndrome and much walking/lifting. Using the same reference, persons with metabolic syndrome and sedentary work had a HR of 2.74

(95% CI 1.82 to 4.12) while persons with metabolic syndrome and heavy physical work had a HR of 3.02 (95% CI 1.93 to 4.75).

2.2.4 Exposure to vibration

Noise has been known to be associated with an increased risk for CVD (Ising *et al.*, 1997) and is often accompanied by exposure to vibration which can influence the individual by being transmitted through the hands (hand-arm vibration) or through the whole body (Mansfield, 2005). Hand-arm vibration exposure is associated with disorders in the blood vessels, nerves, muscles and bones while whole body vibration is associated with lower back pain (Mansfield, 2005).

In a study on vibration exposure and myocardial infarction incidence: the VHEEP case-control study to assess the risk of contracting first episode of myocardial infarction (MI) subsequent to vibration exposure and to assess a possible exposure-response with Vasternorrland heart epidemiology programme as its source of data. Exposure information was collected by questionnaire and vibration exposure was assessed in 218 cases and 257 controls. The results show that the OR of acute MI when exposed to vibration was 1.6 (95% CI: 1.1 - 2.4) (Bjor *et al.*, 2006).

2.3 Non- communicable diseases among different occupations:

2.3.1 Knee and hip osteoarthritis

Osteoarthritis is a form of arthritis that affects usually the knees, hands, hips or spine and causes pain, swelling and reduces motion in the joints. Some of the risk factors include overweight and aging (NIH, 2013). From a study by Andersen *et al.* (2012) on

cumulative years in occupation and the risk of knee and hip osteoarthritis in men and women: a register-based follow-up study from 1981 to 2006 involving floor/brick layers, construction workers, health care assistants, office workers and farmers, it was found out that male floor and bricklayers and male and female health care assistants had the highest risk of knee Osteoarthritis and farmers had the highest risk of hip Osteoarthritis. Furthermore a WHO comparative risk assessment of studies by Fingerhut *et al.* (2005) which involved five occupational risk factors (risks for injuries, carcinogens, airborne particulates, ergonomic risks for back pain and noise) found out that these few occupational risk factors accounted for 850,000 deaths per year and for almost 24million disability-adjusted life years, occupational injuries resulted in about 312,000 deaths per year for 2.7billion workers, out of the 35million healthcare workers,3million had percutaneous exposure to blood borne pathogens in 2000 (equivalent to between 0.1 and 1.2 sharp injuries per year per health worker). Exposure to workplace lung carcinogens (such as asbestos, silica and diesel exhaust) and Leukomogens (ionizing radiation, benzene, ethylene oxide) accounted for 9% of the cancers of the lung, trachea, bronchus and about 2% of the leukemias, 13% of all chronic obstructive pulmonary disease and about 11% asthma cases. In addition virtually all cases of pneumoconiosis worldwide were due to workplace exposure, 37% of back pain and 16% of all hearing loss problems were due to workplace exposure.

2.3.2 Diabetes and hypertension

In a study involving two different populations (police =318 and general population =401) in the same demographic area, prevalence of metabolic syndrome (57.3 vs 28.2, $X^2 =64.5$ $p<0.0001$) was significantly higher among Police population (P) compared

to the General Population (GP) and also a higher prevalence of individual cardio metabolic abnormalities and diabetes were found among the police population as compared to the general population ($p < 0.05$). Furthermore a high prevalence of high blood pressure (GP; 29.2% vs Police 58.5%, $\chi^2=6.13$, $p < 0.0001$) was found among the police population as compared to the general population (Tharkar *et al.*, 2008). According to a cross sectional study by Lokare *et al.* (2012) involving 400 bank staff between the ages of 30 and 60 years in Hubli, a city in Karnataka state, India, 4% had developed coronary heart disease, 10% were diabetic, 37% were hypertensive and 68% had BMI greater than 25.

A ten-year follow-up study on the relation between development of non-insulin-dependent diabetes (NIDDM) and occupation among 1087 workers (managers, technical workers, clerical workers, workers in transport and labourers), the incidence of NIDDM was 3.1% and the age-adjusted incidence of the workers in transport was the highest and that in labourers was the lowest. Adjusted relative risk of the workers in transport compared with the labourers was significantly high (3.95) (Morikawa *et al.*, 1998).

2.3.3 Myocardial infarction

Myocardial infarction is a health condition in which heart attack occurs when blood flow to a part of the heart is blocked long enough to cause part of the heart muscle to die or get damaged (USNLM, 2013). A study on hospital admissions among male drivers in Denmark by Hannerz and Tuschen (2001) found out that Standardised Hospital Ratios (SHRs) for all diseases of the body system and organs was higher among professional drivers as compared to the male working population and SHRs

for myocardial infarction increased among the drivers with time as SHRs for acute gastritis decreased with time. Among drivers of passenger transport SHRs for Chronic Obstructive Pulmonary disease increased overtime.

Tuschen *et al.* (2006) undertook a prospective study on stroke among male drivers in Denmark from 1994 - 2000 in which a cohort of 6285 bus drivers, 4204 car, van and taxi drivers and 25879 heavy truck and lorry drivers were followed up for hospital admission due to stroke and sub diagnoses. A high Standardised Hospitalisation Ratios (SHR) for stroke among all groups of professional drivers was found (SHR=132; 95% CI 121 - 141). Among car, taxi, and van drivers the SHR was 157 (95% CI 132–189), among bus drivers it was 139 (95% CI 119 - 163), and among heavy truck and lorry drivers it was 124 (95% CI 113 - 136). The excess risk for all groups of professional drivers was highest for cerebrovascular infarction (SHR=139; 95% CI 124 - 155) and lowest for non-traumatic intracranial haemorrhage (SHR=113; 95% CI 96 - 133). The excess risks for all groups were significantly higher for cerebrovascular infarction than for non-traumatic intracranial haemorrhage (relative risk ratio (RRR) 1.23; 95% CI 1.01 - 1.51). The RRR of stroke among drivers in the metropolitan area compared to rural areas was 1.13 (95% CI 0.94 - 1.36). The RRR for stroke among car, taxi, and van drivers compared to drivers of heavy trucks and of lorries was 1.28 (95% CI 1.03 - 1.57).

2.3.4 Cancer

Cancer is a group of diseases characterised by uncontrolled growth and spread of abnormal cells. A person's risk of developing a particular cancer is influenced by combination of factors such as personal and family characteristics and exposure to

cancer causing agents in the environment or workplace (CDC, 2012). A study on the mortality among 883 white male pulp and paper workers in Berlin, New Hampshire, a standardised mortality ratio (SMR) analysis was used to compare death rates for each of the exposure groups with United States national rates, for all the subjects, deaths due to all causes, all malignant neoplasms, and lung cancer were close to the number expected and excesses were noted for cancers of the digestive system and leukaemia. Among pulp mill workers, the number of cancers of the digestive system was raised and the SMR for pancreatic cancer was especially high (SMR = 305, 95% CI = 98-712). Among paper mill workers, more deaths were due to leukaemia and cancers of the digestive system than expected (Henneberger *et al.*, 1989).

Guha *et al.* (2010) conducted a meta-Analysis on lung cancer in painters to quantitatively compare the association between occupation as a painter and the incidence or mortality from lung cancer using data from data from 47 independent cohort, record linkage, and case-control studies (from a total of 74 reports), including > 11,000 incident cases or deaths from lung cancer among painters. The summary relative risk (meta-RR, random effects) for lung cancer in painters was 1.35 (95% confidence interval (CI), 1.29 - 1.41; 47 studies) and 1.35 (95% CI, 1.21 - 1.51; 27 studies) after controlling for smoking. The relative risk was higher in never-smokers (meta-RR = 2.00; 95% CI, 1.09 - 3.67; 3 studies) and persisted when restricted to studies that adjusted for other occupational exposures (meta-RR = 1.57; 95% CI, 1.21 - 2.04; 5 studies). The exposure response analyses suggested that the risk increased with duration of employment.

Schernhammer *et al.* (2003) investigated the association between night-shift work and risk of colorectal cancer in the nurses' health study involving 78586 women who were followed from 1988 to 1998. A total of 602 incident cases were recorded. Women who worked 1-14 years or 15 years or more on rotating night shifts had multivariate relative risks of colorectal cancer of 1.00 (95% confidence interval (CI) = 0.84 to 1.19) and 1.35 (95% CI = 1.03 to 1.77), respectively (P(trend) = .04) as compared to women who never worked on a night shift.

A systematic review of professional drivers and lung cancer to provide evidence on the association between professional drivers and lung cancer in the last decade after taking into consideration the potential confounding effect of cigarette smoking. A significantly increased risk of lung cancer (pooled smoking-adjusted RR 1.18, 95% CI 1.05 to 1.33) among professional drivers was observed after combining four cohort studies and nine case-control studies. A higher pooled RR was observed among smoking-adjusted studies reporting 10 years or more of employment (RR 1.19, 95% CI 1.06 to 1.34) as compared with the study having a shorter duration of employment (6 years) (RR 1.00, 95% CI 0.92 to 1.09). It was also found that an 18% excess risk of lung cancer was linked to professional drivers who are potentially exposed to diesel exhaust, after adjustment for the confounding effect of smoking (Tsoi and Tse, 2012). Molgaard *et al.* (2013) conducted a population-based register study on chronic lower respiratory diseases among demolition and cement workers to estimate standardised hospitalisation ratios (SHR) for chronic lower respiratory diseases. In all 895 demolition and 5633 cement workers in Denmark were involved in the study from 1995 to 2009. A statistically significant high SHR for the cement workers, SHR=134

(95% CI 117 to 153) was found. The SHR for demolition workers was 131 (95% CI 87 to 188).

2.3.5 Musculoskeletal disorders

Chiang *et al.* (1993) undertook a cross-sectional study on the prevalence of shoulder and upper-limb disorders among 207 workers in a fish-processing industry. The results showed shoulder girdle pain of 30.9%, epicondylitis 14.5% and carpal tunnel syndrome 15.0% as the three common soft tissue disorders. The odd ratios of shoulder girdle pain was 1.6 (95% CI 1.1 - 2.5) among workers who performed repetitive task with their upper limb while it was 1.8 (95% CI 1.2 - 2.5) for workers who sustained forceful movement of their upper limbs during work.

Osbourne *et al.* (2012) reviewed twenty four studies on the prevalence of musculoskeletal disorders (MSD) among farmers. Life-time prevalence of any form of MSD among farmers was 90.6% while 1-year MSD prevalence was 76.9% (95% CI 69.8 - 82.7). The majority of studies focused on spinal MSDs with low back pain (LBP) the most frequently investigated. Life-time LBP prevalence was 75% (95% CI 67 - 81.5) while 1-year LBP prevalence was 47.8% (95% CI 40.2 - 55.5). The next most common regional MSDs reported were upper (range 3.6 - 71.4%) and lower extremities (range 10.4 - 41%).

Rosali *et al.* (2009) conducted a cross sectional study among military armoured vehicle drivers in the two largest mechanized battalions with the objective to determine the prevalence of low back pain (LBP), and its association with whole body vibration (WBV) and other associated factors. A total of 159 respondents participated in this study and 102 (64.2%) of them were subjected to WBV measurement. One-

hundred-and-seventeen respondents complained of LBP for the past 12 months giving a prevalence of 73.6%. The prevalence of LBP among tracked armoured vehicle drivers was higher (81.7%) as compared to wheeled armoured vehicle drivers (67.0%). Logistic regression analysis revealed that only driving in forward bending sitting posture (OR=3.63, 95% CI 1.06-12.42) and WBV exposure at X-axis (OR=1.94, 95% CI 1.02 - 3.69) were significant risk factors to LBP.

A study on Knee Pain and Driving Duration: A Secondary Analysis of the Taxi Drivers' Health Study involving 1242 drivers to estimate 1-year prevalence of knee pain as assessed by the Nordic musculoskeletal questionnaire found the prevalence of knee pain, stratified by duration of daily driving (≤ 6 , > 6 through 8, > 8 through 10, and > 10 hours), was 11%, 17%, 19%, and 22%, respectively. Compared with driving 6 or fewer hours per day, the odds ratio of knee pain prevalence for driving more than 6 hours per day was 2.52 (95% confidence interval = 1.36, 4.65) after we adjusted for socioeconomic, work-related, and personal factors in the multiple logistic regression (Chen, 2004). Further studies by Chen *et al.* (2005a) on occupational factors associated with low back pain in urban taxi drivers involving 1242 drivers found 51% reported LBP in the past 12 months, significantly ($P < 0.001$) higher than other professional drivers (33%) in Taiwan. After adjusting for the effects of demographic characteristics, lifestyle factors, anthropometric measures and socioeconomic positions, we found that driving time >4 h/day (prevalence odds ratio (POR) 1.78; 95% CI 1.02 - 3.10), frequent bending/twisting activities while driving (adjusted OR 1.86; 95% CI 1.15 - 2.99). A study on work-related Musculoskeletal Disorders in Urban Bus Drivers in Hong Kong involving 481 drivers (77 females and 404 males), on the average drivers worked 9 - 10h per day, with 5 days on and 1 day off. Neck, back, shoulder and knee/thigh areas had the highest 12-month prevalence rates

ranging from 35% to 60%, and about 90% of the discomfort was related to bus-driving. Occupational factors of prolonged sitting and anthropometric mismatch were perceived to be most related to musculoskeletal discomfort. On physical examination, grip strength was significantly related to neck and shoulder discomfort (Szeto and Lam, 2007).

2.4 Risk factors of cardiovascular diseases

Literature has identified diet, abnormal lipid level, obesity, lifestyle practices (excessive alcohol use and tobacco use), stress, hypertension and diabetes as risk factors for CVDs (WHF, 2012a). Their relationships with CVDs are documented here from various studies.

2.4.1. Diet

Diet plays a critical role in the development and prevention of cardiovascular disease. According to World Heart Federation (2012a) intake of diets low in saturated fat and rich in fruits and vegetables leads to a 73% reduction in the risk of new cardiac events as compare to diets rich in saturated fat and low in fruits and vegetables (WHF, 2012c). Diet rich in saturated fat has been known to cause 31% Coronary Heart Disease and 11% Stroke worldwide (WHF, 2012a). Saturated and Trans fat raise cholesterol levels in the blood which leads to arteriosclerosis. Also diets which have more than 37% of its total calories as fat even if the fat is unsaturated increase the risk of having CVDs. High sodium intake has been known to be a risk factor for hypertension. Furthermore it has been estimated that a reduction in one's dietary intake of sodium by 1g and salt by 3g will lead to a decrease of 50% of people

needing treatment for hypertension, 22% drop of death relating to stroke and 16% of death relating to Coronary Heart Disease (WHF, 2012c).

In a study involving 502 farmers (18 – 79years) from the valley of Crete, Greece who were randomly selected and examine in 2005, there was a 30% increase in BMI (29.8 vs 22.9, p (0.001)) and 16% increase in total cholesterol level (239.6 vs 206.9mg/dl, p (0.001)). Also there was an increase in meat and saturated fat intake, decrease in fruit intake p(0.001), decrease in monosaturated fatty acid and an increase in saturated fatty acid intake p(0.001) as compare to the outcome of the study in 1960 (Vardavas *et al.*,2010).

A study by Jo McCullagh (2005) on “fat and fitness- in for the long haul” survey aimed to collect data on the lifestyles of long-distance lorry drivers visiting the Port of Liverpool, in Merseyside involving 168 men and two women in United Kingdom age between 23 and 74years found out that the drivers daily intake of fruit and vegetables was low with the drivers consuming only one portion of fruit and vegetable on the average with 28.8% excluding fruits and vegetables from their diet. In addition only 7.1% consumed the minimum of five portions of fruits and vegetables recommended by the World Health Organization. The drivers attributed their poor intake of fruits and vegetables to the difficulty of acquiring and eating fruits and vegetables during the working week due to the fact that the motorway services and other road outlets were their only source and fruits and vegetables and at these sites are not fresh, expensive, poor in quality and also the drivers claim eating of fruits and vegetables is more messier than eating of snacks. Also 51.7% of the drivers use unhealthy spread such as butter and saturated margarine on regular basis with only 1 in 15 people using margarine that contain plant sterols such as floral proactive and bencol which has the

ability to reduce cholesterol level. The drivers' weekly consumption of fried foods, takeaway meals, biscuits and crisps was also high.

According to Siu *et al.* (2012), Hong Kong Chinese drivers had poor intake of vegetables and fruits with 38.7% taken less than 1 bowl/day of vegetables and 38.8% taken less than 1 fruit/day. Majority of them ate frequently at fast foods stores or restaurants (54.9% eating out 6 or more times in a week) which are known to serve high calorie and salt diet. Furthermore study by Achulo *et al.* (2011) detected that less than 20% of 116 commercial long distance drivers interviewed ate homemade foods in the past week but on the contrary 80% of them reported consuming fruits in the past week.

2.4.2 Abnormal blood lipid level

According to United States National Cholesterol Education Program (NCEP) (2001), blood total cholesterol ≥ 5.18 mmol/L, high density lipoprotein less than 1.04mmol/L, triglycerides level ≥ 1.70 mmol/L and low density lipoprotein ≥ 3.36 mmol/L are risk factors for coronary heart disease. A higher prevalence of increased levels of triglycerides was found among police than the general population (GP; 40.6% vs police; 49.7%, $X^2 = 5.5$, $p = 0.02$) (Tharkar *et al.*, 2008). In a study by Siu *et al.* (2012) involving 3376 Hong Kong Chinese drivers, 58.7%, 34.9% and 29.3% had high cholesterol, high triglycerides and low high density lipoprotein respectively. Furthermore Saberi *et al.* (2009) found the prevalence of abnormal lipid levels to be hypertriglyceridemia 53.4% and low HDL cholesterol, 48.7%. The risk of increased LDL and decreased HDL in bus drivers was 4.38 and 5.28 ($P < 0001$) times as high as the control group (non drivers), respectively (Nasri and Moazenzadeh, 2010).

2.4.3 Obesity

According to WHO (1995), a person with BMI of 30 or more is considered obese. Worldwide 400million and 1billion adults are obese and overweight respectively and 17.6million children under five are also overweight. Overweight and obese people are at risk of developing diabetes, hypertension and atherosclerosis (World Heart Federation, 2012d). In a retrospective study involving 14,379 UK aircrew and other UK population, it was found out that age-sex group mean BMI was significantly lower in almost all the pilot age groups compared to the general population. Overweight age-sex group prevalence was significantly higher in the < 25, 35 - 44, 45 - 54 and 55 - 64 age groups for male pilots, and lower for female pilots in the 25 - 34 and 45 - 54 age groups. Male and female pilots had significantly lower age-sex-group prevalence of obesity and current smoking compared to the general population. For hypertension, the male < 25 and 35 - 44 year age groups had significantly higher prevalence, and the 45 - 54 and 55 - 64 year age groups had significantly lower prevalence than the general population. Age-standardised mean BMI and prevalence of overweight and hypertension were not significantly different from the highest income quintile of the general population. Age-standardised obesity and current smoking prevalence were significantly lower in pilots compared to the highest socio-economic quintile of the general population (Houston *et al.*, 2011). Prevalence of overweight and obesity among professional bus and truck drivers in Kashan was 41% and 23.1% respectively (Saber *et al.*, 2009).

In Ghana overweight and obesity have been reported among commercial drivers. In 2000, Kainyah and Owusu reported a prevalence of overweight and obesity among minibus drivers (*trotro*) to be 24.7% and 5.8% respectively. Also in 2008, Adu-Asare and Steiner-Asiedu, documented overweight and obesity rates among taxi drivers in

Accra to be 41.6% and 38.8% respectively. In another study of 116 commercial long distance drivers in circle lorry station (Accra-Ghana) 50% were found to be overweight or obese (Achulo *et al.*, 2011).

2.4.4 Excessive alcohol use

Too much intake of alcohol can raise the level of triglycerides, increase blood pressure and increase calorie intake. This increase in calorie intake can lead to obesity and hence cardiovascular disease. Also excessive alcohol intake and binge drinking can lead to heart failure and stroke (American Heart Association, 2013). Núñez-Córdoba *et al.* (2009) studies on alcohol consumption and the incidence of hypertension in a Mediterranean cohort: The SUN Study in which 9963 spanish men and women without hypertension at baseline were followed up for (median (interquartile range), 4.2 [2.5 - 6.1] years), 554 incident cases of hypertension were identified over a total of 43 562 person-years. The hazard ratio for hypertension among those who consumed alcohol on ≥ 5 days per week was 1.28 (95% confidence interval, 0.97 - 1.7) compared to abstainers. Among those who drank alcohol ≥ 5 days per week, the hazard ratio for hypertension associated with consuming ≥ 1 drink per day was 1.45 (95% confidence interval, 1.06 - 2) compared to abstainers. The hazard ratio associated with consuming >0.5 drinks of beer per day was 1.53 (95% confidence interval, 1.18 - 1.99) compared with abstainers. The authors concluded that, in this Mediterranean population, consumption of beer or spirits, but not wine, were associated with a higher risk of developing hypertension. However, the weekly pattern of alcohol consumption did not have a significant impact on the risk of hypertension.

Fuchs *et al.* (2001) undertook a cohort study in which 8334 of the Atherosclerosis Risk in Communities (ARIC) Study participants, aged 45 to 64 years at baseline, who were free of hypertension and coronary heart disease had their blood pressures ascertained after 6 years of follow-up. It was established that high alcohol consumption (≥ 210 g ethanol per week or 3 drinks per day) independently increased risk of hypertension in black and white North Americans. However, low to moderate consumption (< 210 g per week) increased the risk of hypertension in black males, while being protective against hypertension in black females and whites. It was also observed that the effect of alcohol on blood pressure depended on the individual's current intake. A study by Achulo *et al.* (2011) found out that a little over one third of the 116 commercial long distance drivers (CLDDs) reported preference for at least one type of alcoholic beverage. The drivers reported average number of drinks of alcohol per week to be 16.1 ± 17.2 drinks per week and spirits was consumed by 61% of the CLDD at an average of 21.1 ± 1.9 drinks per week.

2.4.5 Tobacco use

Smoking has been estimated to cause 10% of cardiovascular disease and is the second leading cause of CVDs after high blood pressure. Nearly 6million people die from tobacco use or exposure to tobacco smoke accounting for 6% female and 12% male deaths in a worldwide every year. By 2030, tobacco-related deaths have been projected to increase to more than 8million in a year. The risk of coronary heart disease is 25% higher in female smokers than male smokers. The risk of non-fatal heart attack increases by 5.6% for every cigarette smoked and persists even at only one or two cigarette smoked per day. Tobacco use whether chewing or smoking

damages blood vessels, increases blood pressure and increases the tendency for blood to clot (WHF, 2012h).

In a study involving 1082 Italian health professionals (51.4% females; mean age was 37.3 years: 25.3% were nurses, 24.5% medical doctors, 17.1% students and 33.1% other healthcare workers) to evaluate prevalence of smoking, knowledge and attitude, prevalence of smoking was 44%. Post-graduate students (OR = 3.42; 95% CI: 1.81 - 6.44), nurses (OR = 2.48; 95% CI 1.51 - 4.08), nursing students (OR = 1.91; 95% CI 1.08 - 3.38) and auxiliary personnel (OR = 2.72; 95% CI 1.51 - 4.88), showed a higher likelihood of smoking than medical doctors (Ficcaro *et al.*, 2011). Cigarette smoking in taxi and bus drivers was 1.4 (P <0.3) and 3.24 (P <0001) times as high as the control group, respectively (Nasri and Moazenzadah, 2010). Kurosaka *et al.* (2000) found 93% taxi drivers to be smokers as compare to 70.2% non- taxi drivers.

2.4.6 Physical inactivity

Globally physical activity has been reducing and this is has been attributed to increase in urbanization and mechanization (WHF, 2012e). In 2008 31% of adults 15 years and above were found to be insufficiently physically active (WHO, 2011c). Physical activity helps in maintaining healthy weight, blood pressure level, blood lipid levels and also beneficial so far as the function of clotting factors and blood vessels are concern (WHF, 2012e). Siu *et al.* (2012) detected that 56% out of the 3397 drivers were physically inactive. A study by Achulo *et al.* (2011) found out that approximately 35% of the commercial long distance drivers (CLDDs) engaged in physical exercise in the past 7 days out of which about 51% of the drivers were

classified as having low physical activity level, while 29% and 28% were classified as having had moderate or high physical activity levels, respectively.

2.4.7 Stress

Acute stress triggers reduce blood flow to the heart; irregular heart beat and increases the likelihood of blood clotting and these can initiate the development of CVDs. Also people living stressful life tend to adopt poor habits like smoking and eating badly and hence increasing their risk of getting CVDs (WHF, 2012f). In a study of occupational stress among health care workers, stress survey instrument derived from a model was distributed to 771 hospital and nursing home employees in New Jersey. The results support the hypothesis that reported job strain (job dissatisfaction, depression, psychosomatic symptoms) and burnout is significantly higher in jobs that combine high workload demands with low decision latitude. This association remained significant after controlling for age, sex, education, marital status, children, hours worked per week and shift worked. Other job characteristics (job insecurity, physical exertion, social support, hazard exposure) were also associated with strain and burnout (Landsbergis, 2006).

Experience of work-related stress was assessed among workers in 26 different occupations in United Kingdom using a short stress evaluating tool which provides information on a number of stress related stressors and stress outcomes. Six occupations (ambulance workers, teachers, social services, customer services – call centres, prison officers and police) reported worse than average scores on each of the factors-physical health, psychological well-being and job satisfaction. The high

emotional labour associated with the high stress jobs is discussed as a potential causal factor (Johnson, 2005).

2.4.8 Hypertension

Globally there are at least 970million people with elevated blood pressure of whom about 330million are from the developed countries and around 670million from the developing countries. According to World health Organization, hypertension is one of the most leading causes of premature death in the world. It has estimated that 1.56billion adults will be living with elevated blood pressure by the year 2025. Hypertension has been known to be the single most important risk factor for stroke and causes about 50% of ischemic stroke and increases the risk of hemorrhagic stroke. It stresses the blood vessels causing them to get weaken or clogged which in tend can lead to the narrowing of the blood vessels. As the blood vessel get narrow, they easily get blocked with blood clot or bits of fatty material breaking from the lining of the blood vessels wall. People who develop elevated blood pressure before age 50 are more likely to develop CVDs (WHF, 2012f). Dwiwedi *et al.* (2000) study on the prevalence of hypertension among medical doctors in Dehli found 27% to be hypertensive.

A study of the prevalence of hypertension among 104 workers in a fertilizer company in Surat district found out that 34 workers were hypertensive (Divan *et al.*, 2010). Saberi *et al.* (2009) prevalence of hypertension among professional bus and truck drivers in Kashan was 42.9%. Furthermore Achulo *et al.* (2011) found 41.3% of 116 commercial long distance drivers to be hypertensive. Nasri and Moazenzadeh (2010) compared risk of been hypertensive between taxi drivers, bus drivers and non drivers

(control) and found out that taxi drivers have an increased risk of been hypertensive compared with the control group (odds ratio: crude =5.94, adjusted = 9.09; P<0001). In a study by Siu *et al.* (2012) to determine prevalence of undiagnosed diabetes mellitus and cardiovascular risk factors in Hong Kong professional drivers, 3376 professional Hong Kong Chinese drivers were involved, majority of them were hypertensive (57.0%). Kurosaka *et al.* (2000) found 57.9% taxi drivers to be hypertensive as compare to 53% non taxi drivers.

2.4.9 Diabetes

Diabetics have two to four chances of developing CVDs compared to non diabetics. This is mainly because other risk factors of CVDs such as hypertension, abnormal blood lipid level and obesity occur more frequently in diabetics. Uncontrolled diabetes causes damage to the blood vessels, making them more prone to atherosclerosis and hypertension. Among diabetics, atherosclerosis is more severe and occurs at a younger age. Diabetics are more likely to develop heart attack or stroke and since diabetes can cause damage to the nerves, heart attack can be “silent”. Diabetes also cancels the protective effect of estrogen against CVDs in premenopausal women (WHF, 2012g). In a study by Kurosaka *et al.* (2000) to compare the coronary heart disease risk factors among taxi drivers and non taxi drivers, 50.9% of the taxi drivers were diabetic as compared to 27.4% non taxi drivers. Saberi *et al.* (2009) study on metabolic syndrome among professional bus and truck drivers in Kashan found the prevalence of diabetes to be 7%.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Research Design and Setting

The research design was a cross sectional study. The study covered the various transport organizations: Tantri number 1, Tantri number 2, Francol Transport Services Ltd, Metro Mass Transit Services and Co-operative Transport Union. These organizations have passenger buses transporting passengers from Cape Coast to Accra, Tema, Kumasi, Obuasi, Takoradi and nearby towns and villages.

3.2 Study Population and Sampling

The number of drivers who participated in this study was 170 commercial long distance bus drivers (CLDBDs) who had registered with the transport organizations (Tantri number 1 and 2, Francol Transport services, Metro mass transport and Pedu Co-operative Union) in Cape Coast. These drivers have Accra, Tema, Obuasi or Kumasi as their final destination. The daily work routine of these drivers starts as early as 3.30am but most of these drivers start work or leave Cape Coast anytime of the day depending on passengers' availability and the shift system.

According to Ghana Metro Mass Transit (2010), a distance of 140km or more is considered as long distance. Therefore the population for this study were all Commercial long distance bus drivers (CLDBDs) (drivers who travel a distance of 140km or more with Cape Coast as the reference point) who are registered with the Cape Coast transport organizations and are willing to participate in the study. In all 170 commercial long distance drivers were involved in the study but only 109 and 91 drivers had their fasting blood glucose level and lipid profile measured respectively.

3.3 Data Collection

Initial oral consent was sought from the authorities of the various transport organizations. Data collection commenced at 4:30am and ended at 9.00am, Monday to Saturday, in October 2012 to November 2012. The drivers were asked to observe an overnight fast in order to have their data taken.

3.4 Data Collection Procedure

Data collection was in 4 parts: Questionnaire Interviews, anthropometric measurements, blood pressure measurement and blood lipid chemistry.

3.4.1 Questionnaire Interviews

A pre-tested closed-ended questionnaire (Appendix 2) was administered by face to face interview to obtain information on the bio-data, driving history, food habits, physical activity habits, health and nutritional status, and stress level of the participants. Below are the details of the questionnaire:

Bio- data: Information on participants' age and educational level were collected.

Driving history: Information on the participants' daily work routine, number of years of being commercial drivers, number of trips they make in a day, week and month, and then their past and current routes were collected.

Stress related to driving: Information were collected to assess the stress level of the participants and to find out how driving as a profession contribute to this.

Food habits: Dietary habits of the participants were assessed to find out the type of food they normally take (main meals, fruit intake and snacks) and also about their alcoholic usage.

Lifestyle Practice (Physical activity, Alcohol and Tobacco use): Information on the participants' physical activity level, alcohol and tobacco usage was assessed.

Health: Information on the health status of the participants and their family members were collected.

3.4.2 Anthropometric data

Anthropometric data collected were body weight, height and percentage body fat. Determination of Body Mass Index (BMI) and percentage body fat: For height measurement, each participant bare footed stood on the foot board of the stadiometer (model: HM200P Charder USA) (Appendix 7) with the heel, head and buttocks touching the body of the stadiometer and taken in a deep breath. Height was then recorded to the nearest 0.1m. The height measurement, age and gender of the participant were keyed in the Omron Fat Loss Monitor with scale (HBF 400; Omron China) (Appendix 8) which has been mounted on a leveled ground. This equipment operates on the principle of bioelectric impedance analysis. The participant wearing minimal clothing was allowed to mount the equipment (Omron fat loss monitor with scale) with cleaned and dried feet. The weight measurement, BMI and the percentage body fat readings were read. Weight was measured in 0.2 pound and the percentage body fat in 0.1% increments.

3.4.3 Biochemical Indicators (lipid panel)

Blood samples (60µl) of participant who had observed an overnight fast were collected with a capillary blood collector pipette after pricking the ethanol- cleaned fingertip with a sterilized lancet. The blood was placed in the window of the lipid

profile strip that has been inserted in the Lipid profile analyzer (Model CardioChek P A; POCD Australia) (Appendix 9) after the apply sample signal was shown. The blood cholesterol levels were measured to the nearest 0.01mmol/L. The analyzer displayed measurements for total cholesterol, triglycerides, low and high density lipoprotein cholesterol and a ratio of total cholesterol and high lipoprotein cholesterol in turns. Some of the blood was placed on the strip inserted into the Glucose meter (Model HumaSens Human GmbH; Wiesbaden-Germany) (Appendix 10), and after some few minutes, the fasting blood glucose was read. The fasting blood glucose was measured to the nearest 0.01mmol/L.

3.4.4 Clinical (blood pressure)

A standardized digital Omron automatic blood pressure monitor (HEM – 172CN2; Omron, China) (Appendix 11) was used for measuring the blood pressure. Participants were made to understand that the reading would be taken thrice. It was further explained that cuff would be inflated and during the period, some discomfort may be felt. Blood pressure and pulse measurements were taken three consecutive times and averaged.

Classification of blood pressure was done based on the categories in WHO–ISH (1999). Systolic and diastolic blood pressure above 140mmHg and 90mmHg respectively were classified as high blood pressure. This was done after at least 5minutes of rest (sitting).

3.5 Quality Assurance

In order to ensure accuracy and precision, the questionnaire was pretested at Madina Lorry Park among long distance drivers who ply Madina to Aflao, Kpando, Ho, and

Hohoe. Based on the response the needed modifications were made concerning the questions asked, the length of time needed to administer a questionnaire, and even how to relate with drivers in order to get the correct information. The fat loss monitor with scale was calibrated every day to ensure accuracy in its reading. Height and blood pressure measurements were taken in duplicates and triplicates respectively to minimize random errors and then averaged. In order to ensure validity and reliability of the data collected two people who assisted in the data collection were trained in the administration of the questionnaire.

3.6 Data Capture and Analysis

The body mass index of the participants was determined based on the standard of WHO (1995) and percentage body fat based on the standard of Gallagher *et al*, (2000) (Appendix 3), systolic and diastolic blood pressure were assessed using the WHO-ISH 1999 (Appendix 4) standard in which systolic blood pressure of ≥ 140 mmHg and diastolic blood pressure ≥ 90 mmHg or the use of hypertension medication is considered high blood pressure, Stress level of the drivers was assessed using an adapted version of Stress management for dummies by Allen (2012) (Appendix 5), fasting blood glucose level determined based on the WHO (1999) and the blood lipid chemistry determined according to ATP III NCEP (2001) (Appendix 6).

The collected data were entered into and statistically analyzed using SPSS 16.0 Software package (Chicago, USA). Frequencies and percentages were used to summarize categorical variables such as level of education while means and standard deviation for the continuous variables. Binary logistic regressions were run using high blood pressure, overweight and high ratio of total cholesterol and high density lipoprotein as the dependent variables to determine the risk factors of CVDs.

Independent variables used in the model include age of drivers, percentage body fat, years of commercial driving, hours of driving, number of trips made in a day, seat capacity of vehicles, turn-around time, stress level, hours of sleep in a day, physical activity level, alcohol intake, smoking and snack intake. P- values less than 0.05 were considered significant.

3.7 Ethical Consideration

Ethical clearance was sought from the Institutional Review Board of the Noguchi Memorial Institute of Medical Research, University of Ghana. Volunteers were given Consent Forms (Appendix 1) in which the purpose of the research study, body measurements and samples requires were clearly stated. Risks and discomforts that were envisaged and measures that were put in place to manage them were also spelt out. Furthermore confidentiality concerning their data, their right to participate or opt out without been penalized was stated. Volunteers were recruited into the study after they had given their consent and signed or thumb printed the consent forms prior to receiving thorough explanation about the nature of the study and having had their questions, if any, answered.

CHAPTER FOUR

4.0 RESULTS

4.1 Preamble

Data on socio-demographic characteristics, driving history and activities, stress level, food habits, lifestyle practices, medical history profile of drivers , anthropometric indicators and blood pressure were collected for all the 170 drivers except for the lipid profile and fasting blood sugar in which only 91 and 109 drivers respectively were involved.

4.2 Background Characteristics of CLDBDs

Table 4.1 shows the background characteristics of the CLDBDs. All the participants in this study were men. The mean age was 40.78 ± 8.26 with the majority of the participants been less than 35years. Majority of the drivers 130 (76.5%) had JHS/MSLC as their highest educational level attained with only 1 (0.6%) having tertiary education. The mean years of driving commercial vehicle was 18.46 ± 8.48 with majority 88 (51.8%) of them driving for 18years or less. The drivers drive for 2.96 ± 0.76 mean hours with most of them driving in the range of 2-3hours 126 (74.1). The vehicles were having a mean seat capacity of 27.49 ± 1.85 and majority 101 (59.4%) of them having 20seats or less. The maximum number of trips made in a day was two with 94 (55.3%) making only one round trip. The turn-around time ranges between 1 - 24hours with 90 (52.9%) having a turn-around time of 1 hour and 1 (0.6%) making a turn-around in 24 hours.

Table 4.1 Background characteristics of CLDBDs (N = 170)

Characteristics	n (%)
Age(years)	
< 35	45 (26.5)
35-40	39 (22.9)
41-45	42 (24.7)
≥46	44 (25.9)
Educational Level	
None/ Primary	13 (7.6)
¹ JHS/MSLC/	130 (76.5)
² SHS/GCE(OL)/Tech/Voc	26 (15.3)
Tertiary	1 (0.6)
Years of commercial driving	
≤ 18	88 (51.8)
≥ 19	82 (48.2)
Vehicle sitting capacity(seats)	
≤ 20	101 (59.4)
≥ 21	69 (40.6)
Hours driven to destination	
2-3	126 (74.1)
>3	44 (25.9)
Number of round trips in a day	
1	94 (55.3)
2	76 (44.7)
Turn- around time back to Cape Coast (hours)	
1	90 (52.9)
2	61 (35.9)
3	18 (10.6)
24	1 (0.6)

¹JHS/MSLC denotes Junior High School/Middle School Leavers Certificate ²SHS/GCE (OL/AL)/Tech/Voc denotes Senior High School/ General Certificate Examination (Ordinary level/Advance Level)/ Technical School level/Vocational Education CLDBDs denotes commercial long distance bus drivers.

4.3 Reported medical profile of CLDBDs

Among the study population 1 (0.6%), 9 (5.3%), 82 (48.2%), 99 (58.2%), 133 (78.2%) and 95 (55.9%) reported having diabetes, high blood pressure, body pains, back pains, waist pains and headache respectively (Fig 4.1). Prevalence of disease conditions among the relations of the drivers were 16 (9.4%) diabetic, 11 (6.5%) hypertensive and 62 (36.5%) being of overweight (Fig 4.1)

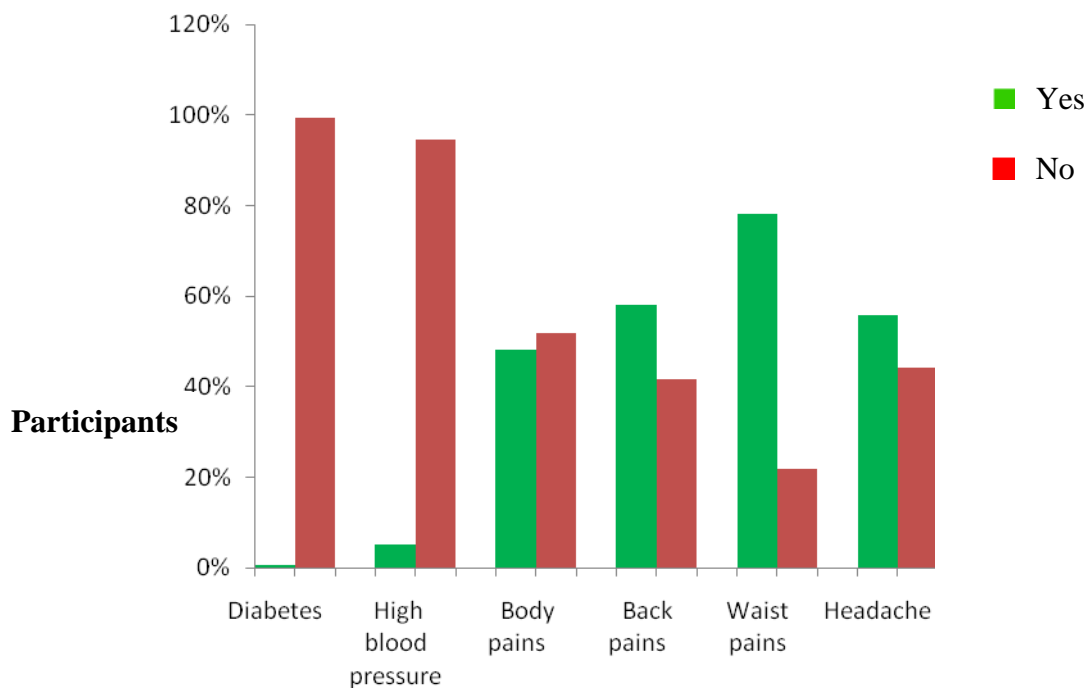


Figure 4.1 Reported Medical History profile of drivers (N=170)

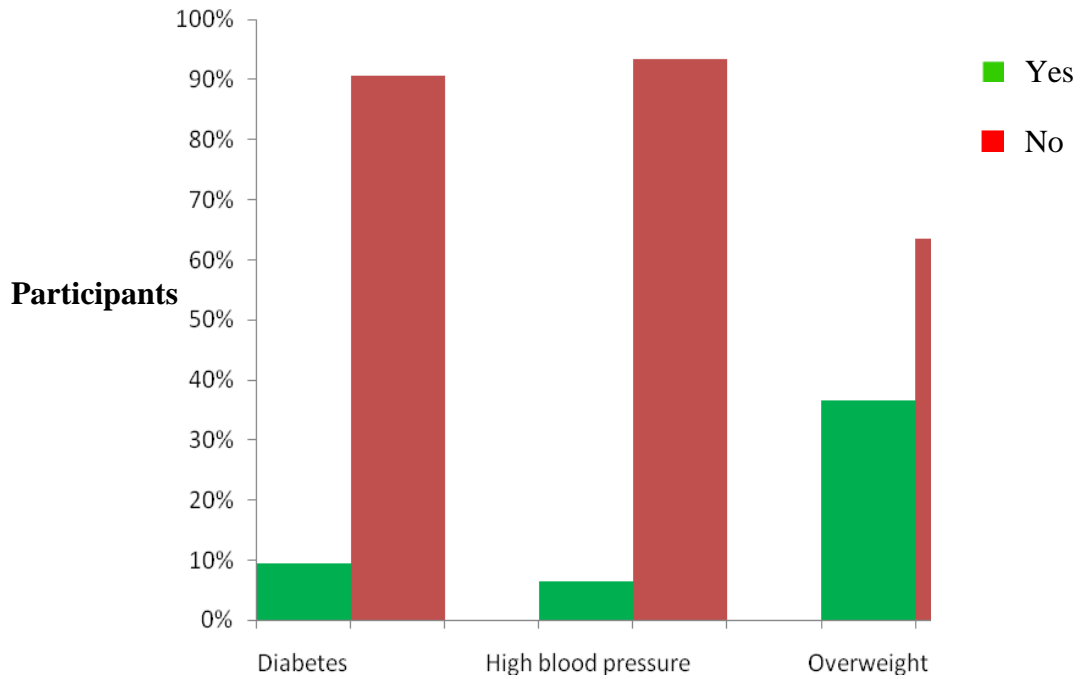


Figure 4.2 Reported family disease conditions

4.4 Stress and lifestyle practices of CLDBDs

An overview of stress and lifestyle practices among the drivers is presented in table 4.2. Majority of the drivers 167 (98.2%) were having lower stress levels whilst only 3 (1.8%) were averagely stressed. Alcohol intake was high 78 (45.9%) with majority of them 42 (53.8%) consuming spirits. On the contrary tobacco use was low with only 3 (1.8%) being current smokers. The drivers had mean sleeping hours of 5.81 ± 1.49 with most of them sleeping for only 7 hours or less. Most of the drivers 110 (64.7%) were less active.

Table 4.2 Stress level and lifestyle practices of CLDBDs (N=170)

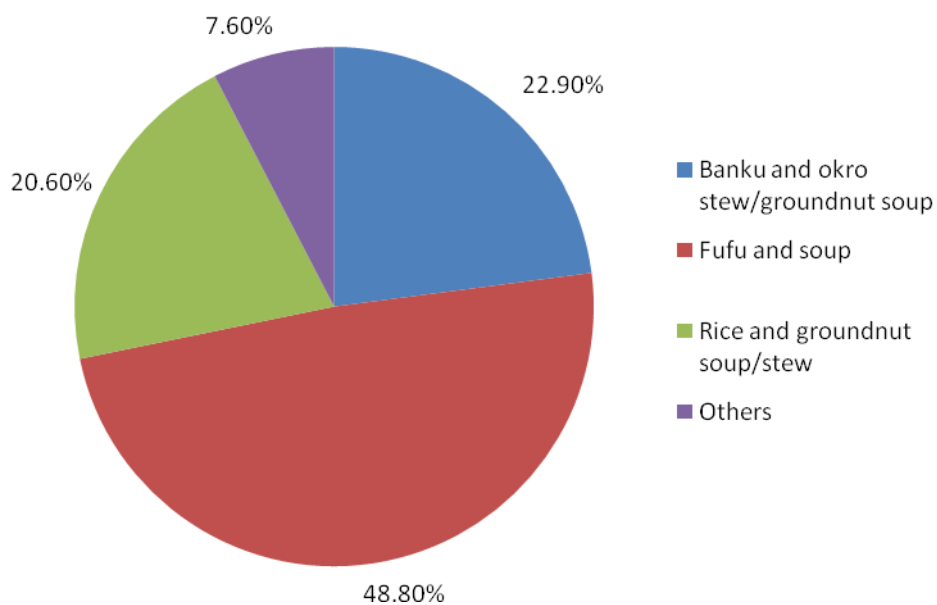
Characteristics	n(%)
Stress level	
Lower than average (0-19)	167 (98.2)
Average (20-39)	3 (1.8)
Lifestyle Practices	
Alcohol intake	
Yes	78 (45.9)
No	92 (54.1)
Type of alcohol	
Spirit	42 (53.8)
Beer	35 (44.9)
Wine	1 (1.3)
Tobacco use	
Yes	3 (1.8)
No	167 (98.2)
Sleeping hours in a day	
3-5	76 (44.7)
6-7	72 (42.2)
≥8	22 (12.9)
Physical activity level	
Low	110 (64.7)
Moderately low	43 (25.3)
High	17 (10.0)

4.5 Dietary pattern of CLDBDs

Fufu and soup, banku and okro stew or groundnut soup, and rice and groundnut soup or stew was the common consume by the drivers (Fig 4.3). Almost all drivers 168 (98.8%) were eating on their trips, with more than half meeting the required number of meals for the day. Fruit intake and snacking were on the higher side with 155 (91.2%) and 123 (72.4%) eating fruit and snacking respectively (Table 4.3)

Table 4.3 Dietary pattern of CLDBDs (N=170)

Dietary pattern	n(%)
Do you eat on your trips	
Yes	168 (98.8)
No	2 (1.2)
Number of meals per day	
1-2	81 (47.6)
3-4	89 (52.6)
Do you take fruit	
Yes	155 (91.2)
No	15 (8.8)
Snack intake	
Yes	123 (72.4)
No	47 (27.6)

**Figure 4.3 Common foods eaten by drivers (N=170)**

4.6 Anthropometric indicators and blood pressure profile of CLDBDs

Figure 4.4 shows the BMI distribution among the drivers. The mean BMI was 25.4 ± 4.2 with 5 (2.9%), 79 (46.5%), 62 (36.5%) and 24 (14.2%) being underweight, normal weight, overweight and obese respectively. For the percentage body fat, ages 20-39 years recorded 5 (6.4%), 30 (38.5%), 28 (35.9%) and 15 (19.2%) as having low, normal, high and very high body fat with a mean of 20.5 ± 7.7 , ages 40 - 59 years had 2 (2.2%), 34 (37.8%), 26 (28.9%) and 28 (31.1%) as having low, normal, high and very high body fat levels with a mean of 23.6 ± 6.7 and for ages 60-79 years, only two drivers fell in this category with one having high and the other having very high percentage body fat levels and their mean was 21 ± 14.5 (Fig 4.5)

A total of 36 (21.2%) had systolic blood pressure 140mmHg or higher and 134 (78.8%) had systolic blood pressure less than 140mmHg with a mean value of 130.5 ± 18.1 . The mean diastolic blood pressure was 81 ± 13.7 with 38 (22.4%) having diastolic blood pressure 90mmHg or more. The mean pulse rate was 72.6 ± 9.9 with only a driver 1 (0.6%) having a pulse rate greater than 100 beats/min (Table 4.4).

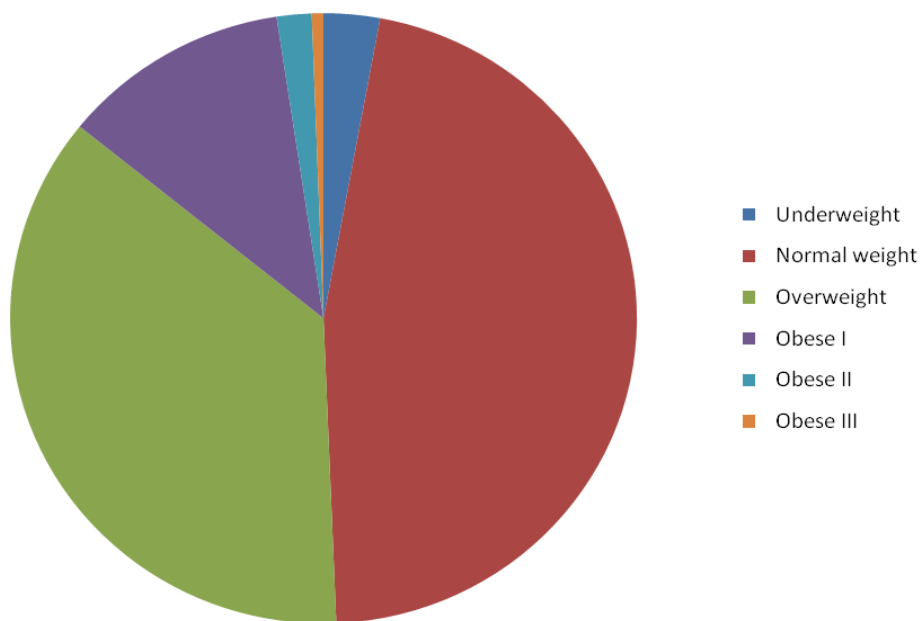


Figure 4.4 Body mass index distribution of participants (N=170)

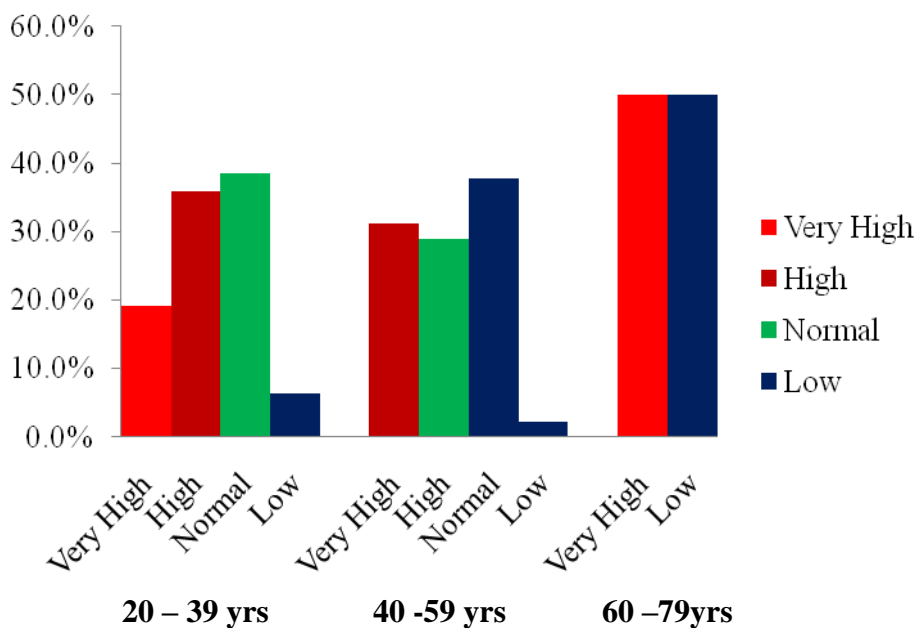


Figure 4.5 Percentage body fat of participants (N=170)

Table 4.4 Blood pressure levels of CLDBDs (N= 170)

Measurements	n (%)
Blood pressure(mmHg)	
Systolic	
< 140	134(78.8)
≥ 140	36(21.2)
Diastolic	
< 60	4 (2.4)
< 90	128(75.3)
≥ 90	38(22.4)
Pulse rate(/min)	
60-100	169(99.4)
>100	1 (0.6)

4.7 Blood chemistry of CLDBDs

The blood chemistry of the drivers is shown in table 4.5. The mean low density lipoprotein was 1.3 ± 0.7 mmol/L with majority of the having optimal levels and 4 (4.4%) and 2 (2.2%) having borderline high and high levels respectively. The mean Triglyceride level was 1.0 ± 0.1 mmol/L with majority of them 89(97.8%) having normal levels and only 2 (2.2%) having high levels. The mean high density lipoprotein level was 1.5 ± 0.7 mmol/L with majority 54 (59.3) having low levels and only 8 (8.8%) having high or desirable levels. For total cholesterol, majority of them 86 (94.5%) had desirable levels with only 1 (1.1%) and 4 (4.4%) having borderline high and high levels respectively with a mean of 1.1 ± 0.4 .

The ratio of total cholesterol to high density lipoprotein (total cholesterol/HDL) had a mean of 1.7 ± 0.9 with 57 (62.7%) drivers having normal level and 31 (34.1%) having high level. With the fasting blood sugar, the mean was 6.5 ± 1.9 mmol/L with only two drivers having low levels, 64 (58.7%) and 79 (72.5%) having sugar level (diabetes) respectively.

Table 4.5 Blood Chemistry of CLDBDs

Measurement	n(%)
Lipid profile (mmol/L)	
Low density lipoprotein	
Optimal (< 2.59)	74 (81.3)
Near optimal (2.59- 3.35)	11 (12.1)
Borderline high (3.36- 4.12)	4 (4.4)
High (4.13 – 4.90)	2 (2.2)
Triglycerides	
Normal (< 1.70)	89 (97.8)
Borderline high (1.70- 2.25)	2 (2.2)
High density lipoprotein (HDL)	
Low (<1.04)	54 (59.3)
Borderline high (>1.04)	29 (31.9)
High (1.55 or more)	8 (8.8)
Total cholesterol	
Desirable (< 5.18)	86 (94.5)
Borderline high (5.18- 6.20)	1 (1.1)
High (6.21 and above)	4 (4.4)
Ratio of total cholesterol and HDL	
Desirable (< = 4.5)	64 (70.3)
Risk for CVD (> 4.5)	27 (29.7)
Fasting Blood Sugar (mmol/L)	
Below normal (<3.6)	2 (1.8)
Normal (3.6-6.1)	28 (25.7)
High sugar level (>6.1)	79 (72.5)

Fasting blood sugar: N=109

Lipid profile: N=91

4.8 Predictors of CVD

4.8.1 Predictors of high diastolic blood pressure (HDBP)

Controlling for age, percentage body fat, years of commercial driving, hours of driving, number of hours of sleep, alcohol intake, tobacco use and snack intake in the model, age and percentage body fat were found to be predictors of HDBP (Table 4.7). Drivers who are less than 46 years were significantly about 20% (CI= 0.04 – 0.76) less likely to develop HDBP compared to those who are 46 years or more. Drivers with the normal percentage body fat were also 20% (CI= 0.06 – 0.65) less likely to develop HDBP than those with very high percentage body fat and it was significant. Participants who drive small buses were significantly at an increased risk of 3.58times (CI = 1.09 – 11.75) of developing HDBP. The remaining variables were not significantly associated with HDBP.

Significantly independent predictors of HDBP were found to be age, percentage body fat and years of commercial driving (Table 4.7). Drivers who are less than 35 years and those between the age range of 35 – 40 years were about 10% (CI= 0.03 – 0.39) and 20% (CI= 0.05 – 0.55) respectively less likely to develop HDBP than those who are 46 years and above. The likelihood of drivers with normal percentage body fat developing HDBP was about 20% (CI = 0.07 – 0.53) unlikely to develop HDBP than those with very high percentage body fat. Driving for less than 14 years place the driver (s) at a decreased risk of 10% (CI= 0.04 – 0.39) than those who have being driving for more than 21 years. The other variables were not significantly associated with HDBP.

Table 4.6: Logistic regression to show factors that predict high diastolic blood pressure among CLDBDs in the study (N=170)

Variable	OR Adjusted (95%CI)	P-Value	OR Unadjusted (95%CI)	P- Value
Age category (years)				
< 35	0.19 (0.03 – 1.11)	0.07	0.10 (0.03 – 0.39)	< 0.01
35-40	0.18 (0.04 – 0.76)	0.02	0.17 (0.05 – 0.55)	< 0.01
41-45	0.78 (0.26 – 2.36)	0.66	0.65 (0.27 – 1.57)	0.34
≥ 46	1.00		1.00	
Percentage body fat				
Low	0.47 (0.04 – 5.49)	0.55	0.23 (0.03 – 2.01)	0.18
Normal	0.20 (0.06 – 0.65)	0.01	0.19 (0.07 – 0.53)	< 0.01
High	0.70 (0.24 – 2.06)	0.52	0.50 (2.11 – 1.20)	0.12
Very high	1.00		1.00	
Years of commercial driving				
< 14	0.37 (0.08 – 1.82)	0.22	0.13 (0.04 – 0.39)	< 0.01
14-21	0.96 (0.32 – 2.94)	0.95	0.50 (0.22 – 1.14)	0.09
> 21	1.00		1.00	
Hours of driving				
≤ 3	0.70 (0.19 – 2.51)	0.59	0.64 (0.29 – 1.39)	0.26
> 3	1.00		1.00	
Number of round trips make in a day				
1	0.94 (0.32 – 2.75)	0.91	1.15 (0.55 – 2.38)	0.72
2	1.00		1.00	
Turn-around time in hour (s)				
1	0.99 (0.16 – 6.22)	0.99	0.94 (0.28 – 3.18)	0.19
2	1.52 (0.29 – 7.80)	0.62	1.14 (0.33 – 4.00)	0.84
3	0.00 (0.00 – 0.00)	1.00	0.00 (0.00 – 0.00)	1.00
24	1.00		1.00	
Seat capacity				
≤ 20	3.58 (1.09 – 11.75)	0.04	1.01 (0.48 – 2.14)	0.98
> 20	1.00		1.00	
Stress level				
Low	1.02 x 10 ⁹ (0.00 – 0.00)	0.99	4.76 x 10 ⁸ (0.00 – 0.00)	0.99
Average	1.00		1.00	

Table 4.6 cont'd: Logistic regression to show factors that predict high diastolic blood pressure among CLDBDs in the study (N=170).

Variable	OR Adjusted (95% CI)	P- Value	OR Unadjusted (95% CI)	P- Value
Physical activity level				
Low	0.62 (0.14 – 2.82)	0.54	0.86 (0.26 – 2.89)	0.81
Moderately high	0.73 (0.14 – 3.74)	0.71	1.11 (0.30 – 4.16)	0.87
High	1.00		1.00	
Hours of sleep in a day				
3-5	3.12 (0.57 – 15.15)	0.19	2.58 (0.69 – 9.61)	0.16
6-7	1.67 (0.32 – 8.58)	0.54	1.39 (0.36 – 5.42)	0.63
≥ 8	1.00		1.00	
Alcohol use				
Yes	1.56 (0.62 – 3.89)	0.34	1.87 (0.89 – 3.88)	0.09
No	1.00		1.00	
Tobacco use				
Yes	2.83 (0.19 – 41.34)	0.45	7.28 (0.64 – 82.55)	0.11
No	1.00		1.00	
Snack intake				
Yes	0.99 (0.36 – 2.71)	0.99	0.75 (0.34 – 1.65)	0.48
No	1.00		1.00	
Fasting blood sugar				
< 3.6			0.00 (0.00 – 0.00)	0.99
3.6 -6.1			0.29 (0.08 – 1.06)	0.06
> 6.1			1.00	

Hosmer-Lemeshow Statistic: P = 0.439; Nagelkerke R² = 0.348

4.8.2 Predictors of high systolic blood pressure (HSBP)

Age, percentage body fat, years of commercial driving, hours of driving, number of round trips in a day, turn-around time, seat capacity, stress level, physical inactivity level, hours of sleep, alcohol intake, tobacco use and snack intake were controlled for in the model. Age and percentage body fat significantly predicted HSBP (Table 4.8). Drivers who are less 35 years and within the age range of 35 and 40 years were about 10% (CI = 0.02 - 0.82) and 20% (CI = 0.04 - 0.61) respectively less likely to develop

HSBP than those who are 46 years or more. Participants with normal percentage body fat were at about 20% (CI = 0.06 - 0.60) decreased risk of developing HSBP than those with very high percentage body fat. The rest of the variables were not significant predictors of HSBP.

Independently age of drivers, percentage body fat, years of commercial driving and alcohol use were significant predictors of HSBP among the drivers. Drivers who are less than 35 years were about 10% (CI= 0.02 - 0.52) and those in the age range of 35 to 40 years were also about 10% (CI= 0.04 - 0.45) less likely to develop HSBP than those who are 46 years or older. Participants with normal and high percentage body fat were about 20% (CI= 0.07 - 0.48) and 30% (CI= 0.13 - 0.82) respectively less likely to develop HSBP compare to those with very high percentage body fat. Drivers who have being driving for less than 14 years and between 14 and 21 years were at 13% (CI= 0.04 - 0.39) and 41% (CI= 0.18 - 0.96) respectively less likely to develop HSBP compare to those who have being driving for more than 21 years. Drivers who take alcohol were at 2.54times (CI= 1.19 - 5.45) increase risk of developing HSBP than those who don't drink alcohol. The rest of the variables were not significantly associated with HSBP.

Table 4.7: Logistic regression to show factors that predict high systolic blood pressure among CLDBDs in the study (N=170).

Variable	OR Adjusted(95%CI)	P- Value	OR Unadjusted(95%CI)	P-Value
Age category (years)				
< 35	0.14 (0.02 – 0.82)	0.03	0.09 (0.02 – 0.32)	< 0.01
35-40	0.15 (0.04 – 0.60)	0.01	0.14 (0.04 – 0.45)	< 0.01
41-45	0.34 (0.10 – 1.09)	0.07	0.33 (0.13 – 1.57)	0.07
≥ 46	1.00		1.00	
Percentage body fat				
Low	0.33 (0.03 – 4.19)	0.39	0.21 (0.02 – 1.83)	0.16
Normal	0.19 (0.06 – 0.60)	0.01	0.18 (0.07 – 0.48)	< 0.01
High	0.34 (0.11 – 1.04)	0.06	0.33 (0.13 – 0.82)	0.02
Very high	1.00		1.00	
Years of commercial driving				
< 14	0.37 (0.07 – 1.96)	0.24	0.13 (0.04 – 0.39)	< 0.01
14-21	0.59 (0.19 – 1.91)	0.39	0.41 (0.18 – 0.96)	0.04
> 21	1.00		1.00	
Hours of driving				
≤ 3	0.75 (0.19 – 2.94)	0.69	0.49 (0.23 – 1.07)	0.08
> 3	1.00		1.00	
Number of round trips make in a day				
1	0.83 (0.27 – 2.53)	0.75	1.17 (0.56 – 2.46)	0.68
2	1.00		1.00	
Turn-around time in hour (s)				
1	0.99 (0.15 – 5.53)	0.91	0.99 (0.22 – 2.19)	0.54
2	0.77 (0.15 – 3.92)	0.76	0.64 (0.19 – 2.13)	0.46
3	0.00 (0.00 – 0.00)	1.00	0.00 (0.00 – 0.00)	1.00
24	1.00		1.00	
Seat capacity				
≤ 20	1.24 (0.38 – 4.02)	0.72	0.68 (0.32 – 1.43)	0.30
> 20	1.00		1.00	
Stress level				
Low	8.53 x 10 ⁸ (0.00 – 0.00)	0.99	4.44 x 10 ⁸ (0.00 – 0.00)	0.99
Average	1.00		1.00	

Table 4.7 cont'd: Logistic regression to show factors that predict high systolic blood pressure among CLDBDs in the study (N=170).

Variable	OR Adjusted (95% CI)	P- Value	OR Unadjusted (95% CI)	P- Value
Physical activity level				
Low	0.62 (0.13 – 2.94)	0.55	0.91 (0.27 – 3.04)	0.87
Moderately high	0.39 (0.07 – 2.26)	0.29	0.74 (0.19 – 2.89)	0.67
High	1.00		1.00	
Hours of sleep in a day				
3-5	0.73 (0.15 – 0.34)	0.69	1.55 (0.45 – 4.99)	0.51
6-7	0.79 (0.17 – 0.35)	0.75	0.99 (0.29 – 3.42)	0.99
≥ 8	1.00		1.00	
Alcohol use				
Yes	1.95 (0.76 – 5.02)	0.17	2.54 (1.19 – 5.45)	0.02
No	1.00		1.00	
Tobacco use				
Yes	2.11 (0.14 – 32.61)	0.59	7.83 (0.69 – 88.85)	0.09
No	1.00		1.00	
Snack intake				
Yes	0.99 (0.36 – 2.71)	0.99	0.95 (0.42 – 2.18)	0.91
No	1.00		1.00	
Fasting blood sugar				
< 3.6			0.00 (0.00 – 0.00)	0.99
3.6 – 6.1			0.23 (2.05 – 1.06)	0.50
> 6.1			1.00	

Hosmer-Lemeshow Statistic: P = 0. 873; Nagelkerke R²= 0.365

4.8.3 Determinants of BMI (overweight)

High BMI has been shown to be a factor in CVDs. It's against this background that we were interested in identifying predictors of BMI which might be indirectly linked to CVDs. Controlling for age, percentage body fat, years of commercial driving, hours of driving, number of round trips in a day, turn-around time, seat capacity, stress level, physical activity level, hours of sleep, alcohol intake, tobacco use and snack intake in the model, age and turn - around time significantly predicted for overweight.

Drivers younger than 35 years and those between the ages of 35 and 40 years were 3% (CI= 0.00 - 0.60) and 3% (0.00 - 0.38) respectively and less likely to become overweight 46 years and above. Those whose turn-around time was 1 hour were at 37.47 times (CI= 1.79 - 783.44) increase risk of becoming overweight than those whose turn- around time is 24 hours. The remaining variables were not significantly associated with overweight.

Independently drivers who are less than 35 years were 35% (CI= 0.15 - 0.82) less likely to become overweight compare to those who are 46 years and above. Those who drink alcohol were at 2.78 times (CI= 1.49 - 5.18) increase risk of becoming overweight compare to those who do not drink. The other variables were not significantly associated with overweight.

Table 4.8: Logistic regression to show factors that predict overweight among CLDBDs in the study (N=170).

Variable	OR Adjusted(95%CI)	P- Value	OR Unadjusted(95%CI)	P-Value
Age category (years)				
< 35	0.03 (0.00 – 0.60)	0.02	0.35 (0.15 – 0.82)	0.02
35-40	0.03 (0.00 – 0.38)	0.01	0.44 (0.18 – 1.08)	0.07
41-45	0.22 (0.03 – 1.69)	0.14	0.52 (0.22 – 1.23)	0.14
≥ 46	1.00		1.00	
Percentage body fat				
Low	0.00 (0.00 – 0.00)	0.99	0.00 (0.00 – 0.00)	0.99
Normal	0.00 (0.00 – 0.00)	0.99	0.00 (0.00 – 0.00)	0.99
High	0.00 (0.00 – 0.00)	0.99	0.00 (0.00 – 0.00)	0.99
Very high	1.00		1.00	
Years of commercial driving				
< 14	2.99 (0.33 – 26.93)	0.33	0.48 (0.22 – 1.03)	0.06
14-21	1.76 (0.27 – 11.76)	0.56	0.81 (0.39 – 1.71)	0.58
>21	1.00		1.00	
Hours of driving				
≤ 3	0.19 (0.03 – 1.25)	0.08	0.64 (0.32 – 1.27)	0.19
> 3	1.00		1.00	
Number of round trips make in a day				
1	0.55 (0.11 – 2.69)	0.46	0.86 (0.47 – 1.58)	0.63
2	1.00		1.00	
Turn-around time in hour (s)				
1	37.47 (1.79 – 783.44)	0.02	1.64 (0.59 – 4.53)	0.54
2	7.84 (0.61 – 100.29)	0.11	0.99 (0.35 – 2.86)	0.99
3	0.00 (0.00 – 0.00)	1.00	0.00 (0.00 – 0.00)	1.00
24	1.00		1.00	
Seat capacity				
≤ 20	1.22 (0.28 – 5.36)	0.79	0.73 (0.39 – 1.36)	0.32
> 20	1.00		1.00	
Stress level				
Low	0.00 (0.00 – 0.00)	0.99	0.00 (0.00 – 0.00)	0.99
Average	1.00		1.00	

Table 4.8 cont'd: Logistic regression to show factors that predict overweight among CLDBDs in the study (N=170).

Variable	OR Adjusted (95% CI)	P- Value	OR Unadjusted (95% CI)	P- Value
Physical activity level				
Low	2.47 (0.26 – 23.98)	0.44	1.48 (0.53 – 4.17)	0.46
Moderately high	1.46 (0.12 – 17.11)	0.76	1.64 (0.53 – 5.12)	0.39
High	1.00		1.00	
Hours of sleep in a day				
3-5	1.81 (0.22 – 14.77)	0.58	1.69 (0.65 – 4.43)	0.28
6-7	3.82 (0.45 – 32.76)	0.22	1.44 (0.55 – 3.80)	0.46
≥ 8	1.00		1.00	
Alcohol use				
Yes	3.02 (0.79 – 11.48)	0.11	2.78 (1.49 – 5.18)	< 0.01
No	1.00		1.00	
Tobacco use				
Yes	0.25 (0.01 – 8.59)	0.44	1.98 (0.18 – 22.21)	0.58
No	1.00		1.00	
Snack intake				
Yes	1.81 (0.29 – 10.99)	0.52	0.92 (0.47 – 1.80)	0.80
No	1.00		1.00	

Hosmer-Lemeshow Statistic: P = 0.990; Nagelkerke R² = 0.826

4.8.4 Predictors of high ratio of Total Cholesterol (TC) to High Density

Lipoprotein (HDL)

Controlling for age, percentage body fat, years of commercial driving, hours of driving, number of round trips in a day, turn-around time, seat capacity, stress level, physical activity level, hours of sleep, alcohol intake, tobacco use and snack intake in the model, age and seat capacity of buses driven by the drivers significantly predicted high TC/HDL (Table 4.10). Drivers between the age range of 41 to 45 years were at 66.98 times (CI= 2.66 - 1.69 x 10³) increase risk of having high TC/HDL as compare

to those who were 46 years and above. Also drivers who drive small buses were at 25.95 times (CI= 2.73 - 247.24) increase risk of having high TC/HDL compare to those driving big buses. All other variables were not significantly associated with high TC/HDL either independently or when adjusted.

Table 4.9: Logistic regression to show factors that predict high TC/HDL among CLDBDs in the study (N=91).

Variable	OR Adjusted (95%CI)	P- Value	OR Unadjusted 95%CI)	P- Value
Age category (years)				
< 35	0.11 (0.00 – 3.31)	0.20	0.33 (0.08 – 1.48)	0.15
35-40	0.20 (0.02 – 2.74)	0.23	0.29 (0.07 – 1.25)	0.09
41-45	66.98 (2.66 – 1.69 x 10 ³)	0.01	2.89 (0.87 – 9.60)	0.08
≥ 46	1.00		1.00	
Percentage body fat				
Low	0.00 (0.00 – 0.00)	0.99	0.00 (0.00 – 0.00)	0.99
Normal	0.34 (0.06 – 1.86)	0.21	0.57 (0.19 – 0.17)	0.31
High	2.75 (0.00 – 1.01)	0.27	1.21 (0.38 – 3.89)	0.74
Very high	1.00		1.00	
Years of commercial driving				
< 14	1.77 (0.13 – 23.56)	0.67	0.47 (0.17– 1.31)	0.15
14-21	0.07 (0.27 – 11.76)	0.05	0.29 (0.08 – 1.03)	0.06
> 21	1.00		1.00	
Hours of driving				
≤ 3	0.31 (0.34 – 2.83)	0.29	0.72 (0.27 – 1.92)	0.52
> 3	1.00		1.00	
Number of round trips make in a day				
1	0.37 (0.04 – 3.47)	0.39	1.46 (0.59 – 3.62)	0.42
2	1.00		1.00	
Turn-around time in hour (s)				
1	0.16 (0.01– 4.02)	0.26	0.99 (0.23 – 4.32)	0.99
2	0.47 (0.02 – 97.9)	0.63	1.47 (0.32 – 6.69)	0.62
3	0.00 (0.00 – 0.00)	1.00	0.00 (0.00 – 0.00)	1.00
24	1.00		1.00	
Seat capacity				
≤ 20	25.95 (2.73 – 247.24)	0.01	2.64 (0.88 – 7.89)	0.08
> 20	1.00		1.00	
Stress level				
Low	0.00 (0.00 – 0.00)	1.00	0.00 (0.00 – 0.00)	1.00
Average	1.00		1.00	

Table 4.9 cont'd: Logistic regression to show factors that predict TC/HDL among CLDBDs in the study (N=170).

Variable	OR Adjusted (95% CI)	P- Value	OR Unadjusted (95% CI)	P- Value
Physical activity level				
Low	2.39 (0.13 – 44.76)	0.56	1.46 (0.27 – 7.93)	0.66
Moderate	0.81 (0.03 – 19.71)	0.89	0.95 (0.15 – 5.99)	0.95
high				
High	1.00		1.00	
Hours of sleep in a day				
3-5	4.23 (0.32 – 55.77)	0.27	0.27 (0.51 – 14.21)	0.24
6-7	1.54 (0.13 – 17.91)	0.73	0.15 (0.28 – 8.14)	0.64
≥ 8	1.00		1.00	
Alcohol use				
Yes	0.49 (0.09 – 2.66)	0.41	0.91 (0.37 – 2.24)	0.83
No	1.00		1.00	
Tobacco use				
Yes	0.51 (0.01 – 27.58)	0.74	2.42 (0.15 – 40.22)	0.54
No	1.00		1.00	
Snack intake				
Yes	2.63 (0.39 – 17.91)	0.32	1.48 (0.52 – 4.24)	0.47
No	1.00		1.00	

Hosmer-Lemeshow Statistic: P = 0. 841; Nagelkerke R²= 0.605

CHAPTER FIVE

5.0 DISCUSSIONS

5.1 Background information of drivers

The study was cross sectional that determined the cardiovascular disease risk factors; age, diet, overweight/obesity, abnormal lipid levels, lifestyle practices (excessive alcohol intake, smoking and physical inactivity), diabetes, stress and high blood pressure among CLDBDs in Cape Coast. Also other possible risk factors of CVD associated with long distance driving were assessed.

In Ghana, the mean age for commercial drivers have been reported to be 38.8 ± 13.7 years by Asiamah *et al.*, (2002) and later to be 41.2 ± 8.6 by Achulo *et al.*, (2011). In this present study a mean of 40.78 ± 8.26 was observed which falls within the ranged reported. According to DVLA (2011), the laws of Ghana allows a person 18 years and older to attain driving license after going through practical and theoretical examination. Renewal of license is done every year. This is done to protect both the driver and the general populace. Educational background of the CLDBDs varies and consisted of illiterates/school dropouts and secondary or technical school leavers with a few tertiary education graduates were observed in the current study. Consistent with these findings on educational profile are those reported by Asiamah *et al.* (2002) who found that 16%, 60% and 23% of the drivers in Accra had no formal education, basic primary education and secondary education respectively. Also a study by Achulo *et al.* (2011) in Accra among commercial long distance drivers found out that 1.7%, 37.9%, 58.6% and 1.7% had no formal education, primary/JHS/MSLC education, secondary and tertiary education respectively. Most people opt for commercial driving as an occupation as a result of not having good academic qualification to enable them further their studies or to get them jobs of interest and also due to limited

vacancy for blue and white collar jobs. Majority of the vehicles driving by these drivers are owned by other people with only 1.7% being car owners (Achulo *et al.*, 2011) and due to the demand from these owners, the drivers are forced to overwork and even drive when tired putting their lives and that of their passengers and other road users at risk.

Dietary pattern and lifestyle practices of the drivers

The working day of a professional driver starts very early in the morning and most of the time ends very late in the night. As a result most drivers skip some of the major meals (breakfast, lunch, and dinner) of the day especially breakfast and this can lead to unplanned snacking (Schlundt *et al.*, 1992) and snacks are known to contain high amount of saturated fat and hence resulting in overweight and obesity which are risk factors of CVD. Some of the CLDBDs in the study were skipping one or two of the main meals for the day and this can be attributed to the fact that they leave the house very early in the morning and also due to how busy they are at the lorry stations. Also due to the nature of their work, they often return home late in the night, eat and then go to bed right afterwards thereby accumulating fat at the end of the day. Snacking and eating outside their homes were common behaviours among these drivers and this agrees with findings of Gill and Wijk (2004), Escoto *et al.* (2010) and Achulo *et al.* (2011) among Sweden, Minnesota (USA) and Accra (Ghana) drivers respectively. These foods are normally high in calories and salt (Guthrie *et al.*, 2002) which can lead to overweight/obesity, diabetes and high blood pressure. Fruit intake among the drivers was on higher side 91.2% and can be due to the readily availability of already sliced and packaged forms in which vendors present them along the roads sides in

Ghana making accessibility very easy and similar trend was observed by Achulo *et al.* (2011).

Most drivers take alcohol because they believed it relaxes them, releases their inhibitions, increase their confidence level on the road, builds up friendships and also because of the taste (Asiamah *et al.*, 2002). From our study about 50% of the drivers were taking alcohol but they claim they drink after work and/or on their free days. Majority (53.8%) drink spirits and this agrees with the findings of Asiamah *et al.* (2002) and Achulo *et al.* (2011). Alcohol intake is positively associated with abdominal obesity in men (Duvigneaud *et al.*, 2007) and obesity is a known risk factor for CVDs and other health problems (Kamadjeu *et al.*, 2006). A higher prevalence of low physical activity level was observed among the drivers (64.7%) and similar outcome was found among drivers in the study of Achulo *et al.* (2011) and Hedberg *et al.* (1993) in Sweden. None or lower physical activity levels have been associated with the onset of non-communicable diseases such as CVDs, obesity and diabetes to mention a few (WHO, 2011b).

Body size, percent body fat and lipid chemistry of drivers

BMI profile of the drivers indicated that 14.2% were obese however, this prevalence is higher compare to the national prevalence of obesity (2.8%) for males 18 years and older (Britwum *et al.*, 2005) and among drivers in Accra reported by Achulo *et al.*'s study in 2011. and this may be due to the frequent rate at which they patronize food from vendors which is known to be high in saturated fat (Guthrie *et al.*, 2002) and also due to late night eating (Birketvedt *et al.*, 1999). Regarding overweight, this study

reported a prevalence of 36.5% which is lesser than that reported by Achulo *et al.*'s study (38.8%).

High BMI (overweight/obesity) and high percentage body fat are risk factors for cardiovascular disease (CVD) (WHF, 2012a). Data from this study show that prevalence of overweight and obese are high and agrees with the findings of Achulo *et al.* (2011). Also other studies in Ghana by Kainyah and Owusu (2000) found high prevalence of overweight and obesity among commercial minibus (trotro) drivers and among taxi drivers by Adu-Asare and Steiner-Asiedu (2008). In Kashan, the same trend was found among professional bus and truck drivers (Saber *et al.*, 2009). This high BMI can be due to the fact that these drivers are mostly physically inactive and also patronize food from fast food joints which is often high in saturated fat (Guthrie *et al.*, 2002), snacking most of the time and these snacks normally are high in calories and also as a result of late night eating which causes the body to accumulate more calories which are later turn into fat (triglycerides).

Only a small percentage (8.8%) had the desirable high level of HDL. This may be attributed to high prevalence of low physical activity level among the drivers and high intake of snacks which is normally high in saturated fat. Although our study did not look into the composition of foods, findings by NCEP (2001) shows that high intake of saturated fat leads to low HDL level. This low level of HDL places the drivers at risk of developing CVD. Prevalence of high fasting blood (> 6.1mmol/L) sugar was 72.5% among the drivers. This high prevalence can be attributed to fact that the drivers did not observe an overnight fast before their samples were taken since they reported observing the fast. This high blood sugar level cans leads to the development

of type 2 diabetes, damages to nerves, blood vessels and some organs of the body (Diabetes health center, 2013)

High low density lipoprotein (LDL), high triglyceride level and low level of high density lipoprotein (HDL) are risk factors for CVD (NCEP, 2001). Findings from the study show that majority of the drivers have normal/low levels of LDL, triglycerides, total cholesterol and low level of HDL. The low level of HDL (less than 1.04mmol/L) has implications for risk of CVDs since HDL mops up fat from the arteries to prevent atherosclerosis. Similar trends of high levels of triglycerides, total cholesterol and low level of HDL were also reported in other studies among drivers. (Saber *et al.*, 2009 and Siu *et al.*, 2012). This trend of low level of HDL seen across these studies may indicate sedentary lifestyle of most drivers since HDL level is normally high in active people compare to less active people (NCEP, 2001). High levels of triglycerides were also found among policemen than the general population (Tharkar *et al.*, 2008) and the reason for this high level is obscure.

Blood pressure and nutrition

High prevalence of high blood pressure was measured among the drivers and this can be due to the fact that majority of the drivers patronize food from vendors and these foods according to Guthrie *et al.* (2002) contain high amount of salt and saturated fat and also can be due to their gender since the probability of men becoming hypertensive is high compare to women especially premenopausal women (WHF, 2012). Saturated fat, high intake of salt, stress and diabetes are known risk factors of hypertension (WHF, 2012a) but on the contrary data from the study show that the drivers are not too stressed out. Physical inactivity, overweight, obesity, and alcohol

consumption also risk factors of hypertension (WHF, 2012a) were prevalent among the study group and could be contributing to the high blood pressure. Commercial driving is a shift work and shift system of work also predisposes the workers to developing high blood pressure (Pfenninger, 2013). Finding in a study carried out in Accra-Ghana by Achulo *et al.* (2011) and in Kashan by Saberi *et al.* (2009), also agree with the findings on high blood pressure in this study. Among taxi drivers and non-taxi drivers, taxi drivers had a high prevalence of high blood pressure and can be due to the factors mentioned above (Kurosaka *et al.*, 2000). Dwiwedi *et al.* (2000) also found high prevalence of hypertension among medical doctors. High prevalence of hypertension was also found among policemen than the general population (Tharkar *et al.*, 2008) and this can be due to occupationally related stress.

The outcome of the studies indicated that majority of the drivers were diabetics. Again this can be attributed to the high prevalence of overweight, obesity, physical inactivity and alcohol intake among the drivers. On the contrary Saberi *et al.* (2009) found few percentage of truck and bus drivers in Kashan to be diabetic and this can be attributed to the fact that Kashan being an Arab state, alcohol intake is restricted compare to our part of the world and alcohol is known to contribute high calories which leads to abnormal weight gain. Kurosaka *et al.* (2000) found prevalence of diabetes among taxi drivers to be higher compare to non-taxi drivers.

5.2 Determinants of CVDs

In this study high blood pressure, overweight and the ratio of total cholesterol to HDL were used as outcomes in binary logistic regression modules to predict CVDs. From the data, younger drivers were less likely to have high systolic and diastolic blood

pressure compare to the older drivers either independently or when other confounders were adjusted for. As one ages the probability of having high blood pressure (HBP) increases and before age 45 men are at a higher risk compare to women (NHLBI, 2012). This can also be due to the fact that the older drivers under normal circumstance have been physically inactive for long as a result of the nature of their work compared to the younger drivers and hence accumulated more fat and high sugar level which are risk factors of high blood pressure. Again the older driver has been exposed to job- related stress for long which, on their own, can increase blood pressure by thickening the blood and hence more force or pressure from the heart to pump it (WHF, 2012f).

For drivers with normal percentage body fat, the odds of developing high systolic and diastolic blood pressure was less compared with those with very high percentage body fat and it was significant either adjusted or independently and it may be due to the fact that people with normal percentage body fat also have all forms of lipid in their right amount since abnormal lipid levels increases ones likelihood of developing HBP (WHF, 2012a). There was a decreased odds of developing HBP for drivers with few number of years of commercial driving as compared to those who have been driven commercially for longer periods. Prevalence of high blood pressure was found to increase with years of commercial driving among drivers in San Francisco (Ragland *et al.*, 1997). This implies that the longer the years of commercial driving, the higher the risk of developing CVDs. The likelihood of drivers who drive for 3 hours or less hours developing HBP was less compare to those driving for longer hours independently or when other confounders were adjusted for. Long driving hours has been found to be associated with in haematological markers of increase of CVDs risk (Chen *et al.*, 2005b). Long working hours according to has been found to increase

tension resulting in increase in the activity of the sympathetic nerve thereby increasing the mean daily blood pressure in both normotensive and hypertensive individuals (Sokejima and Kagamimori, 1998). This increase in blood pressure increases the risk for CVDs.

Participants who sleep for only few hours in the day than the recommended hours (8 hours) were more likely to develop HBP as compare to those who sleep for more hours. This outcome can be due to the fact that these drivers don't get enough rest and at the end of the day they get stressed out which increases their blood pressure, also it can be that they work late into the night that is why they sleep late but wake up early and long working hours is known to increase ones chance of developing heart disease by 40% – 80% (Hagan, 2012).

The likelihood for drivers who take in alcohol or smoke tobacco to develop HBP was high compare to those who don't drink nor smoke. Smoking can lead to atherosclerosis and excessive alcohol intake can also lead to overweight or obesity which is risk factors for CVD.

Overweight has also been shown to be a factor contributing to CVDs. The data showed that younger drivers were less likely to be overweight compare to the older drivers and this was significant. This can be attributed to the fact that the young drivers are more physically active than the old ones and also, their rate of metabolism is higher hence lose excess fat. Furthermore older drivers the conditions of the job such as physical inactivity, frequent snacking, skipping of breakfast and eating late in the night for long compare to the younger ones might have predisposed them to weight gain. These assertions were also reported in some studies earlier where years of commercial driving was independently associated with overweight; drivers who

have worked for few years were less likely to be overweight compared with those who have worked for longer periods and the effect was attributed to long period of patronizing foods rich in saturated fat from vendors (Guthrie *et al.*, 2002), skipping meals especially breakfast and hence snacking anyhow (Schlundt *et al.*, 1992), eating late in the night (Birketvedt *et al.*, 1999) and also being physically inactive for long period (French *et al.*, 2007). The data also showed that drivers who drive for 3 hours or less were at a decreased risk of becoming overweight than those who drive for 3 hours or more and this may probably be due to overeating on the trips when distance expands 3 hours. For instance drivers in the study who travel for long hours sometimes have places they stop for passengers to eat and they can be tempted to eat just by the sight of food even when they are not hungry. The data also provided interesting insight into the impact of the type of vehicle on weight status. Drivers of small buses were at decreased odds of becoming overweight independently and this could probably be due to the fact that the more passengers you carry the more income you have at the end of the day so the drivers may not have extra money to be overeating as compare to those with big buses or may be engaging themselves in other jobs in order to make ends meet which make use of more energy and hence prevent accumulation of fat but when other confounders were adjusted, the drivers were at increased risk of becoming overweight and this may be due to the influence of the confounders.

The type of alcohol taken and the amount taken have been shown to impact on health in this study the drivers reported taking alcohol and this was mostly spirits. Participants who drink alcohol were at increased risk of becoming overweight than those who don't drink alcohol independently or when adjusted for and this is due to the high caloric content of alcohol. This high calories can lead to overweight/obesity hence increasing the risk of CVDs. Also alcohol inhibits the breakdown of nutrients

into usable forms (Korsten, 1989) and impair absorption of nutrients (Feinman, 1989) thereby leaving the body deficient of certain nutrients and hence the onset of diseases such as liver damage (Leo *et al.*, 1992; Leo *et al.*, 1993) and alcoholic pancreatitis (Mezey *et al.*, 1988; Korsten *et al.*, 1992) among others.

High TC/HDL ratio gives a higher indication of risk of developing CVDs than the actual total cholesterol (NCEP, 2001).

Drivers within the age range of 41 – 45 years were at an increased risk of having high TC/HDL both independently and when adjusted for compare to those who are 46 years or more and this can be due to high intake of alcohol, high intake of dietary cholesterol (Weggemans *et al.*, 2001) among drivers within this age range compare to those who are 46 years or more and also the older drivers may be on medication due to an ill- health which may have the ability of reducing the total cholesterol. This indicates dyslipidemia and hence placing the drivers at an increase risk of developing CVDs. Those who were 40 years and less were at a decreased risk of having high TC/HDL compare to those who are 46 years and above can be attributed to high physical activity level among the young drivers.

Participants with normal or low percentage body fat were at decreased odds of having high TC/HDL less than those with very high percentage body fat independently or when adjusted for could probably be due the fact that normal percentage body fat corresponds to healthy level of all components of fat in the body. Independently drivers driving for less than 14 years were less likely to have high TC/HDL compare to those who have being driving for more than 21 years but upon adjusting these drivers were at an increased risk of having high TC/HDL and this can be due to other factors such as smoking which decreases the HDL content, physical inactivity (NCEP,

2001) among others. Participants with driving hours of 3 hours or less were at decreased odds to have high TC/HDL than those who drive for more than 3 hours independently or when adjusted for. This may be due the fact that drivers who drives for long hours tend to overeat hence becoming overweight and being physically inactive thereby reducing the HDL level (American Heart Association, 2013) and hence increasing their risk for CVDs. Drivers who use alcohol and/or smoke tobacco were at increase risk of having high TC/HDL than those who do not drink and/or smoke and this could probably be due to the caloric content of alcohol which can lead to excess weight gain which in tend reduces the HDL level and smoking also reduces HDL level (American Heart Association, 2013) and hence increasing the ratio. Snack foods were found to be associated with an increased risk of having high TC/HDL and this is probably due to high caloric content of these foods.

CHAPTER SIX

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

From this current study, the following conclusions are made based on the objectives set:

- Late night eating, skipping meal(s) and snacking were common among the drivers.
- High prevalence of overweight (36.5%) and high fasting blood sugar level (72.5%) was observed among the drivers.
- Intake of alcohol was high (45.9%) among the drivers but just a few did any smoking.
- Physical activity level was low among the drivers; 64.7% showed low physical activity level.
- The observed stress levels among the drivers were low.
- HDL level was low.
- The main determinants of CVDs among the drivers were found to be snacking, alcohol intake, low physical activity level, very high percentage body fat, low level of HDL and overweight.

6.2 Recommendations

Based on the present study the following recommendations for further research and policy are made:

- Further studies should be carried to assess the food eating patterns of drivers and the risk on CVDs;
- Stress of the drivers should be assessed by scientific means and not based on report given by the drivers since responses might not give a true reflection of their situation.
- Regular nutritional and health checks should be organize by the Ministry of Road and Transport and the Ministry of Health for the drivers.
- Drivers who are involved in accidents should be medically assessed for potential CVD risk factors.

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APPENDICES

APPENDIX I – CONSENT FORM

STUDY TITLE: Cardiovascular Diseases risk factors among Commercial Long Distance Bus Drivers in Cape Coast in the Central Region of Ghana.

PRINCIPAL INVESTIGATOR: Heckel Amoabeng Abban (Mrs)

ADDRESS: Department of Nutrition and Food Science, University of Ghana, Legon,
Accra.

GENERAL INFORMATION ABOUT RESEARCH

PURPOSE: The Ghana Road Safety Commission has been advising drivers on the possible ways of avoiding road accidents and one of the main sensitive issues has been “don’t drive when tired”. Tiredness is developed as a result of stress and other factors due to the nature of the profession. Stress and other factors lead to diseases such as Cardiovascular Diseases (CVDs) (diseases of the heart and blood vessels). This study tends to assess the risk factors of CVDs which the drivers are exposed to and then give out the possible measures to help control it. The data collection will last for two months.

If you accept to participate in this research study, your body measurements such as blood pressure, height and weight would be taken. You would be asked to observe an overnight fast and a small amount of blood would be taken from your thumb using sterile lancet and a capillary tube. Also you will be asked to provide certain information such as age, level of education and health status. None of this information will bear your name.

ELIGIBILITY: Before you participate you must be a registered commercial long distance driver with Cape Coast as your reference point.

POSSIBLE RISKS AND DISCOMFORT: The inconvenience you may experience is the time you would have to spend to complete the questionnaire; however research personnel would be there to assist you in the answering of the questions and hence reduce the time needed to complete the questionnaire. Also it is possible that answers to some of the questions will make you feel uncomfortable or will interfere with your privacy. The drawing of the blood may be slightly painful to you however a Phlebotomist would be assigned to do this work in order to reduce the pain as much as possible.

POSSIBLE BENEFITS: The outcome of this study will let you know your health status so far as CVDs are concerned. When we find anything unusual about your health such as high blood pressure, high levels of sugar in the blood etc we will inform you and then advise you to seek medical attention. The necessary dietary advice such as reducing your intake of fatty and salty foods, increasing your intake of fruits and vegetables as well as exercising regularly would also be given to you. In addition the outcome of the study would be made known to policy makers which will indirectly provide a driving force for policy makers to plan educational and health programmes for drivers to improve upon their nutrition and health and indirectly help curb road accidents.

CONFIDENTIALITY: Any information obtained from you would be kept strictly confidential. Your consent form would be kept separate from the data. The data would not be made available to anyone other than the researcher. The information may be

used in presentations and/or research papers. However, your name will never be used in any presentations, papers or reports.

COMPENSATION: You would be given a small face towel for your time and participation.

VOLUNTARY PARTICIPATION: Participation in this study is not compulsory. You are free to withdraw at any point in time if you so wish. You will not be penalized for deciding to quit the study and also you are not compelled to answer the entire questionnaire or to complete the interview. You are at liberty to decline to give your blood if you choose to.

QUESTIONS: Kindly take enough time to make a decision. All your questions about the study are always welcome. For further information concerning your participation in this study you can contact the Principal Investigator, Heckel Amoabeng Abban on 0244450327 or my supervisor Prof. Matilda Steiner- Asiedu on 0541260704.

YOUR RIGHT AS A PARTICIPANT: This research has been reviewed and approved by the institutional Review Board of Noguchi Memorial Institute for Medical Research (NMIMR-IRB). If you have any questions about your rights as a research participant you can contact the IRB Office between the hours of 8am-5pm through the landline 0302916438 or email address: nirb@noguchi.mimcom.org or HBaidoo@noguchi.mimcom.org

VOLUNTEER AGREEMENT: The above document describing the benefits, risks and procedures for the research on Cardiovascular Diseases risk factors among commercial long distance drivers in Cape Coast has been read and explained to me. I have been given the opportunity to ask any questions concerning my participation in

APPENDIX II - QUESTIONNAIRE**CARDIOVASCULAR DISEASE RISK FACTORS AMONG LONG
DISTANCE BUS DRIVERS**

QUESTIONNAIRE No:

DATE:

A. BIO-DATA

1. Age (Years):

i. 20- 29 [] **ii.** 30 – 39 [] **iii.** 40 – 49 [] **iv.** Others specify_____

2. Education level:

i. None [] **ii.** JHS/ MSLC [] **iii.** SHS [] **iv.** Others specify_____3. Gender: **i.** M [] **ii.** F []**LIVELIHOOD****DRIVING HISTORY**

4. When did you start driving commercial vehicles (Years)? _____

5. What was the route (distance) you travelled on when you started driving?

6. When did you start driving on your current route (Years)?_____

7. What type of vehicle do you drive now? (TICK)

i. Short Yutong [] **ii.** Long Yutong [] **iii.** Stanbic bus []**iv.** Sprinter bus [] **v.** Metro Transit bus [] **vi.** Hyundai []**vii.** Short Ford [] **viii.** Long Ford [] **ix.** Long bus (VIP) []**x.** Others (specify)_____

8. How far do you travel from Cape Coast? _____

9. What is the distance (km)? _____

10. How long have you been on this route (Years)? _____

11. What time do you leave Cape Coast? TICK ONE

i. Dawn [] **ii.** Morning [] **iii.** Afternoon [] **iv.** Evening []

12. How long does it take you to get to your destination (hrs)? _____

13. Do you make any routine stop(s) on the journey? **i.** YES [] **ii.** NO []

14. Explain your answers.

15. If yes to Q13

Is the stop point predetermined? **1. YES** [] **2. NO** []

How many times do you stop? _____

How much time do you spend at a stop (hrs)? _____

Identify the stop point(s) _____

16. What do you do when you make a stop? _____

17. What is the turn-around time back to Cape Coast? (Hrs/days) _____

18. Explain your answer to Q17. _____

19. How many trips (Cape Coast and return) do you make in a

Day _____ Week _____ Month _____ Others (Specify) _____

20. Describe what you do when you arrive at your destination?

21. On your return to Cape Coast describe what you do?

22. How much sleep do you have in a day (hrs)? TICK ONE

i. 4hours [] **ii.** 5hours [] **iii.** 6hours [] **iv.** 7hours [] **v.** 8hours []

vi Others (specify) _____

23. Explain your answer to Q22

STRESS LEVEL

24. Does your driving cause the following? (Multiple answers)

Never = 0 Sometimes = 1 Often = 2 Very often = 3

- i.** Irritation [] **ii.** Tiredness [] **iii.** Easily gets annoyed []
iv. Anxiety [] **v.** Worry [] **vi.** Lack of focus []
vii. Profuse sweating [] **viii.** Not eating well []
ix. Not hungry but keeps on eating [] **x.** Sleeplessness/Problem sleeping []
xi. Others (list) _____

25. What is it about the driving that is causing the above?

FOOD HABITS

26. What is your favourite food? _____

27. How often do you eat your favourite food? TICK ONE

- i.** Once a day [] **ii.** Twice a day [] **iii.** Thrice a day []

28. Do you eat on your trips? **i.** YES [] **ii.** NO []

29. Do you eat your favourite food on your trips? **i.** YES [] **ii.** NO []

30. If yes to Q29, how often? **i.** On all trips [] **ii.** Sometimes []

31. If no to Q29 what do you eat? _____

32. What is the typical food that you eat at your destination? _____

33. How many meals do you have in a day? _____

34. Do you eat fruits? **i.** YES [] **ii.** NO []

35. Explain your answer to Q34

36. If yes to Q34 what is your favourite fruit(s)? List only two. _____

37. How often do you eat your favourite fruit(s)?

In a day _____ In a week _____ In a month _____

38. Do you eat any fruit when you arrive at your destination? **i.** YES [] **ii.** NO []

39. Do you take snack? **i.** YES [] **ii.** NO []

40. Explain your answer to Q39

41. If yes to Q39 what do you snack on? (List as many as possible)

42. How often do you snack? State _____

LIFESTYLE PRACTICES

43. Do you take in alcohol? **i.** YES [] **ii.** NO []

44. If yes to Q43 what type of alcohol do you take (Multiple answers)

i. Spirit [] **ii.** Beer [] **iii.** Wine []

45. How often do you take alcohol? TICK ONE

i. Once a day [] **ii.** Once a week [] **iii.** Once a month [] **iv.** Others (specify)

46. How much do you take at a time? (Tot, glass, bottle, etc)

i. Spirit _____ **ii.** Beer _____ **iii.** Wine _____ **iv.** Others (specify) _____

47. Do you use tobacco? **i.** YES [] **ii.** NO []

48. If yes to Q47 do you smoke or chew tobacco?

i. Chew tobacco [] **ii.** Smoke tobacco []

49. Why do you use tobacco? _____

50. When do you use it? _____

51. How often do you use tobacco?

i. Everyday [] **ii.** Sometimes []

PHYSICAL ACTIVITY

52. What do you do when you are not driving? (Multiple answers)

i. Watch TV [] **ii.** Play in-door games [] **iii.** Visit friends []

iv. Visit station to socialise [] **v.** Exercise []

vi. Attend social functions (outdooring, marriage ceremony, funeral, etc) []

vii. Others (specify) _____

If no exercise go to Q56

53. If you exercise, describe the activity _____

54. How often do you exercise? How many times

i. In a day _____ ii. In a week _____ iii. In a month _____ iv. Other times (specify)

55. How much time do you spend on an exercise?

i. In a day _____ ii. In a week _____ iii. In a month _____ iv. Other times specify

MEDICAL HISTORY

56. Is there anybody in your family who has any of these diseases? i. Diabetes []

ii. High cholesterol [] iii. High blood pressure [] iv. Overweight []

i. Yes [] ii. No []

57. If yes please identify the member of the family.

i. Diabetes _____ ii. High cholesterol _____

iii. High blood pressure _____ iv. Over weight _____

58. Do you have any of the above diseases? i. YES [] ii. NO []

59. If yes to Q58 which one(s) List.

60. Do you suffer from these other ailments? (Multiple answers)

i. Body pain [] ii. Back pain [] iii. Waist pain []

iv. Headache [] v. Others (Specify) _____

BLOOD CHEMISTRY

61. Lipid profile

i. Low density lipoprotein level (mmol/L) _____

ii. Triglycerides level (mmol/L) _____

iii. High density lipoprotein level (mmol/L) _____

iv. Total cholesterol level (mmol/L) _____

v. Total cholesterol: High density lipoprotein _____

62. Blood pressure: Systolic BP (mmHg) i _____ ii _____ iii _____
Diastolic BP (mmHg) i _____ ii _____ iii _____
Pulse (/min) i _____ ii _____ iii _____
63. Fasting Blood Sugar (mg/dl) _____
64. Height (ft/m) i _____ ii. _____ iii. _____
65. Weight (lb/Kg): _____
66. BMI (Kg/m^2) _____
67. Percentage Body fat _____

THANK YOU

APPENDIX III

i. The BMI of the subjects was determined using the standard of WHO (1995):

Underweight : < 18.50

Normal weight: $18.5 - 24.99$

Overweight: ≥ 25.00

Obese class I: $30.00 - 34.99$

Obese class II: $35.00 - 39.99$

Obese class III: ≥ 40.00

ii. Percentage body fat of the subjects was determined using the standard according to Gallagher *et al.*, 2000:

Age	Low	Normal	High	Very High
20 – 39	< 8.0	$8.0 - 19.9$	$20.0 - 24.9$	≥ 25
40 – 59	< 11.0	$11.0 - 21.9$	$22.0 - 27.9$	≥ 28
60 – 79	< 13.0	$13.0 - 24.9$	$25.0 - 29.9$	≥ 30

APPENDIX IV

According to WHO-ISH (1999).

Systolic blood pressure : ≥ 140 mmHg – high

Diastolic blood pressure : ≥ 90 mmHg – high

APPENDIX V

Stress level

Stress Level of the subjects was estimated based on an adapted Stress Symptom questionnaire Scale by Allen Elkin (Dummies.com, 2012)

Your score	Comparative Rating
0 – 19	Lower than average
20 – 39	Average
40 – 49	moderately higher than average
50 and above	much higher than average

APPENDIX VI

i. The lipid profile of the subjects was determined based on reference values of ATP

III NCEP (2001):

Total cholesterol	: <5.18mmol/ L – desirable
	5.18mmol/L– 6.20mmol/L – borderline to high
	6.21mmol/L and above – high
High Density Lipoprotein (HDL)	: < 1.04mmol/L – low HDL (High risk for CHD)
	≥ 1.55mmol/L – High HDL (Low risk for CHD)
Triglycerides (TRIG)	: < 1.7mmol/L – normal
	1.70 – 2.25mmol/L – borderline high
	2.26 -5.64mmol/L – high
	≥ 5.65mmol/L – very high
Low Density Lipoprotein	: < 2.59mmol/L – optimal
	2.59 – 3.35mmol/L – near optimal
	3.36 – 4.12mmol/L – borderline high
	4.13 – 4.90mmol/L – high
	≥ 4.91mmol/L – very high

ii. Fasting blood glucose levels of the subjects were measured and the readings compared with the WHO, (1999).

Fasting blood sugar level	: 3.6 – 6.1 mmol/L – Normal
	> 6.1 mmol/L – High (diabetes)

APPENDIX VII

Stadiometer (model: HM200P Charder USA)

APPENDIX VIII

Omron Fat Loss Monitor with scale (HBF 400; Omron China)

APPENDIX IX



CardioChek PA Analyzer

APPENDIX X

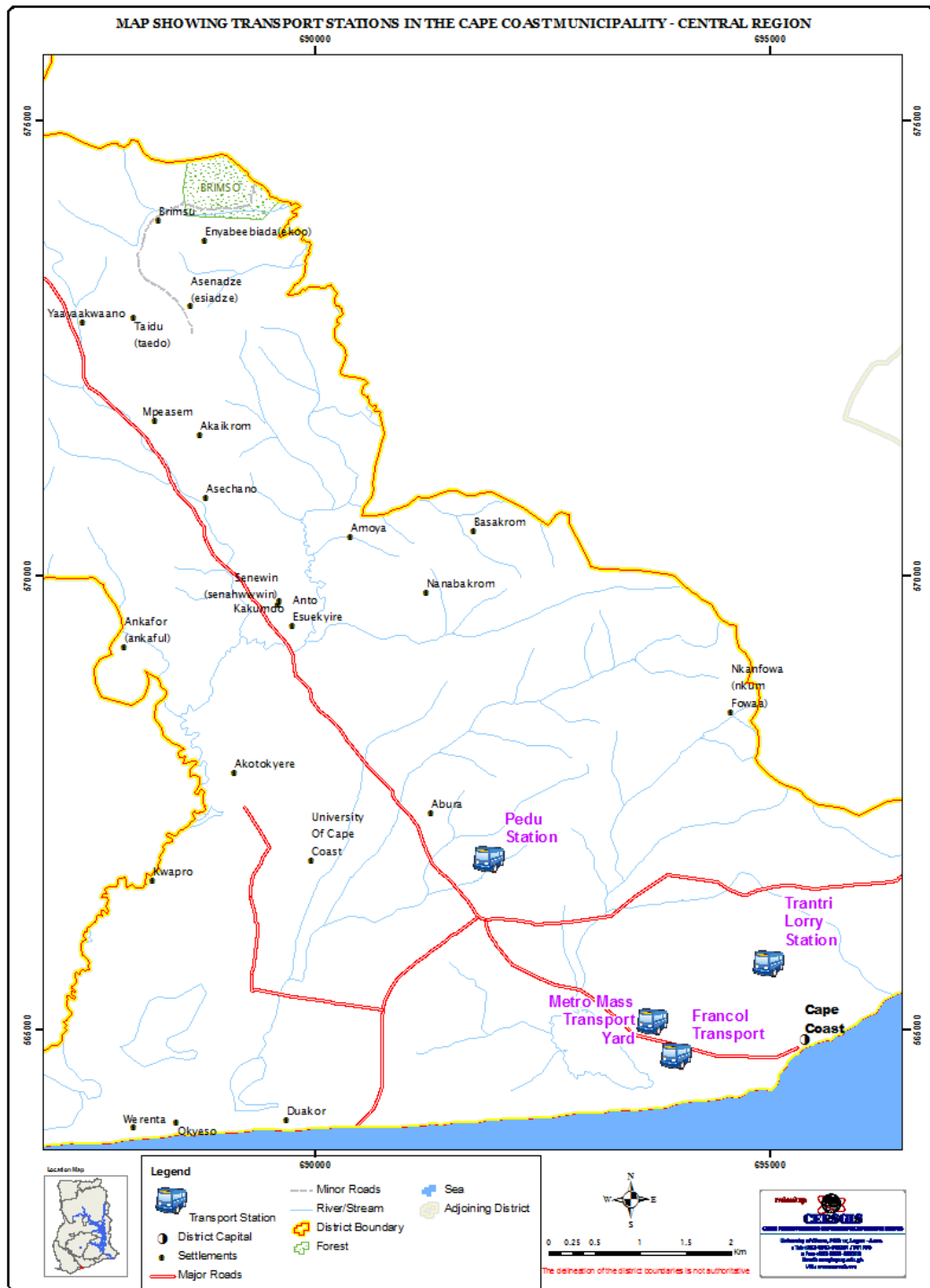


Glucose meter (Model HumaSens Human GmbH; Wiesbaden-Germany)

APPENDIX XI

A standardized digital Omron automatic blood pressure monitor (HEM – 172CN2; Omron, China)

APPENDIX XII



A map showing the study sites in Cape Coast in the central region of Ghana