EVALUATION OF OCCUPATIONAL HAZARDS AMONG TRICYCLE DRIVERS IN TARAUNI LOCAL GOVERNMENT AREA, KANO

BY

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MARCH, 2021

DECLARATION

I, hereby declare that this work is the product of my research efforts undertaken under the supervision of Malam Sharfaddeen Kamilu Ilah and has not been presented anywhere for the award of degree or certificate. All sources have been duly acknowledged**.**

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CERTIFICATION

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ABSTRACT

The increase in the rate of urbanization, population and industrial development has resulted in the increase in the number of tricycles in our cities. This will increase the risk of occupational diseases and hazards of the drivers due to constant exposure to noisy and pollutant gases as well as whole body vibration and stressful occupational condition over a long period of time which can lead to Musculoskeletal disorder among drivers. The aim of this study is to evaluate the occupational hazards of tricycle drivers in Tarauni local government area, Kano. by identifying the occupational hazards prevalence among tricycle drivers, establishing the major causes of hazards associated with tricycle driving, examining the implication of tricycle driving in the environment and assessing the level of awareness of occupational hazards among tricycle drivers. Cross sectional survey was employed and questionnaire was used to obtain information from 211 respondents selected through purposive and convenient non probability sampling technique. The data collected were analyzed using frequencies, percentages and cross tabulation. Graph and charts were used to present findings. Findings revealed that 67.1% of the respondents experienced back pain due to working for about 5 to 8 hours daily and earning ₦2000-4000 Naira. 97.2% of the respondents agreed that over speeding, over loading of luggage and passengers by both side of the driver which is frequently among tricycle drivers. 95.7% of the drivers are indifferent towards the tricycle smoke. It also revealed that 93.4% of the tricycle drivers were aware that high speed can cause occupational hazard. The research concludes that introduction of 4 stroke tricycle engines had reduced the incidence of pollution, the tricycle drivers were aware of their health status; the tricycle drivers have some level of knowledge and awareness which make them aware of road traffic regulation. The research recommends that provision of good road network by the government and regular monitoring of riders activities, also the government and association of tricycle drivers should make driving schools compulsory, provision of good healthcare facilities for tricycle drivers by the government and association, regular examination and medical checkup so as to know their health status, finally age restriction especially underage driving should abolished.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Auto-rickshaws or tricycles are a common means of public transportation in many developing countries. They are also known as three-wheelers, tempo, tuktuk, trishaw, auto, rickshaw, auto rick, bajaj, rick, tricycle, mototaxi and baby taxi. An Auto rickshaw is usually a three-wheeled cabin cycle and used as a vehicle for hire. It is a motorized version of the traditional pulled rickshaw or cycle rickshaw (Swapnil and Praveen, 2018). The tricycle are vehicles with petrol engine, and fuel capacity of 10.5 liters, also have passenger capacity of four people with adequate room for passenger's luggage and speed up to 80km per hour. They are suitable for intra-city commuting and commercial passenger carriage (Declan, 2012).

Auto rickshaw driving involves prolonged sitting in a polluted environment with noisy, dangerous pollutant gases, and whole-body vibration as well as harmful lifestyle like irregularity of meals, bad posture while driving and stressful occupational conditions and which over period of time may lead to occupational disorders (Mahadik et al., 2018).They are also exposed to significant amounts of air pollutants in their work like carbon monoxide, sulfur dioxide, diesel fuels with carcinogenic properties, etc., which can damage the respiratory tract leading to morbidity and mortality due to diseases like chronic obstructive pulmonary diseases, asthma, bronchi, headache, sore eyes, and ear problems (Tuchsen and Hannerz, 2000). Prolonged hours of work result in insufficient sleep, less time spent with family members and friends, insufficient leisure time, less physical activity, and less time for preparation of food (Christian, 2012).

Occupational safety and health is defined by the International Occupational Hygiene Association (IOHA) as the science of anticipation, recognition, evaluation and control of hazards of workplace that may endanger or threaten the employees health and well being, all along with considering the possible influences on the environment (WHO ,1995). Occupational safety and health is generally concerned with the total well being of the employees at work and besides physical safety and well-being, it embraces mental well being and psycho-social wellbeing (Amponsa-Taiwah, 2013). The economic, legal, and moral points of view, occupational safety and health have become a critical issue applied in the enterprises to help them remain profitable in the competitive global market (Leman, 2013).

Occupational hazard exists in different form including chemical, biological agent and adverse ergonomic conditions (Kalejaiye, 2013). It may lead to Occupational diseases/ disorder in the course of employment because the drivers have a higher prevalence of occupational disorders than other groups. Musculoskeletal disorders represent a serious public health problem, being one of the most important causes of disability and absenteeism in workers, as well as having various personal, social and economic impacts. Included among these musculoskeletal disorders are neck, shoulder, elbow, hand, waist, knee and muscle crapping, poor circulation of blood in the leg and buttock, lower back pain, neck, shoulder and knee pain (Umang, 2012).

Occupational health and safety is the concern of human wellbeing in this day, transportation service giving the sectors development, which result in workplace health problem. Workplace safety and health hazards nowadays considered as a driving force toward finding solutions on how to prevent the drivers from negative consequence. In recent years, the quality, health,

knowledge and safety requirements in many countries have been more stringent than was the case previously seen (Jilcha and Kitaw, 2016).

According to the World Health Organization stated that in a global level more than 1.3 million people are killed every year and 50 million sustain injuries as result of road traffic accidents, 90% of these take place in low income countries (70% in Africa), It is further reported by WHO (2008), that the world economy loses the sum of $1.4 billion daily as a result of road traffic accidents and individual national economies lose in average, between 1-3% of their Goss Domestic Products to road traffic accidents every year.

The statistics of occupational injuries are poorly documented in both developed and developing countries; especially in Sub-Saharan Africa countries appear to have the greatest rate of occupational injuries. Amongst the occupations contributing to these problems is tricycle driving (Shuvai et al., 2017). According to available literature, risk factors leading to injuries are present in every occupation and among all occupations with industrial, agricultural and transport workers having the highest risks (Umar and Ibrahim, 2015).

Urbanization is a reflection of population growth in the cities which allows an increasing proportion of the people to live in towns and cities. Since human activities are surrounded by mobility, the need for transportation in the cities cannot be overemphasized (Declan, 2012). According to Ajayi (2004), revealed that factors responsible for people in Nigeria preferring to live in cities as well as the reason for the numerical increase of cities and urban centres in Nigeria, includes; The continuous geopolitical restructuring of the country through creation of states and local governments in 1967, 1976, 1987, 1991and 1996, the industrialization process

between 1960 and 1975 and the categorization of settlements into hierarchical order of townships.

According to the International Herald Tribune (2008), the United Nations said that half of the world's population will live in urban areas by end of 2008. This is especially true of the developing countries such as Nigeria where there is little or no employment opportunities in the rural areas, and where everybody heads to the city for other advantages such as higher incomes, better healthcare, and security like better drinking water, electricity, good roads and housing. Hence, urbanization is closely linked to modernization, industrialization, and the sociological process of rationalization (Ankeri, 1986). As more and more people leave villages and farms to live in cities, urban growth results. This explains the need for massive investment and development in the transport sector. Consequently, the replacement of commercial motorcycles in our towns and cities with the tricycles goes a long way in addressing the problem of urban mobility created by urban population growth. At the same time, it assists in job creation for our teaming urban unemployed youths.

The rate of increase in urbanization, population and industrial development, has lead to increase in the demand of social, economic need by the peoples in different part of the world (Ipingbemi and Adebayo, 2016). This increases the risks of drivers because of pollution emitted in to the environment inform of air and noise which cause of occupational hazards of the drivers and others (Raghavendraswamy et al., 2012). Traffic air pollution is responsible for much of the ambient air pollution in cities, with exhaust emissions alone accounting for up to 30% of all particulate matter emitted in urban areas (Krzyzanowski et al., 2005). Commercial drivers of buses, cars, motorcycles and tricycle in urban areas are commonly exposed to ambient air pollution in the course of their work (Lawin et al., 2018).

In developing world, especially Indian and Philippines Tricycles are considered major sources of air and noise pollutions in cities. Almost all of these have two stroke engines emitting fine particulate matter, which poses a danger to public health in the form of premature mortality, respiratory symptoms, exacerbation of asthma, and changes in lung function (Dorado et al., 2015). The introduction of electric tricycle in the early part of 2012 as a technique of improving air quality by reducing emissions locally with a view to achieving a sustainable transportation for urban mobility has promote healthy environment (Adetunji, 2017).

Occupational health and safety practice is still at infancy in most indigenous organizations in Nigeria. There is a limited literature in the area of occupational risks and hazards among tricycle drivers in Nigeria and also limited studies among tricycle drivers in the northern part of Nigeria (Umar & Ibrahim, 2015).

Tricycle in Lagos was called Keke NAPEP or Keke Marwa as it was introduced by one time Lagos State Military Administrator General Buba Marwa, as Poverty Alleviation Progamme or Strategy for job creation particularly for unemployed youths in 2001 and this has made the name of the mode acceptable to members of the public (Ipingbemi and Adebayo, 2016). The use of electric tricycle for urban transportation has not been introduced in the country because appropriate machinery has not been put in place which results in tricycle operators to power their engine with gasoline (Adetunji, 2017).

Kano as one of the most populous state in Nigeria has today become notorious for its high number of commercial tricycle. Commercial tricycle operation can be defined in this context as a mode of transport using tricycle categorized into three types thus, a tricycle owned by their operators, those on lease and those that pay determined amount on daily, weekly or monthly

basis. The deepening poverty in Nigeria is one of the factors responsible for the continued migration of youth to Kano metropolis where they operate mainly as commercial tricycle drivers with so much risk to themselves and the society (Muhammad, 2017).

1.2 Statement of Research Problem

The continuing rapid urbanization trend in many developing countries and to some extent in developed nations has been accompanied by phenomenal increase in demand for different modes of transport services and associated infrastructural facilities (Muhammad, 2017). The increase in population, urbanization and industrial development in the developing countries, has lead to increase in demand for public transport (Ipingbemi and Adebayo, 2016). This has resulted to occupational hazard particularly accident resulting in injuries and even death in severe cases to the tricycle drivers, passengers and pedestrian.

According to the World Health Organization (WHO, 2008), globally more than 1.3 million people are killed every year and 50 million sustain injuries as result of road traffic accidents, 90% of these take place in low income countries (70% in Africa), It is further reported by WHO (2008), that the world economy loses the sum of $1.4 billion daily as a result of road traffic accidents and individual national economies lose in average, between 1-3% of their Goss Domestic Products to road traffic accidents every year (Bayero, 2016).

Driving a passenger is rather a sensitive and stressful job, which is characterized by a considerable number of such harmful factors as: weather conditions; increasing density, intensity, velocity of the traffic flows; possible traffic jams; ignorance of the transportation schedules; non standardized working days; complex routes, and so on (Cunningham, 2016). Their effect results in the drivers' occupational diseases. The most frequent of them are as

follows: diseases related to the development of a cardiovascular pathology, neuropsychic disorders, gastrointestinal disturbances, diseases related to the problems with the musculoskeletal system mobility, disorders stipulated by the sedentary lifestyle and dysmetabolism, as well as allergic and oncologic diseases. The drivers are also affected by the harmful sanitary and hygienic factors: noise, vibration, increased temperature, harmful admixtures in the bus cabin, and nervous tension (Czerwnska et al., 2016 and Poó et al., 2018). Under the certain conditions, they may result in the serious changes in a human organism (Damijan and Uhrynski, 2010; Frank et al., 2016). Thus, the analysis of the scientific studies makes it possible to specify three potential consequences of that effect negative emotion, deterioration of the physical and psychical state of a human health (AFLCIO/CLC, 2019 and Rowden et al., 2011). As a result, there may be different cardiovascular pathologies, neuropsychic disorders (Netterstrøm and Juel, 1988; Price, 2003), problems with the sense of hearing (Bhupen et al., 2016), feeling of constant fatigue, carbon monoxide poisoning, and development of allergic and oncologic diseases (Rowden, 2011, and Lee et al.,2017).

The study of Ashish et al., (2011), stated that road traffic related injuries are one of the prominent killers all over the world. Hence, road traffic injuries must be considered as a global health epidemic and effective counter measures are required to tackle this pandemic. Also, according to the WHO report on road safety, India tops the list of countries in the world, in terms of the number of road traffic deaths. Road traffic in India is extremely heterogeneous in nature, consisting of pedestrians, bullock carts, bicycles, rickshaws, motorized two-wheelers, cars, buses, trucks, etc. Due to lack of segregation, the same road space is used by motorized as well as non-motorized traffic, thus creating unsafe conditions for the road users to especially vulnerable road users such as pedestrians, cyclists and motorcyclist. However, the problems

suffered by the bus drivers and conductors may be attributed to the nature of work they are exposed to and the associated life-style which is an outcome of their occupation. However, their exposure to the environment with air and noise pollution, posture and position of their working condition, irregular food habits and other habits like smoking' etc. arise out of the occupation. A continuous stress and problems related to hysterical and inappropriate traffic regulations and management puts them to further risks of fatigue and tension. This deterioration is largely the result of traffic congestion and its associated air and noise pollution but also with the pressures of maintaining a demanding schedule in circumstances that make that task almost impossible (Bhatt and Seema, 2012).

Ravindra, (2011), studied the data of pollution released by the auto rickshaw and also he carried out the health problem of auto rickshaw drivers. He has found out that, almost 40% decrease in air pollution on auto-rickshaw strike day in Bangalore in main areas. On the other side the auto-rickshaw drivers face a lot of health problems than the normal public. The study was carried out in 31 auto rickshaw drivers of Delhi to determine the respiratory morbidity due to air pollution. The auto rickshaw drivers are directly exposed to the air pollutants being discharged from automobile exhaust. The main symptoms observed were cough (77 percent), eye irritation (80 percent), breathlessness (54 percent), throat irritation (25 percent), headache (6 percent) and passage of black sputum in the morning (22 percent). 6(19 percent) drivers showed normal Pulmonary Function Test (PFT). 25 (80 percent) showed mild moderate-severe obstruction, of which 12 (48 percent) were non-smokers and 13 (52 percent) were smokers. The severity of obstruction was higher in the smokers. It is therefore concluded that auto rickshaw drivers have a high respiratory morbidity due to the exposure of pollution.

In Nigeria, it was introduced as a mode of transport about two decades ago; some years later, it was popularized to cushion the effect of ban on commercial two-wheeled motorcycles from urban roads (especially in capital territories and major cities e.g Kano) on the account of high prevalence of road traffic injuries and metropolitan security concerns associated with the latter (Idialu, 2018 and Babatunde, 2014). Tricycle was use for commercial passenger service, and has brought about different opinions from both government and individual level regarding its operation. Some state government today claim that the best thing that has happened to the transport system is the introduction of tricycle (Declan, 2018). At individual level; some people say that they prefer tricycle to the conventional taxi, whereas others see it as a monster on the road because of the problem pose to the individual. Another school of thought sees it as not befitting of a modern society (Declan, 2018). The development also resulted in metamorphosis of two-wheeled motorcycle drivers (known for recklessness and hazardous driving on the road) into auto tricycle drivers without proper training and orientation (Idialu, 2018). Also from the work of Omoke et al., (2019) findings from biomechanical studies indicated that auto tricycle has limited crashworthiness, and at crash speed as low as 30 km hr, the occupants are at risk of severe injuries.

Industrial revolution, transport system included, has led to global problem of air pollution. The problem poses adverse effects on industrialized areas of the world and urban centers including Port Harcourt metropolis, located in the southern part of Nigeria, therefore assessments of air quality studies in Nigeria have majorly focused on urban centers, industrial processes, traffic congestion and domestic activities usually part of everyday life, constitute major sources of air pollution (Fagbeja et al., 2008; Robert, 2015). Research conducted by (Odunlami et al., 2018) reported that Air pollution is associated with increasing cases of

many adverse health and environmental effects, e.g. mortality, respiratory diseases, global warming, cancer. Aside of the widely known, drastic and documented effect on human health, the high concentration of these gaseous emissions can lead to stunted growth of plants, haze, damage to buildings, etc. A research conducted by Ayodele (2012), revealed that general experience of low back and upper back pain, and other explainable musculoskeletal stress occurs at wrist pain, buttock right feet and neck of driver. The level of discomfort is more pronounced among long distance business drivers. However it is clear that direct involvement of taxicab operators in the design considerations and modification of in-vehicle component may enhance ergonomic advantages. it can be concluded that, among Commercial tricycle drivers (CTDs), musculoskeletal pain reflects in the acute period as hip/thighs/buttocks pains while in the chronic period it presents mostly as ankle pain. The Musculoskeletal Performance (MSP) affects the performance of commercial tricycle drivers in terms of duration of work, the longer the duration the more the risk of musculoskeletal pain (Muhammad et al., 2016).

However, most of the studies carried out by these scholars focused mainly on the road traffic, musculoskeletal disorder, pollution and health problem associated with tricycles and vehicles. Thus information on occupational hazards associated with tricycles driving for in Nigerian cities is very scanty. This is due to the fact that tricycles are relatively new, thus little is written about the nature, use and operation of tricycles as a mode of public transport. Therefore; Tarauni local government area was chosen as study area of this research of the fact that the study area was among Kano metropolis with high population density for the use of tricycles as a public transport which will exposed them to various kind of occupational hazards. As a result of this; the research will focus on evaluation of occupational hazards among tricycle drivers in Tarauni Local Government Area, Kano State. However; from the basis of the study, it is hopeful that

findings and suggestion from the study will enable the drivers to become aware of the occupational health hazard associated with tricycle drivers

1.3 Research Questions

i. What are the occupational hazards prevalent among the tricycle drivers in the study area?
ii. What are the major causes of hazards associated with tricycle in the study area?
iii. What are the implications of tricycle driving on the environment?
iv. What is the level of awareness of occupational hazards among the tricycle drivers in the study area?

1.4 Aim and Objectives

The aim of this study is to evaluate the occupational hazards among tricycle drivers in Tarauni Local Government Area.

The specific objectives are to:

1. Assess the occupational hazards prevalence among the tricycle drivers in the study area.
2. Examine the major causes of hazards associated with tricycle driving in the study area.
3. Examine the effect of tricycle driving on the environment.
4. Assess the awareness of occupational hazards among the tricycle drivers.

1.5 Significance of the Study

This research evaluates the occupational hazards prevalent among tricycle drivers is of great importance in enlightening and educating the tricycle drivers on the potential hazards they are exposed to, by making the causes of such hazards known to them. Government should provide and improve the existing facilities and road network in the study area thereby decreasing hazards. It also serves as an important information and recommendation for policy makers, and

management strategy, devices of curbing hazards among drivers. The study also enlightens the populace to maintain occupational safety and healthy life style to prevent any re-occurrence of occupational hazards/risks among the drivers and their by stimulate more research as well as source of reference in the area of occupational hazards. This is with a view of providing recommendation that would enhance compliance with the traffic rules and safety driving.

1.6 Scope

The scope of this study is limited to evaluate occupational hazards associated with tricycle drivers Tarauni local government area in year 2019 with a view of identifying and assessing their awareness of occupational hazards among the tricycle drivers in the study area. The study area encompasses Tarauni, Gyadi-Gyadi, Darmanawa, Daurawa, Babban Giji, Hotoro, Unguwa Uku, and Unguwar Gano which are all within Tarauni Local Government Area.

1.7 The Study Area

1.7.1 Location

Tarauni is one of the 44 Local Government Areas in Kano State, Nigeria. Its head quarter is in the locality of Unguwa Uku within the City of Kano and has 10 political wards. The study area lies within the Latitude $11^{o}57'00''N$ and $12^{o}02'00''N$ and Longitude $08^{o}33'00''E$ and $08^{o}36'00''E$ and has a total land area of $28km^2$ (Mahmud, 2014). Tarauni Local Government Area is bordered at the north by Nasarawa Local Government, at the east and south by Kumbotso Local Government and west by Municipal Local Government as shown in Figure 1.1

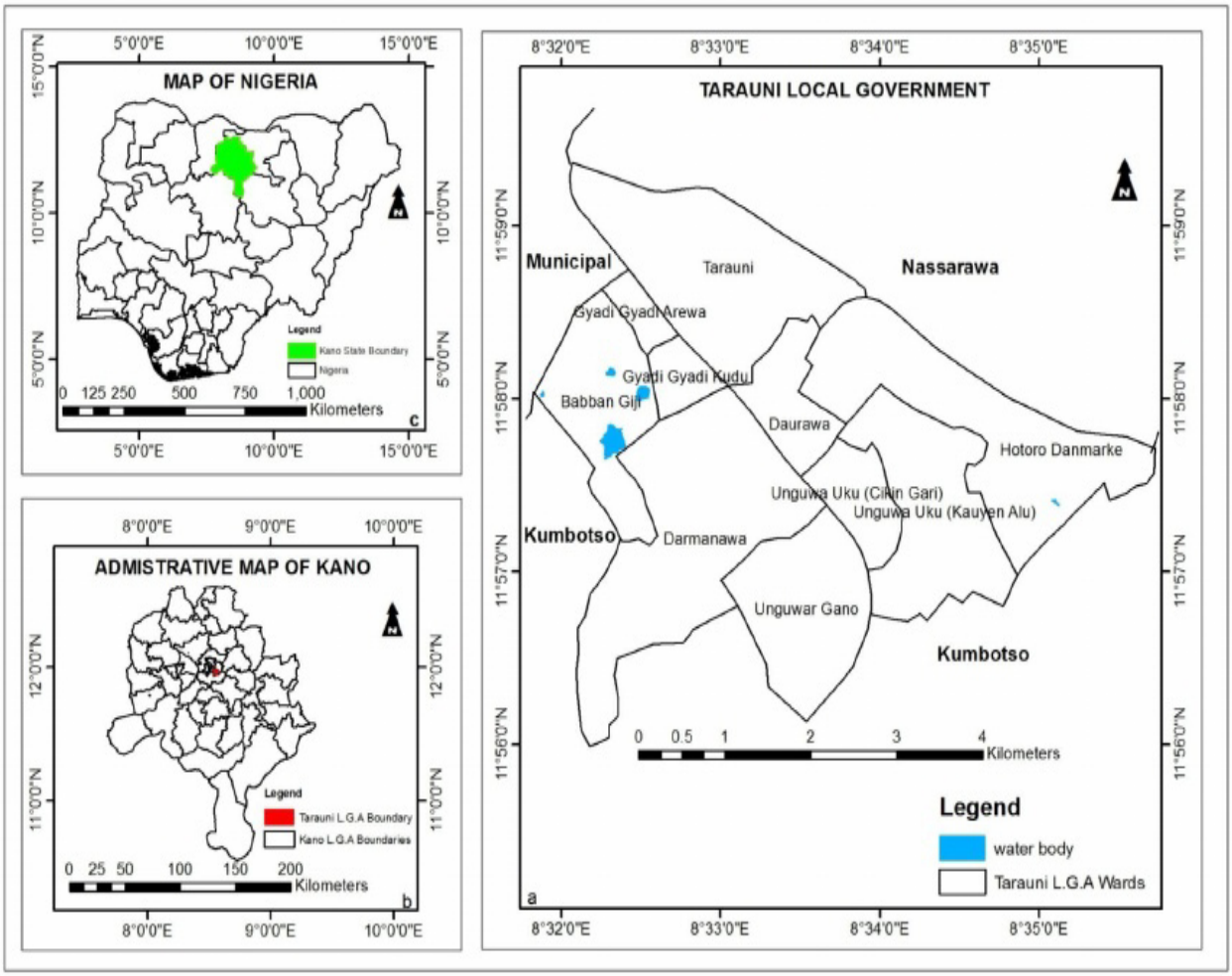

Figure 1.1 Tarauni local government area, Kano

Source: Cartography laboratory, Bayero University, Kano (2015).

1.7.2 Geology

The geology of the study area falls within the basement complex rocks, these rocks are of Precambrian origin and consist of metamorphic and igneous rocks. Common among the rocks are granite of different description such as gneisses, philites, magmites etc. these rocks is affected by weathering process and other denudation activities to produce clay-rich regolith. The regolith was subjected to a wide spread of lateralization during the fluvial period of the past. There are also extensive sedimentary rocks of cretaceous age forming sand plains (Olofin, 2014).

1.7.3 Landforms

The landforms in the study area consist of little granitic and few lateritic outcrops as observed in some part of Challawa. The area is relatively plains; these plain are believed to be initial pediplains which are now almost covered by wind drift materials from the north. There is a presence of alluvial channel complexes consisting of both old and current flats (Olofin, 2014).

1.7.4 Drainage and River System

The study area is drained by rivers including Challawa which is located in part of Southern Katsina and Kaduna states. The river has length of 121km and flows through five local government areas of Karaye, Gwarzo, Rogo, Kabo and Madobi, in the southwestern part of Kano state. The main river is dammed at Challawa Gorge Dam where water is discharged periodically for irrigation and domestic uses. The drainage pattern of the river/stream is dendritic, with stream coming from different directions to merge into Challawa. The headstreams discharge their water into the reservoirs seasonally, while water from the dam is discharge all year to maintain a particular water level especially during the dry season (Adamu 2014), other river includes Kano River and Jakara River.

1.7.5 Climate

The climate of the study area is the tropical dry-and-wet type, classified by Koppen's as Aw. The movement of the Inter-Tropical Discontinuity (ITD) gives rise to two seasons (wet and dry seasons). The wet season lasts from May to mid-October with a peak in August while the dry season extends from mid-October of one calendar-year to mid-May of the next (Abaje et al., 2014). Rainfall is generally scanty in the area; it is usually falls in 90-120 days. There are only four real wet months (June-September) which have substantial rainfall. Almost 40% of the annual rainfall comes in August, which is the peak of wet season (Olofin and Tanko, 2002 and Ahmed, 2007). The annual rainfall around the metropolis is about 800mm.

1.7.6 Vegetation

The area lies in the Sudan Savannah vegetation of northern Nigeria. The typical vegetation of the study area is characterized by a numerous of grasses with scattered trees, the trees are relatively short, with many tall kinds of grasses. The dominant trees in the area are Neem tree, Acacia albida, Adansonia digitata (Baobab), Tamarindus and Azadirachata indica (Neem Tree). The nature of the vegetation is to a considerable extent controlled by climate, soil and topography which are principal factors for agriculture potential as well as fertility level of the soil, positively or negatively (Olofin, 2014).

1.7.7 Population and Economic Activities

The population in the study area according to National Population Commission (N.P.C) (2006) is about 221,844 people. The population was projected to have increased to over 308,600 as at 2016 (National Bureau of Statistic, 2016). Tarauni is an urban area and the dominant economic activities are trading and administrative. Commercial activities such as trading are dominant along the road side.

1.7.8 Transportation

Infrastructural facilities especially road network is among the basic indexes of measuring the quality of urban wellbeing. Generally, road network forms the most basic level of transport infrastructure within urban areas, and link with all other areas, both within and beyond the boundaries of the urban area. It therefore facilitates social interaction through easy movement of people (Ibrahim, 2016).

Roads in Kano are classified into three grades based on their importance as trunks A, B and C (CBN 2002, FMT 2008). Trunk A road are federal roads which link major parts of the country by connecting the main urban centers such as state capitals, major centers of economics activities and the border crossing to neighboring countries. This class of road is constructed, maintained and financed by the federal government through the federal ministry of works and federal road maintenances agency.

Trunk B roads are the secondary category of main road in Nigeria. They link the major towns within states capitals. These roads are financed by the state governments. They also surfaced road with the primary objective of enhancing socio-economic development of the states.

Trunck C roads, the third category of roads in Nigeria, are local feeder roads constructed and maintained by the work department of local government authorities. Usually un-tarred and seasonal in nature, the roads link communities in the remote parts of each local government area (Atubi, 2000).

Kano is the hub for access to other cities and states in the Northern Nigeria. It is also a gateway to neighboring Niger and Chad Republics as well as other West African countries such as Mali, Burkina Faso and Cameroon. Kano receives approximately one million visitors

every day, and about 90% of the visitors came for business trips i.e. to buy and export goods to their places of origin (KSEDS). Such items of trade include textile materials, leather works (like shoes, Carpets, cushions etc), plastics, grains, essential commodities and so on. The major reason that attracted people to Kano to buy these goods was due to their relative cheapness which accrued huge profit. However, even if one agrees that Kano's reputation is based on its cheap commodities, one is still obliged to look for a fundamental reason which enables her to excel in the sale of cheap trade items, and the most important single answer to this valuable question is its location and `efficient transport system. Thus, it is important to argue that the cheapness of these commodities in Kano is attributed to the cheapness of transport fares due to availability of access roads and different modes of transport services which lessen the cost of production and distribution of goods. Transportation is a critical factor for economic growth and development. It is a wealth creating industry on its own. Consequently, there is a large and growing transport market for goods, fuel and services in Kano. This adds up to a many different economic activities providing employment and market for drivers, mechanics, electricians, vulcanizers, panel beaters, spare parts and tyre dealers, commission agents, insurers and hundreds of thousands of other beneficiaries such as food vendors (Fabian 2000). In addition to that there were many informal roadside petrol dealers (*Yan Cuwa-cuwa* or *Yan Bunburutu*) and engine oil sellers. There are also mechanic workshops with different specialisation located in different parts of study area. Some specialized in repairs of automobiles, some motorcycles, while others tricycles and bicycles. The development of different modes of intra-city transport services has contributed to the growth of business in places such as, Unguwa Uku Tarauni market, Gyadi-Gyadi roundabout and so on. The rapid population growth in the study area had led to a continued demand for effective passenger transport services (Yusuf, 2015).

CHAPTER TWO

THEORETICAL FRAME WORK, CONCEPTUAL FRAME WORK AND LITERATURE REVIEW

2.1 Introduction

The chapter present the literature review carried out to identify the existing state of knowledge explore by researchers, experts and professionals in relation to the research problem. The review provides theoretical framework, conceptual framework and literature review regarding the research problem at hand used in carrying out research in the study area.

2.2 Theoretical Framework

The most popular theories of accident causation are the Domino theory, the human factors theory, the accident/incident theory, the epidemiological theory.

2.2.1 Domino Theory of Accident Causation

Heinrich (1931) proposed that accident occurs in a chain of events after conducting studies on statistical accident analysis. Heinrich elaborated that the individual fault can be related to other factors in sequence, just like a domino. There are five dominoes according to this theory. Heinrich explains that undesirable personality traits can be passed along through inheritance or develop from person's social environment and both inheritance and environment contribute to faults of a person. This can be considered as the first domino. The second domino deals with worker personality traits. Heinrich explains that inborn or obtained character flaws contribute to accident causation. According to Heinrich, natural or environmental flaws in the worker's family or life cause these secondary personal defects, which are themselves contributors to unsafe acts or the existence of hazardous conditions. The third domino is the direct cause of incidents-the unsafe act. Heinrich defines four reasons why people commit dangerous acts: (i) improper

attitude, (ii) lack of knowledge or skill, (iii) physical unsuitability and (iv) improper mechanical or physical environment. Heinrich later subdivides these categories into ’direct’ and ’underlying’ causes and concludes that combination of multiple causes creates a systematic chain of events that leads to the accident. The fourth domino is accidents deals with "The occurrence of a preventable injury is the natural culmination of a series of events or circumstances which invariably occur in a fixed and logical order." He defines accidents as, "events such as falls of persons, striking of persons by flying objects are typical accidents that cause injury." The fifth domino was injury which results from accidents and some types of injuries Heinrich specifies in his "Explanation of Factors" are cuts and broken bones. (The goal of domino theory is to establish a linear cause-effect relationship among various social and individual factors using five metaphoric dominoes (Zobair and Hasegawa 2017 cited in Heinrich 1931).

2.2.1.1 Bird’s Modified Domino Theory Model

Many researchers felt that Heinrich’s theory attributed too much cause to factors internal to workers and neglected the importance of external factors. Around 1970, Frank E. Bird, a researcher with the International Loss Control Institute, revised Heinrich’s domino theory (Bird and O’Shell 1973). Bird’s model was a simple revision, but it was an important insight, because it introduced the thought of managerial error into the accident causation sequence. Bird’s modified domino theory is not as widely accepted by construction managers as Heinrich’s model, probably because Heinrich’s model lets them "off the hook". Blaming workers is easier and less costly than training workers, changing how an operation is performed, or making environmental modifications. Ironically, although Heinrich seemed to emphasize the fault of the worker, a careful study of his writings leaves the reader with the impression that the notion has been over-emphasized. Bird’s revised domino theory is:

a. Injuries are caused by accidents.
b. For every accident there are immediate causes that are related to operational errors.
c. Operational errors are only symptoms of deeper underlying or basic causes related to management errors.
d. The absence of a system of effective control permits the existence of the factors referred to as basic causes.

2.2.1.2 Criticism

The domino model is widely seen today as being too simplistic to be a useful tool to help understand the causal factors of accidents:

i. It leads to an excessively simple view of contributors of human performance to accidents, and to a focus on training and procedural compliance (including "behavior-based safety" programmes), rather than on system design, work load and incentives.
ii. It adopts a purely linear and mechanical model of causality which is inappropriate in complex system where accidents are generally caused by many interacting, partially competing and unpredictable factors.

2.2.2 Human Factors Theory of Accident Causation

The Human factors theory of accident causation is when a worker is distracted by factors that are either internal or external. The distracting factors influences are temporary and not permanent. Therefore, if care is taken to eliminate the distracting factors, there is a possibility of preventing accidents. The human factors theory of accident causation consists of three broad factors that lead to human error as presented in figure (2.1)

a. **Overload:** The work task is beyond the capability of the worker

i. Includes physical and psychological factors

ii. Influenced by environmental factors, internal factors, and situational factors

b. **Inappropriate response**

i. To hazards and safety measures (worker's fault)

ii. To incompatible work station (management, environment faults)

c. Inappropriate activities.

i. Lack of training and misjudgment of risk

Human Factors Theory of Accident Causation

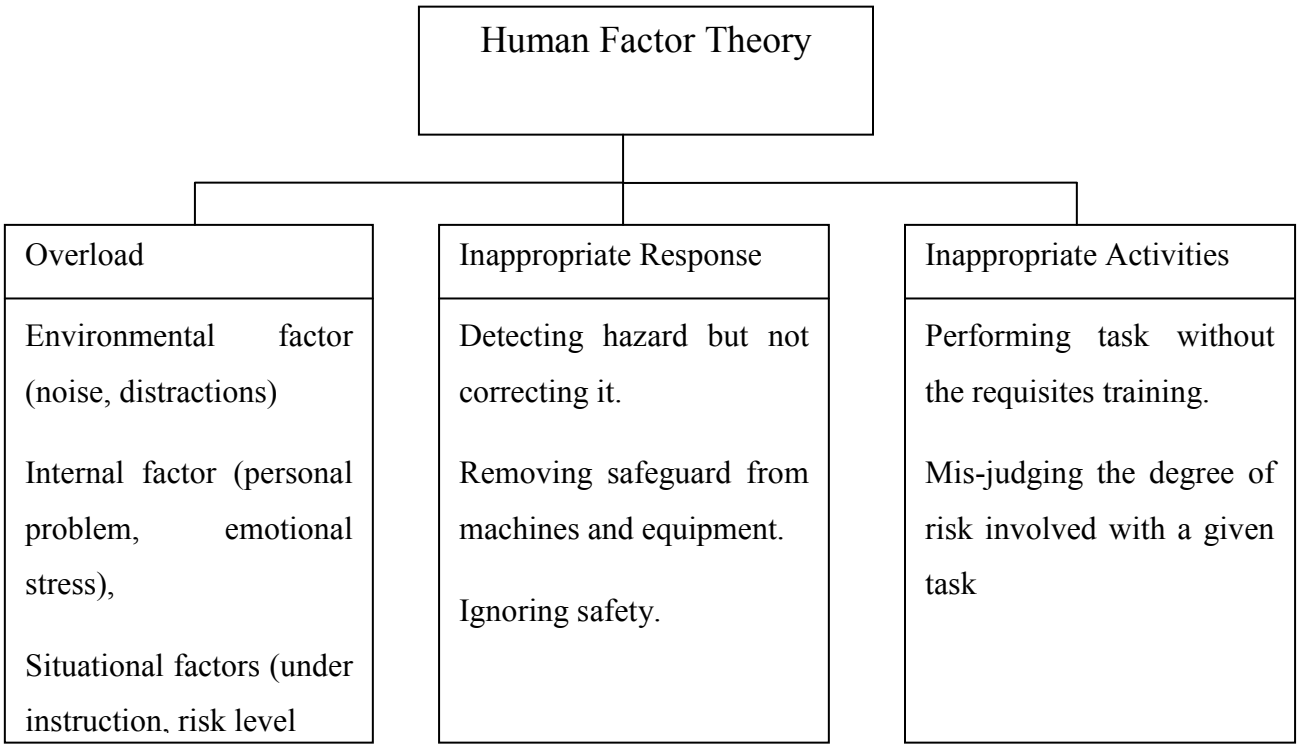

Figure 2.1 Source: Culled from Moliero, 2008

2.2.3 Accident/Incident Theory of Accident Causation

The accident/incident model of accident causation suggests that human error normally arises from three multidimensional factors of overload, ergonomic traps and a decision to err. These factors lead to an accident under the Accident/incident model as shown in figure (2.2)

Accident Model

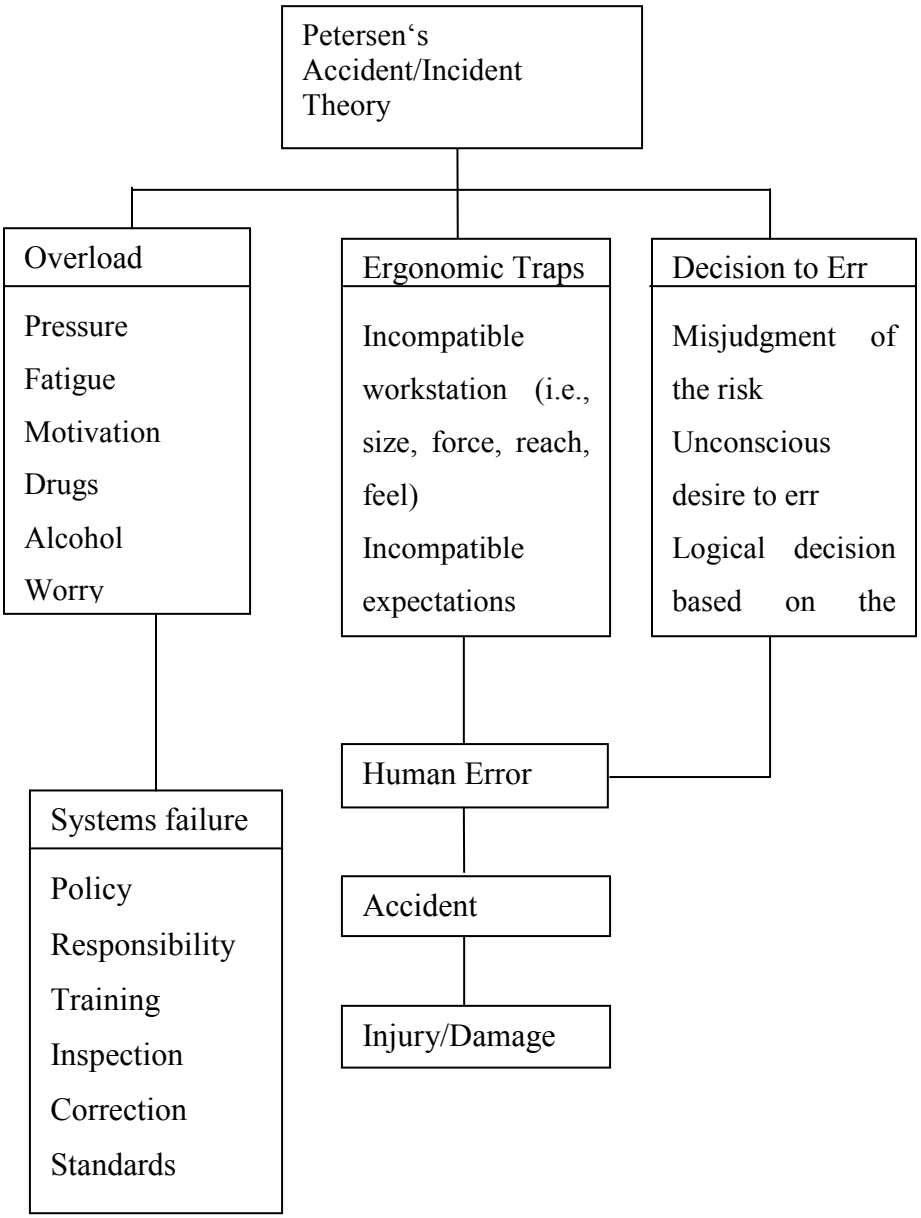

Figure 2.2 Source: Culled from Moliero, 2008

The model postulates that even as a person interacts with a machine within an environment, three activities take place between the system and the tasks to be executed. Each time a task is performed, risk exists that accident may occur. Sometimes the risks are great and at other times the risk are small. Strasser et al., (1981) homeostasis or equilibrium remains one of the basic concepts of system theory of accident causation. A system is stable when it runs according to its design, but when it is exposed to extraneous disturbances, it develops a built in mechanism to restore its balance, as if a pedestrian being pushed by a vehicle or a car and its driver skidding off the road.

2.2.4 Epidemiological Model

One of the distinct theoretical areas of research on road traffic accidents is built around the concept of the epidemiological model. Dart and Mackenzie (1981) and Badejo (2011) the epidemiological model originated from medical research, where it is a study of causal relationships between environmental factors and disease. This was later widely used in the analysis of non-disease injury and fatality due to road traffic accident. It was premised on three variables of the host, the agent and the environment as shown in figure (2.3)

Epidemiological model of road traffic accident

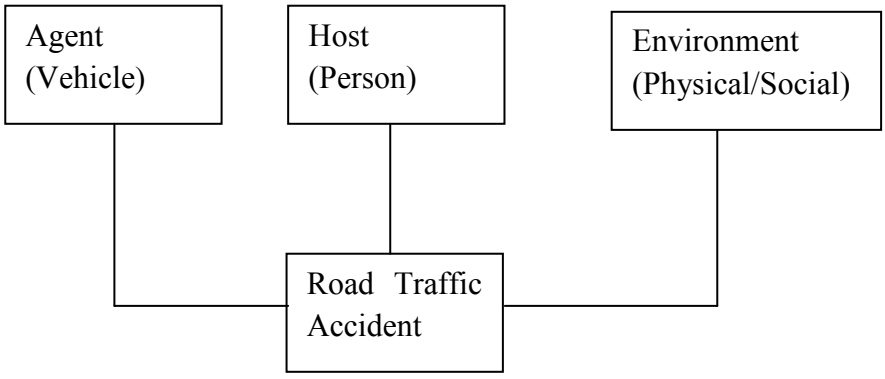

Figure 2.3 Source: Culled from Schram, 1970

Under this model, the host is the person, the agent is the vehicle, and the environment is the physical and social factors. It is the interactions that take place between these variables that result in an accident

Drawing from the work of Badejo (2011), road traffic accident phases are captured at three levels of occurrence, these are;

The pre-crash phase: This is also called the accident avoidance stage, and it is made up of all accident causation factors of the vehicle, environment, road users and all measures taken to prevent the accident from happening.

The crash phase: This is the accident‘s occurrence stage and is known as the injury prevention stage. The outcome of the accident and the circumstances of its occurrence in terms of time and location are included in this phase.

The post-crash phase: At this phase, accidents consequences are assessed and evaluated to achieve severity reduction. It involves saving lives and reducing the number going to hospital and prevention of disabilities. Nigeria is in this stage in its accident management level, as efforts are largely concentrated in managing accidents rather than actual prevention due to failure to enforce traffic rules and regulations.

Table 1 The Haddon Matrix Table

Phase		Factor		
		Human	Vehicle and equipment	Environment
Pre cash	Crash prevention	Information Attitudes Impairment Police enforcement	Roadworthiness Lighting Braking Handling Speed management	Road design and layout Speed limits Pedestrian facilities
Crash	Injury prevention during crash	Use of restraints Impairment	Occupant restraints Other safety devices Crash-Protective design	Crash-protective roadside objects
Post-crash	Life sustaining	First-aid skills Access to medics	Ease of access Fire risk	Rescue facilities Congestion

Source: World report on Road Traffic Injury Prevention, 2004

Table 2.1 shows The Haddon Matrix as an illustration of the interactions of the three factors of human, vehicle/equipment and the environment at the three phases of accident occurrence. The essence of these interactions is to help reduce exposure to risk, prevent the accident from happening, reduce severity and injury if the accident happens and then reduce its consequences should it happen. This model is generally applied in order to conceptualize etiologic factors for road traffic accident injury and have the capacity to forecast potential preventive strategies for result oriented safety intervention measures (Sadaukas, 2003).

2.3 Definition of Terms

2.3.1 Occupational Hazard

Occupational hazards are hazard experienced in the workplace. Occupational hazard as a term signifies both long-term and short-term risks associated with the workplace environment and is a field of study within occupational safety and health and public health (Ramos et al, 2018). Short

term risks may include physical injury, while long-term risks may be increased risk of developing cancer or heart disease (Kardous et al, 2016).

2.3.2 Occupational Health and Safety

According to WHO (1995) occupational safety and health can be defined as a multidisciplinary activity aiming at:

i. Protection and promotion of the health of workers by eliminating occupational factors and conditions hazardous to health and safety at work.
ii. Enhancement of physical, mental and social well-being of workers and support for the development and maintenance of their working capacity, as well as professional and social development at work
iii. Development and promotion of sustainable work environments and work organizations.

2.3.3 Occupational Health

The ILO/WHO definition of occupational health is "The promotion and maintenance of the highest degree of physical, mental social well- being of workers in all occupation" and the WHO considers occupational health service to be responsible for the total of worker and, if possible, his or her family.

2.3.4 Hazard

A hazard is a thing or condition that can expose a person to risk of injury or occupational disease. It's any potential source of harm, damage or adverse health effects. For road safety purposes, we also need to think of hazards in terms of exposing people and organizations to other significant losses property damage, business interruption and reputation damage, and environmental harm (RSAW, 2016). Hazard is anything (e.g. condition, situation, practice,

behaviour) that has the potential to cause harm, including injury, disease, death, environmental, property and equipment damage. A hazard can be a thing or a situation (WHS Act, 2011).

2.3.5 Risk

Risk is the possibility or potential for loss. Losses incurred by MVIs can include physical and psychological injuries to workers and others, costs of repairing or replacing damaged property, and impacts to business processes (e.g. lost productivity, reputation) and the environment (RSAW, 2016). In terms of occupational health & safety management, the term 'risk' may be defined as the most likely consequence of a hazard, combined with the likelihood or probability of it occurring. Risk is the possibility of losing something of value. Values (such as physical health, social status, emotional well-being, or financial wealth) can be gained or lost when taking risk resulting from a given action or inaction, foreseen or unforeseen (planned or not planned). Risk can also be defined as the intentional interaction with uncertainty (NIOSH, 2016). Uncertainty is a potential, unpredictable, and uncontrollable outcome; risk is a consequence of action taken in spite of uncertainty.

Three factors determine how much risk is associated with a given hazard:

i. Frequency of Exposure-: how often and for how long workers are exposed to the hazard.
ii. Probability of Occurrence-the likelihood that a (motor vehicle incident) MVI or other incident will occur.
iii. Severity of Consequences - the magnitude of loss, negative consequences or impacts.

Hazards are the main cause of occupational health and safety problems. Therefore, finding ways of eliminating hazards or controlling the risks is the best way to reduce workplace injury and illness (Tadesse, 2006).

2.3.6 Hazard Identification

This is the process of examining each work area and work task for the purpose of identifying all the hazards which are "inherent in the job". Work areas include but are not limited to machine workshops, laboratories, office areas, agricultural and horticultural environments, stores and transport, maintenance and grounds, reprographics, and lecture theatres and teaching spaces. Tasks can include (but may not be limited to) using screen based equipment, audio and visual equipment, industrial equipment, hazardous substances and/or teaching/dealing with people, driving a vehicle, dealing with emergency situations, construction. This process is about finding what could cause harm in work task or area (WHS Act, 2011).

2.3.7 Risk Assessment

Risk Assessment: is the process of assessing the risks associated with each of the hazards identified so the nature of the risk can be understood. This includes the nature of the harm that may result from the hazard, the severity of that harm and the likelihood of this occurring (WHS Act, 2011).

Risk assessment is the process where you:

i. Identify hazards and risk factors that have the potential to cause harm (hazard identification).
ii. Analyze and evaluate the risk associated with that hazard (risk analysis, and risk evaluation).
iii. Determine appropriate ways to eliminate the hazard, or control the risk when the hazard cannot be eliminated (risk control).

2.3.8 Risk Control

Taking actions to eliminate health and safety risks so far as is reasonably practicable. Where risks cannot be eliminated, then implementation of control measures is required, to minimize risks as far as is reasonably practicable. A hierarchy of controls has been developed and is described below to assist in selection of the most appropriate risk control measures (WHS Act, 2011).

2.3.9 Tricycle

This is a three-wheeled vehicle commonly used in conveying more than one individual and deliveries as well as intra-city transportation activities (Ogunsanya and Galtima, 2006). Tricycle is one of most visible modes of informal public transport, also known as Auto-Rickshaws in India; Tuk-Tuks in Thailand and Trishaws or Three-Wheelers in Sri Lanka and Keke Napep in Nigeria, Adaidaita Sahu in Hausa is a motorized development of the traditional pulled rickshaw or cycle rickshaw (Ipingbemi et al., 2016). The auto rickshaw is a common form of urban transport, both as a vehicle for hire and for private use, in many countries around the world, especially those with tropical or subtropical climates, including many developing countries (Ipingbemi et al., 2016).

2.3.10 Classifications/ Types of Occupational Hazard

According to Tadesse (2006) The various hazards which give rise to occupational injuries, diseases, disabilities or death through work may be classified as: -

1. Physical Hazards
2. Mechanical Hazards
3. Chemical Hazards
4. Biological Hazards

5. Ergonomic Hazards

2.3.11 Physical Hazards

Noise: Generally noisy with sources of noise mainly from motor vehicles they are driving and other vehicles on the road.

Inadequate illumination: Primary light source mainly comes from natural lighting during daytime since they usually do trips on the road.

Extreme Heat: Generally hot, especially during noontime. Drivers who have tricycles with no roof directly above them provide additional heat exposure than drivers who have roofs above them. Motor engine that is located directly below the driver can also be an additional source of heat exposure aside from the environment.

Vibration: Vibration source mainly from powered motor engines which expose them to whole body vibration

2.3.12 Mechanical Hazards

Mechanical factors include unshielded machinery, unsafe structures at the workplace and dangerous unprotected tools are among the most prevalent hazards in both industrialized and developing countries. They affect the health of a high proportion of the workforce. Most accidents could be prevented by applying relatively simple measures in the work environment, working practices, and safety systems and ensuring appropriate behavioural and management practices. This would significantly reduce accident rates within a relatively short period of time. Accident prevention programmes are shown to have high cost-effectiveness and yield rapid results. However, ignorance of such precautions, particularly in sectors where production has grown rapidly, has led to increasing rates of occupational accidents. Workers who use hand tools

such as picks, hammers, shovels, or who habitually kneel at their work may suffer from “beat" condition of the hand, knee or elbow. Beat hand is subcutaneous cellulites, which occurs among miners and stoker caused by infection of tissues devitalized by constant bruising (Tadesse, 2006).

2.3.13 Chemical Hazards

Chemical exposure sources from outdoor air pollutants such as particulate matter, ozone, nitrogen oxides, carbon monoxides, sulfur dioxides, and other combustible fuels from motor vehicles. Hazardous chemicals in the work place are substances, mixtures and materials that can be classified according to their health and physicochemical risks and dangers. Health hazard include skin irritants, carcinogens or respiratory sensitizers that have an adverse effect on worker’s health as a result of direct contact with exposure to the chemical, usually through inhalation, skin contact or ingestion.

2.3.14 Biological Hazards

Many biological agents such as viruses, bacteria, parasites, fungi, moulds and organic dusts have been found to occur in occupational exposures. They are at risk of being bitten by insects and mosquitoes especially the outdoors workers and eventually develop vector-borne diseases.

2.3.15 Ergonomic Hazards

Are physical conditions that may pose a risk of injury to the musculoskeletal system such as the muscles or ligaments of the lower back, tendons or nerves of the hands/wrists, or bones surrounding the knees. Ergonomics hazards include things such as awkward or extreme posture, whole-body or hand/arm vibration, poorly designed tools, equipment, or workstations, repetitive motion, and poor lighting. Ergonomics hazard occur in both occupational and non-occupational

settings such as in workshops, building sites, offices, home, school, or public spaces and facilities (Sraff, 2017). Risk factor of static and prolonged postures also increases further if duration is prolonged like heavy traffic. Straddle sitting on motorcycle seats also contributes to ergonomic risk factors (Reynold et al., 2007).

Raghuvanshi and Vinay (2015) Ergonomics is the science of designing user interaction with equipment and workplaces to fit the user. It is employed to fulfill the two goals of health and productivity. Ergonomics in the workplace has to do largely with the safety of employees, both long and short-term. Through ergonomics, workplaces can be designed so that workers do not have to overextend themselves.

Physical work results changes in:

i. Oxygen consumption rate,
ii. Heart rate,
iii. Pulmonary ventilation rate,
iv. Body temperature, and
v. Lactic acid concentration in the blood.

2.3.16 Occupational Health Hazard among Tricycle Drivers

Occupation and health interact with one another. The work environment and the nature of job contribute significantly in the causation of diseases. Professional driving is associated with long hours in a single body posture, under exposure to vibration, vehicle exhaust, and noise. Furthermore, the work is performed in an environment that demands constant vigilance. There are, however, many specific diseases for which significantly increased risks of mortality and morbidity have been reported (Yesurajan & Indra, 2017).

2.3.17 Blood Pressure

High blood pressure, also called hypertension, is dangerous because it makes the heart work harder to pump blood out to the body and contributes to hardening of the arteries, or atherosclerosis, to stroke, kidney disease, and to the development of heart failure. If a person has high blood pressure it means that the walls of the arteries are receiving too much pressure repeatedly - the pressure needs to be chronically elevated for a diagnosis of hypertension to be confirmed (Yesurajan & Indra, 2017).

2.3.18 Back Pain

The human back is composed of a complex structure of muscles, ligaments, tendons, disks and bones - the segments of our spine are cushioned with cartilage-like pads. Problems with any of the1e components can lead to back pain (Yesurajan & Indra, 2017).

2.3.19 Cardiovascular Diseases

Cardiovascular diseases include illnesses that involve the blood vessels (veins, arteries and capillaries) or the heart, or both - diseases that affect the cardiovascular system (Yesurajan & Indra, 2017).

2.3.20 Headache

Headache is a broad term that encompasses many different things. Headaches are pains that occur in any region of the head; they can occur on both sides the head or be isolated to a certain location (Yesurajan & Indra, 2017).

2.3.21 Stomach Pain

Abdominal pain is pain that you feel anywhere between your chest and groin. This is often referred to as the stomach region or belly (Yesurajan & Indra, 2017).

2.3.22 Musculoskeletal Disorders

Musculoskeletal Disorders or MSDs are injuries and disorders that affect the human body's movement or musculoskeletal system (i.e. muscles, tendons, ligaments, nerves, discs, blood vessels, etc.), Musculoskeletal Disorders (MSDs) are group of pain-full disorders that affect the soft tissues of various joints such as neck, shoulder, elbow, hand, wrist, knee, and foot which depends on the type of activity one is involved. The disorders can be inflammatory or degenerative type affecting various tissues and joints due to a single or cumulative trauma. Work Related Musculoskeletal Pain (WRMSP) as defined by Canadian Center for Occupational Health and Safety is a painful disorder affecting muscles, tendon, nerves caused by occupational activities which are associated with frequent and repetitive postures. The World Health Organization (WHO) recognizes those disorders as work-related when the work activities and work conditions significantly contribute to their development or exacerbation but are not the sole determinant of causation (Muhammad et al., 2016).

2.3.23 Chronic Ailment Diseases

A chronic condition is a human health condition or disease that is persistent or otherwise long-lasting in its effects or a disease that comes with time. The term chronic is often applied when the course of the disease lasts for more than three months. Common chronic diseases include arthritis, asthma, cancer, diabetes and viral diseases such as hepatitis C and HIV/AIDS (Yesurajan & Indra, 2017).

2.3.24 Psychological Distress

Psychological distress is a general term that is used to describe unpleasant feelings or emotions that impact your level of functioning. Learn about the causes of psychological distress, the symptoms, and more (Yesurajan & Indra, 2017).

2.3.25 Cancer

Cancer is not one disease, but a large group of almost 100 diseases. It two main characteristic are uncontrolled growth of the cells in the human body and the ability of these cells to migrate from the original site and spread to distant sites. If the spread is not controlled, cancer can result in death (Yesurajan & Indra, 2017).

2.3.26 Causes of Hazard and Accidents among Tricycle Drivers

The increase in commercial tricycle is associated with corresponding increase in hazards to both the riders and the passengers. The drivers are predisposed to a number of hazards which results into injuries and even deaths in severe cases.

Accident is defined as anything which happens by chance, anything occurring unexpectedly. Accident is therefore an unexpected phenomenon that occurs as a result of the operation on the road (Onakomaiya, 1988). Accidents can be fatal, resulting in the deaths of the road user or minor.

Sunderlal, Adarsh and Pankaj (2007), posit that hazards are caused by factors which are categorized into 3:

a. **The Human Factor**: The human factors constitute about 80% of the cause of road traffic accidents recorded in the country. The major components of human factor are drivers, pedestrian, law enforcement agent and the engineer. Most drivers on Nigeria road are very rude, discourteous and have scant regard for human life. This has led to daily avoidable carnage on Nigeria roads with many losses of lives (Gbadamosi, 2017). The human factors include:

i. Prevalent disregard of road traffic signs by road users;

ii. Lack of proper training of drivers;

iii. Irresponsible driving habit particularly among teenage drivers;

iv. Inexperience and incompetent drivers;

v. Over speeding, dangerous driving and total disrespect of traffic regulations especially concerning speed limits;

vi. Drink driving and/ or driving under the influence of drugs including herbal concoctions laced with spirit;

vii. Lack of respect / consideration for other road users;

viii. Impatience and negligence

ix. Overloading;

x. Fatigue;

xi. Poor vision.

b. **The Mechanical Factor**: The vehicle also constitutes one of the major factors of road traffic accident. Road safety however goes beyond periodic check or prompt repair of vehicles. It should be a daily routine of care and check of all components of a vehicle. The main vehicle factors are defects in tyres, brakes and inputs all arising from poor maintenance of the vehicle. Most of the Nigerian use substandard product like tokunbo tyre, and other spare parts. These, coupled with over speeding and reckless driving, negate the principles of safety when considered against the phenomenon of used vehicles. Any of those parts malfunction can eventually affect smooth driving, which in the end, can lead to serious accident (Gbadamosi, 2017). The different component of mechanical factor that resulted into accident is:

i. Brake failure;

ii. Burst tyres;

iii. Engine failure;

iv. Use of fake spare parts;

v. Defective and Dazzling lights;

vi. Poorly maintained vehicles.

c. **The Environment Factor**: This includes inadequate road networks and surfaces, less physical space, overcrowded road conditions and objects in the road. The bad roads in most of Nigerian cities contribute significantly to road accidents (Gbadamosi, 2017). Environmental factor include:

i. Bad road

ii. Weather conditions

iii. Dangerous bends

iv. Broken down/ abandon vehicles

v. Animals not under control

vi. Obstruction on the road

2.3.27 Strategies in Minimizing Occupational Hazard among Tricycle Drivers

2.3.27.1 Driver Education and Training

The production of high quality drivers is consequently non-negotiable. The two basic requirements in producing high quality motor vehicle drivers are proper training and licensing programmes. Well-equipped driving schools should be licensed. Driving license should be issued only to those that have been certified by approved driving schools. It is also important to note that charges by Driving Schools should be kept within the means of the low or no-income earners. If possible Federal and State Governments could consider providing grants to licensed driving schools to encourage them to charge low and affordable fees (Gbadamosi, 2017).

2.3.27.2 Road Infrastructure

Just like vehicles, the condition of the road infrastructure is also very important when thinking of improving road safety records in Nigeria. The state of the federal roads in Nigeria, to say the least, is deplorable. Many lives have been lost due to bad roads. Moreover, the Federal and State Ministry of Works, The Police Nigerian Force, the Federal Road Safety Corps and other related agencies should regularly conduct surveys to identify and mark prominent traffic spots and accident prone road sections (black spot). This would help install advance warning signs to road users. Same goes for very dangerous pot holes especially on the highways. All roads should be well marked and traffic signs appropriately located (Gbadamosi 2017).

2.3.27.3 Enforcement

This is the bane of road safety in Nigeria because when enforcement of traffic regulations is lax, violation of these regulations becomes a common practice and this could lead to complete disregard for the regulation in the long run. Hence, for traffic laws to be effective there must be enforcement. There is thus need to enforce the traffic regulations. But not before the relevant agencies publicize the laws and regulations of the road and the penalties for violating them. These must be adequate and known by the road users. Efforts should be made to test for drunk driving. If possible motorists should be compelled by law to buy and own their own breathalyzer as this will address the problem of non-compliance if a common breathalyzer is to be used (Akpoghomeh, 2011).

2.3.27.4 Effective Legislation

The lack of effective legislation and other regulations capable of ensuring safety on Nigeria roads constitutes a major challenge in redressing the unnecessary carnage on the country's highways and roads. For example, the traffic laws are not only outdated but do not reflect the

contemporary safety needs of the public. There is an urgent need to update the existing laws and regulations. Urgent changes required include those relating to social, economic and political causative factors of road accidents (Gbadamosi, 2017).

2.3.28 Tricycle in Nigeria

Tricycles are a popular mode of public transportation among commuters due to their high accessibility, availability, affordability, and convenience. This type of transport is much less expensive in fares than another mode of road transport such as taxis, thus they play an important role in overall transportation system. Tricycles are the most convenient transportation in most of the cities and usually are located both in big and smaller roads (Kumar, 2011).

The tricycle is also an important means of intra-city transport service which began operation in the late 1986 during Ibrahim Babangida regime because of the economic crisis resulting from the Structural Adjustment Policies (SAPs), SAP affected the economy and led to inflation which affected the cost of imported goods including automobiles used for intra-city commercial services (Madugu, 2017). In 2001 the tricycle resurfaced again as KEKE NAPEP, NAPEP simply means The National Poverty Eradication Program, a scheme introduced in 2001 by the government under Chief Olusegun Obasanjo with the aim of reducing poverty in the country. NAPEP was saddled with the responsibility of coordinating and monitoring the government poverty eradication program nationwide.

During regime of Malam Ibrahim Shekarau introduce Adaidaita Sahu (a societal re-orientation program introduced by the government in connection with Islamic law Shari'ah) performing the function of conveying only women and children. This was an effort of the government to observe the practice of Shari'ah Islamic Law by preventing interaction between men and women in the

intra-city passenger transport services. The government also prohibited commercial motorcycles from transporting women as it is against the religion and customs of the people of Kano. In view of this the administration provided 1,500 Bajaj petrol tricycles (Adaidaita Sahu) for urban mass transit scheme, which operated under the Kano State Transport Authority. The rising population and widening economic activities in Kano metropolis necessitated new modes of transportation such as commercial motorcycle and tricycle. In 2013 with rising security challenges in Kano metropolis necessitated the ban on motorcycles which lead to emergence of tricycle as the main mode of transportation by Governor Rabiu Musa Kwankwaso (Madugu, 2017).

Because it was relatively cheaper buying a tricycle compare to bus and taxi and it can also provide door to door services compared to the buses and taxis, the tricycle therefore, became popular means of intra-city transport service in Kano metropolis. About 27000 registered tricycles (Adaidaita Sahu) service Kano metropolis daily. The state government exercised supreme control and supervision over the licensing of drivers and the tricycle registration which was done under the supervision of Vehicle Inspection Officers (V.I.O), Road Safety (FRSCN) and Kano State Road and Traffic Agency (KAROTA) (Yusuf, 2015).

2.4 Related Literature Review

Raghavendraswamy et al., (2012) studied the magnitude and risk factors of cardio-vascular diseases (CVDs) among auto rickshaw drivers. The study results indicated that high proportion behavioral and anthropometric risk factors of cardiovascular diseases in auto rickshaw drivers. It is clear that around 173rd of the auto rickshaw drivers are having behavioral risk factors likes smoking tobacco, alcohol use and overall sedentary activities near 50% of the study subjects are having generalized obesity and more than173rd having central obesity this may be because of

more sedentariness during there working hours, less of physical activities during leisure time and lack of awareness about hazards of obesity.

Karen Belkic and Milan (1994), studied the mechanisms of cardiac risk among professional drivers, it indicated that professional drivers have excess cardiac risk that is not fully explained by standard risk factors. They found that both the systolic and diastolic blood pressures were significantly high among the bus drivers immediately preceding the driving shift, during most of the driving shift, and just after it than among the refer at matched times. During non work hours, the blood pressure of these two groups did not differ significantly. Increased heart rate has been consistently reported during professional and amateur driving by healthy subjects and cardiac patients. On the other hand a significant correlation was found, for work days only, for the number of ventricular extra systoles with smoking, coffee in take, and lack of sleep. Aerobatic flying and sea piloting have also been found to evoke ventricular arrhythmias in apparently healthy subjects.

Deborah et al., (2010), studied the low back pain among professional bus drivers. The study investigated the prevalence of Low Back Pain (LBP) among Israeli professional urban bus drivers, and evaluates the association between Low Back Pain in drivers and work-related psychosocial and risk factors. Professional drivers have been found to be at high risk for developing low back pain. They found that work-related ergonomic and psychosocial factors showed a significant association with Low Back Pain is Israeli professional urban bus drivers.

Lyons (2002), studied the factors contributing to low back pain among professional drivers, He conducted a review of current literature and possible ergonomic controls on the factors contributing to low back pain among professional drivers. He suggested that professional drivers

are at an increased risk for low back pain and injury due to a variety of factors such as whole body vibration, prolonged sitting, awkward postures, lifting and carrying, and psychosocial issues.

Guillen (2009), View the presence of this unique mode of transportation, has either been classified, according to its physical, operating, demand, organizational and management characteristics such as low-cost transport, intermediate public transport, paratransit4 and informal public transportation. These studies have noted that the reason why local transport mode remains if not continuously increasing is due to its socioeconomic consequences. That is, economic, as a source of employment for the driver. It is demand-driven from the community that has an infrastructure deficit as well a lack of available alternative modes to use for mobility. Nonetheless, related urban and transportation issues that are still persistent in public transportation sector are the problems of traffic congestion, poor public trans- port, decrease safety, worsening environment and insufficient transport services. These are attributed to the deficiencies in various aspects of policy setting, planning and financing, implementation and management not only of the transportation system but also of the overall urban development. Most of these studies provided the macro scenarios in policy setting and usually focus on specific issues such as air pollution. The role of local level policy in the operations of local public transport like tricycles is another important aspect that must not be overlooked. At present, air pollution has become associated with most cities of developing nations. This can be attributed to a number of factors, such as the increasing number of motor vehicles that are not all well maintained. Determining if this issue has been considered in developing local transport policy can provide an insight on how proactive the local government is. Reviewing local

transport policy can also show how local government ensured an acceptable level of public transportation service.

Case et al., (2001), in his study based in the island of Siquijor in the Philippines, the tricycle was rated the second-lowest preference for modes of public transportation when comfort and safety were the deciding parameters. In addition to this, 17% of those who took a survey stated that the only reason they rode the tricycle was that it was the only public transportation mode available. However, 53% preferred the tricycle as a mode of transportation because it has the capability to bring the passenger closest to the desired destination. Since the demand for tricycle operation is high, a need for analysis of the factors affecting the discomfort of passengers could provide basis for the improvement of the preference of the use of this mode of transportation.

Cooper (2013), in an assessment of the environmental effects of tricycle for urban transportation in Manila area in Philippine, he reported that tricycles were a source of air pollution and health hazards. According to him, a gasoline-powered tricycle release over 10million tons of Carbon-monoxide (CO2) and caused more than 4,000 air pollution related deaths on yearly basis in the city. The Asian Development Bank, estimates that for every 20,000 electric tricycles introduced to the city of Manila, the country saves 100,000 liters of fuel daily. This amounts to a savings of more than US$ 35 million annually. In addition, the introduction of electric tricycle for urban transportation may likely reduce the emission of toxic substances into the atmosphere by 54%. Despite the disadvantages of fuel powered tricycle such as emission of toxic substances, low carry capacity and advantages of electric tricycle as highlighted above, it is yet to be introduced as a mode of transportation in urban centres in Nigeria.

Road accidents are considered one of the leading causes of death and injury around the world. Therefore, road safety is considered by different international agencies as a key factor of public health. Furthermore, road accidents are a source of high economic costs for transportation firms, and represent a serious safety risk for professional drivers and other users of the road. Recently, some psychosocial work factors such as driving stress, work overtime and job strain have acquired an important role explaining occupational health and safety problems in professional drivers' populations. Particularly, work stress is one of the factors more frequently associated with accidents or injuries at work. A recent empirical study found a significant negative association between social support and the risk of road accidents among bus drivers. However, this study did not found significant results for the effects of job demands, decision latitude and job strain on the professional drivers' performance (Useche et al., 2018).

The World Health Organization Report (2003), reveals that accidents and injuries are global problems. These are common in developed and developing countries. Injuries represent 12% of global burden of diseases, the third most common cause of death amongst 1-40 years old and more than 20 million people are severely injured or killed on the world road each year.

A study conducted in Zaria reveals that a high prevalence of 59.5% of road traffic accidents which was associated with use of psychoactive drugs was found among the motorcyclists. Commonly identified psychoactive substance/ drugs used were; marijuana (Indian hemp) 25.8%, solution 24.5%, caffeine (kola) 15.8% and coffee 4.8%. Keeping awake, suppression of fatigue and peer effect were the identified factors influencing psychoactive substance use.(Muazu and Aliyu, 2008).

Raji (2015), Studied the appraisal of auto-rickshaw as poverty alleviation strategy in Nigeria: an example of Lagos metropolis. The research aims at exploring the significance of the scheme in solving beneficiary's financial challenge. It study revealed that in Nigeria, problem of poverty has for a long time been a cause for concern to the government. The increasing poverty level in the country necessitated the introduction of poverty alleviation programmes by successive government in the country. This study examines the use of auto-rickshaw (KEKE NAPEP) as one of the various strategies employed by National Poverty Alleviation Programming (NAPEP) in the country. The data obtain from primary and secondary sources, 200 structure questionnaire were randomly administered to the tricycle operators in 24 stratified loading points in the metropolitan area, the information were analyzed using descriptive and inferential statistics. The result shows that 73.5% operator benefit and 26% did not benefit from the scheme, male were dominant in the scheme with 97.3%, the average daily income of the operator is more than ₦2000, while daily operating cost was ₦1610. It was recommended that beneficiary of the scheme should be given loan directly at moderate payback period, provision of parking facilities, educate operators about road safety than extortion by police and local government official.

Ipingbemi and Adebayo (2016), studied on Tricycle as a Mode of Public Transportation in Ibadan Metropolis, Nigeria. The research assessed the operational characteristics of tricycle as a growing mode of public transportation, in Ibadan. The study employed both primary and secondary data with adoption of multi-stage sampling in selecting 147 tricycle registered operators from 10 loading points in the study area. Using a structured questionnaire, information on their socio -economic characteristics, mode of operations, trip characteristics as well as the challenges faced by the operators were collected. In-Depth Interviews were directed to the executives of the Three Wheelers' Association of Oyo State focusing on

issues relating to registration of tricycles, dues and levies. Data were analyzed using descriptive statistics. Findings indicated that all the operators were male, 73.4% had no more than secondary education and 72.8% earned below ₦4000 daily. Unemployment was the main reason why 55.5% of them went into the business. Only 35.4% of the operators had valid license. Extortion from traffic agents 38.6% was the most important challenge faced by the tricycles. In this regard, appropriate sanctions should be recommended for enabling environment for tricycle operations. The study suggested incorporation of their activities into urban transportation planning in Nigeria.

Obioma et al., (2012), studied the quality of the para-transit service (Tricycle) and its operation in Aba, Nigeria. The research views the challenges and the contribution to informal transport and equitable service distribution to the residents of the area. A structured questionnaire was used in collecting the data. The total number of completed questionnaire for the survey was 100 for operator and 229 for users, simple random was employed from several zones of the study area, such as hospital, market for some weeks from August-October 2011. The data were analyzed through percentage and chi-square statistical technique for testing the hypothesis. From the study, it was observed that 92% of tricycle users reported a high level of poor road network, while 8% responded that the road network is good for the operators, 52% reported making 9-12 trips per day, 28% reported making 6-8 trips per day, while 20% making 4-5 trips per day. A total of 75% reported that their operating cost per day is from ₦1000 and up, while 25% reported that they spend between ₦500 and ₦1000 for operating cost per day.

Adetunji (2017), studied on assessment of the sustainability of tricycle operation for public transportation in Lokoja capital city, Kogi State, Nigeria. The study examined the operation characteristic and challenges of tricycle operation with view of determine it sustainability as a

mode of transportation in the study area. Both primary and secondary data were used in collecting information on the challenges like safety related issues, payment of levies and activities of the law enforcement agents, information on accident victim on tricycle were collected. About 2000 tricycle have registered with the association in Lokoja, purposeful quota sampling technique was used to select thirty (30) tricycles at five (5) major loading points for questionnaire administration in Lokoja metropolis. The finding revealed that 75% of tricycles between the age of 26 and 33 year who have higher qualification, 78.9% of the tricycle drivers earned between ₦2000 and ₦4000 per day. It was estimated that 10,000 liters of fuel was lost daily to power 2000 tricycle as against the use of electric tricycles in the city. More than 90% of tricycle crashes occurred along the Federal highways in Lokoja. It was recommended that the operation of tricycle for public transportation should be restricted to secondary road so as to reduce tricycle crashes which claims the lives of urban commuters. The provision and usage of mass transit should be encouraged in order to reduce traffic congestion characterized by Federal roads in the city. Also there is need to provide parking space and the use of electric tricycle for public transportation should be encouraged as to reduce the emission of toxic substance into the atmosphere.

Muhammad et al., (2016), studied the pattern of work related musculoskeletal pain among tricycle drivers in Kano Metropolis, Nigeria. The study investigated the prevalence of musculoskeletal disorder among commercial tricycle drivers operating within Kano metropolis. 500 questionnaires were administered but only 384 were retrieved indicating 77% response. Purposive sampling technique were adopted in selecting the tricycle drivers and cross-sectional survey was employ for all tricycle drivers that have work at least 12 months duration. Nordic questionnaire was used as the assessment tools in the study. It comprises of questions inquiring

about troubles encountered around the nine (9) human body areas, (Neck, shoulders, upper-back, low-back, elbows, wrist, thighs, knees and ankles). The participants recruited were between the age of 19-67 years and all the 384 (100%) were 257 (66.9%) are single while 121 (31.5%) are married. Majority of them never attend school 313 (81.5%), while only 15 (3.9%) of them had attended tertiary institution. From the outcome of the study it revealed that there was a significant relationship between the frequently reported Musculoskeletal pain (ankle pain) and the duration of work; Also no significant relationship was observed between ankle pains and age as well as level of education, Another outcome of this study showed that there was a significant relationship between characteristics pain that limit activities of daily living (low back pain) in the past 12 month and duration of work.

Daniel et al., (2007) studied the prevalence of low back pain in commercial motor drivers and private automobile drivers. The study determined and compared the prevalence of Low Back Pain (LBP) in Commercial Motor Drivers (CMD) and Private Automobile Drivers (PAD). Low back pain was a major problem among the respondents; but was experienced more among CMD. The higher prevalence of Low back pain in Commercial Motor Drivers was attributed to the length of time spent Sitting when driving.

2.5 The Work-Related Driving Context

The driving task has characteristics that distinguish it from other tasks performed within then workplace. First, there are inherent challenges associated with managing behaviour associated with a job task conducted outside the physical boundaries of the organisation. That is, driving is generally an autonomous task where there is low visibility between a supervisor and a driver; thus, limiting opportunity to manage behaviour through the collection of objective performance measures and the timely delivery of associated feedback (Newnam et al., 2012).

Second, there is limited formalized leadership in the safety management of drivers (Newnam et al., 2008, 2012). Driving activities often fall outside line management responsibilities, and drivers are typically supervised by individuals who are not part of the same management structure associated with other aspects of their work roles (Newnam et al., 2008). Rather, driver behaviour is managed by the fleet manager, despite the fact these individuals often do not have formal responsibilities beyond asset (ie., vehicle) management (Warmerdam et al.(2017b).

These challenges are further complicated when driving is considered as a secondary job role (Lynn and Lockwood, 1998). To illustrate, in the role of a sales representative, driving is often perceived secondary to the role of selling a product or service. The consequence is that the driving task is less likely to be formalized within position descriptions and performance evaluations (Warmerdam et al. (2017b). As highlighted in the research literature, this has negative impact on safe driving performance (Newnam et al., 2017; Warmerdam et al. (2017b). That is, the management practices predispose drivers to an unsafe working environment. To understand this relationship, this study draws on role theory.

2.6 Attitudes towards Safe Driving

An attitude is an evaluation of a person, entity or idea that directly impacts on social behavior (Eagly and Chaiken, 1993). Attitudes are influenced both by relatively enduring individual differences, as well as the context that individuals are exposed to (Neal and Griffin, 2004).

For instance, in the workplace environment, an attitude can be formed through an assessment of how closely policy and procedure established by the organisation aligns with the workers' own personal goals (James and James, 1989). That is, the way the role is understood by the individual has an impact on their behaviour. In the work-related driving context, favourable or unfavourable attitudes toward rule violations and speeding has been defined as a safety attitude (Iversen and

Rundmo, 2004). Attitudes towards safe driving have been found to play a critical role in influencing safe driving behaviour. For example, Newnam et al. (2008) found that attitudes predicted motivation to drive safely and self-reported crashes. Wills et al. (2006) also demonstrated how attitudes predicted traffic violations, driver error, driving while distracted, and pre-trip vehicle maintenance, and that attitudes were a strong predictor of future intentions to drive safely in a work-related vehicle (Wills et al., 2009). Although these findings have provided valuable insight into the development of interventions designed to challenge drivers' key beliefs regarding safe driving practices (Newnam et al., 2012), it is still not understood how the attitudes of drivers would interplay with the organisational context in influencing their safe driving behaviours. The focus of this paper is to explore the lack of understanding in this interplay. A worker's interpretation of role-behaviour expectancies has been found to be influenced by how the organisation measures employee effectiveness (ie., achievement of organisational goals; Griffin et al., 2007). However, some degree of ambiguity is likely to exist when interpreting safety goals in the driving role given the uncertainty in the workplace environment. The degree of uncertainty is also likely to be influenced by the behaviours performed when a driver is driving for personal purposes. Newnam et al. (2002) found that individuals drive differently for work and personal purposes and that organizational safety policies and procedures account for some of the variation (Dimmer and Parker, 1999; Downs et al. (1999); Grayson, 1999). To illustrate, a worker may regularly use a hands-free mobile phone when driving for personal purposes, particularly if the individual has not experienced any punishment (i.e., crash, infringements) in their past driving.

2.7 Rule and Objectives of Tricycle Operator Association, Kano.

The rule and objective of tricycle operators was written in Hausa language by the tricycle association; for the easy understanding of their members. Therefore; for the purpose of this research it was translated in to English.

Tricycle operator association Kano should abide by the following rule and regulation in their day-day activities (TOAKAN).

1. Overload and avoid keeping of luggage on top of the machine
2. Indecent dressing is not allowed
3. Alcohol is strongly prohibited.
4. No one-way or driving in between two motors or bus, cars.
5. Do not use spare driver and avoid sitting with female passenger on driver's seat.
6. Be compliance with all traffic laws.
7. Listening of music is not allowed
8. Rough driving on the road and carrying of passengers with wrong parking is not allowed.
9. Fighting with or quarrel with government officials or passengers is totally prohibited.
10. Carrying a kid is not allowed on the front seat.
11. Installing of iron rod at the left side of the passenger's row.
12. Removing or cleaning registration number of any unit is not allowed.
13. It is mandatory to have an ID card before driving.
14. Compulsory registration with VIO.
15. It is not allowed to use another person's registration number or selling the tricycle with the number.
16. It is not allowed to clean tricycle registration number after selling it.

17. All the drivers should have an association.

18. It is compulsory for all the tricycle drivers to obey all this rules.

2.8 Conceptual Linkages of Tricycle Driving and the Environment

Vehicles are one of the dominant sources of urban pollution in the developing world that threatens both people's health and economic activity (ADB, 2005). Tricycles make up a sizeable number of vehicles in Nigeria and mostly have 2-stroke engines emitting fine particulate matter, which pose danger to public health. Epidemiological studies reveal that fine particles have serious health effects including premature mortality and such non-fatal effects as respiratory symptoms, exacerbation of asthma, and change in lung function (Kojima, 2000). Biona et.al (2008), did a preliminary analysis on the fuel use and emission reduction potential of incorporating hybrid systems to two stroke powered tricycles in Metro Manila, Philippines; it was discovered that 4-stroke provided the highest global warming potential when compared to carbureted 2-stroke, carbureted-hybrid 2-stroke, and direct-hybrid 2-stroke. This could be traced to the high methane and CO2 from these vehicles. 4-stroke tricycles also have the highest acidification potential (NO_x production) when compared to the rest. Furthermore, 4-stroke tricycle provides the lowest human health impact compared to their hybridized carbureted 2-stroke counterparts due to its lower nm VOC, PM and CO emissions. Another source of environmental pollution to be discussed is the diesel engine; according to Lloyd (2002), the environmental impact include acidification potential (sources of NO_x production), soil and water pollution. Diesel engines generally release less carbon dioxide the heat-trapping gas primarily responsible for global warming from the tailpipe. So that's a check on the good side of the pollution chart. But when it comes to smog-forming pollutants and toxic particulate matter, also known as soot, today's diesels are still a lot dirtier than the average gasoline car (Monahan and

Friedman, 2005). Soot is in three size category (large soot, coarse soot and fine soot) particles and they harm the body causing chronic bronchitis, asthma, reduced ability of respiratory system to fight infections and remove foreign particles, and cancer (Monahan and Friedman, 2005).

ADB (2005), also reports Ozone as a secondary pollutant caused by tricycles; it is not directly emitted but it is produced by a reaction involving volatile organic compounds (VOCs) and NO_x, the ozone precursors in the presence of sunlight form ozone. Ozone is a highly reactive gas that affects the respiratory system by severely irritating the mucous membrane of the nose and the throat. Since 90% of the ozone breathed into the air is never exhaled, ozone molecules react with sensitive lung tissue to cause several health consequences. Another often unpopular source of pollution from tricycle is noise (unwanted sound); the World Health Organization suggests that noise can affect the human health and well-being in a number of ways, including annoyance reaction, sleep disturbance, interference with communication, performance effects, effect on social behavior and hearing loss (ADB, 2005). Noise can cause annoyance and frustration as a result of interference, interruption and distraction. People experiencing high noise level differ from those with less noise exposure in terms of increased number of headaches, greater susceptibility to minor accident, increased reliance on sedative and sleeping pills, and increased mental hospital admission rate. Exposure to noise is also associated with a range of possible physical effect including: cold; change in blood pressure, other cardiovascular changes, problems with digestive systems and general fatigue. Further, there is fairly consistent evidence that prolonged exposure to noise levels at or above 80 decibels (dB) can cause deafness (ADB, 2005).

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents the methods employed for this study. The research design, population of the study, sample size and sampling techniques, data type and sources, tools for data capture, data collection procedure, data analysis and presentation.

3.2 Research Design

The research design deployed for the study was cross-sectional survey, which help in getting an in depth information about occupational hazards from the selected respondents in the study area.

3.3 Reconnaissance Survey

Reconnaissance survey was conducted in order to gain insight into the number of tricycle operation, in order to avail knowledge for data collection.

3.4 Population and Sampling

The population of this study includes all the registered tricycle drivers and a total of two thousand eight hundred and ninety four (2894) Tricycle drivers in the study area were identified. Purposive and convenient non probability sampling technique was used to select the registered tricycle drivers for this research. Most of the tricycle drivers are always on the move searching for passengers, except on a queue waiting for their turn to pick passengers in selected loading point. The sample sizes for this study was 211 registered tricycle drivers in the study area. (based on Krejcie and Morgan, table of sample size 1970). The sample were derived from eight (8) major loading point in the study area, where the tricycle drivers are constantly loading, the loading are: Bakin-Tasha Anguwa Uku, Bakin Tasha Anguwa Uku Gidan Mai, Dan Marke,

NNPC Roundabout, Kano Line, New Kano Line, Darmanawa Primary and Gyadi-Gyadi Bridge as shown in Table (2).

Table 2 Samples selected

S/N	Loading Point	Population	Sample
1.	Bakin Tasha Anguwa Uku	42	19
2.	Bakin Tasha Anguwa Uku gidan mai	63	28
3.	Dan Marke	63	28
4.	NNPC roundabout Hotoro	51	24
5.	Darmanawa Primary	51	24
6.	Kano Line	63	28
7.	New Kano line	74	32
8.	Gyadi-Gyadi Bridge	63	28
9.	Total	225	211

3.5 Data Types and Sources

Qualitative data were sourced primarily through questionnaire from the tricycle drivers in each of the loading point in the study area, while the secondary data were documented materials from available literatures, journals and rules and objectives of tricycle operator association in Kano.

3.6 Tools for Data Capture

Appendix (1) was used to collect the data on the occupational hazards among tricycle drivers in Tarauni local government Area, Kano from two hundred and eleven respondents (211).

3.7 Data Collection Procedures.

Appendix (1) was distributed to the selected loading point in the study area. The distribution was conducted from 15th of June 2019 to 29th of July 2019 and five (5) days were spent for each of the loading point from 9:00-10:30 am with duration of one hour thirty minute on daily basis until required sampled were obtained. The Appendix (1) contain all the information listed in the table (3) includes both closed and open ended questions. Close and open ended questionnaire were used in order to evaluate the Occupational hazards among tricycle drivers with view of mitigating the hazards discovered.

Table 3 Questionnaire

	Variables
Socio-demographic characteristics	Gender
	Age
	Educational status
	Driving school attendance
	Marital status
	Working hours
	Working days
	Daily income
Others	
	Prevalence Diseases
	Symptoms Experience
	Occurrence of Accident/Injury
	Causes of Occupational Hazards
	Effect of Smoke and Noise Pollution
	Awareness

3.8 Data Analysis and Presentation

Data generated was analyzed using descriptive statistics of frequency and percentages, cross-tabulations and graphs with the use of Statistical Package for Social Science (SPSS) version 20 and Microsoft Excel software while the data were presented using charts and tables.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

In this chapter, the results obtained from the data analysis are presented and discussed. The result presented here were in line with set objective of the study. The socio-demographic characteristics of the respondents, the occupational hazards prevalence among the respondents, the causes of occupational hazards associated with tricycle driving, the implication of tricycle driving on the environment, awareness of occupational hazards among the tricycle drivers and the last section presented the recommended ways of addressing the hazards.

In order to show the socio-demographic characteristics of the respondents, data on gender, educational status, age of the respondents and driving duration were analyzed table 4.

Table 4 shows gender of the respondents shows that majority of tricycle drivers were males. This implies that the operation of tricycle is not only male dominated but gender bias. The dominance of male in the operation of tricycle is expected because of the nature of the mode of operation. Driving tricycle is occupation that is arduous and labour intensive which many women cannot endure. Also it may not be unrelated with the culture where driving is seen as a job not compatible with ladies especially in northern part of Nigeria. The findings of this study is similar with the work of Muhammad et al., (2016), who revealed that majority of tricycle drivers were males 100%.

In terms of the level of education, 6.6% never attend any form of education, 19% possessed primary school certificate while 35.1% were graduates of secondary school education. About 19.4% of the operators attended higher institution of learning, while 19.9% of the respondents

attended qur'anic school. This is an indication that majority of tricycle drivers were literate that have at least certificates in primary, secondary and tertiary institution. This is because most of them can read and understand road signs and markings which are very critical to safety on the roads. Though, it does translate to road safety. This is in line with the result of Jibrilla and Fashola (2017), from his findings revealed that primary and secondary school certificate holder's command 72% and those with tertiary certificate took the remaining 17%.

Age distribution of the respondents reveled that majority fall between 30-39 years with 47.9%, while 27% were between ages 19-29, 12.3% and 9.5% were between age 40-49 and 50-59, while 3.3% were age 60 and above. The age distribution of the respondents indicated that about 74.9% of tricycle drivers were less than 40 years of age. This could be because of job scarcity in the formal sector, in spite of the high level of educational qualifications of many of the tricycle operators and also school dropout of some tricycle drivers which may force them to join tricycle business in order to earn their livelihood. This is similar with the work of Ipingbemi and Adebayo (2016), whose findings shows that more than 70% of tricycle drivers were less than 35 years of age. Also, relate to the work of Adetunji (2017), which shows that, the operators between the ages of 26 and 33years constituted a largest proportion 62% of tricycle operators.

Duration of driving among the respondents indicated that respondents with less than 3 years of experience have 21.3%, respondents with 3-5 years of experience have 57.3%, while respondents with more than 6 years of experience have 21.3%. It is observed that majority of respondents have 3-5 years of experience. This may help the tricycle drivers have much experience about driving and abiding rule safety rule and regulation.

4.2 Socio-demographic characteristics of the respondents

Table 4 Socio-demographic characteristics of the respondents

Gender of the respondents	Frequency	Percentage
Male	211	100
Female	0	0
Total	211	100
Educational status		
Never attended	14	6.6
Primary	40	19.0
Secondary	74	35.1
Tertiary	41	19.4
Qur'anic school	42	19.9
Total	211	100.0
Age of the respondent		
19-29	57	27.0
30-39	101	47.9
40-49	26	12.3
50-59	20	9.5
60 and above	7	3.3
Total	211	100.0
Duration of driving		
>3 years	45	21.3
3-5 years	121	57.3
6 and above	45	21.3
Total	211	100.0

Also present socio-demographic characteristic of respondents, data on the distribution of educational status and driving school attendance were analyzed in table 5.

4.2.1 Driving School Attendance

Table 5 Response on driving school attendance

Driving school attendance	Frequency	Percentage
Yes	47	22.3%
No	164	77.7%
Total	211	100%

Table 5 shows the responses on driving school attendance, 22.3% of the respondents attended driving school, while 77.7% of the respondents did not attend driving school. It is observed that majority of respondents did not attend driving school. This may result to occupational hazards of tricycle drivers, because they may have little knowledge on driving, traffic rule and regulation due to lack of attending driving school.

4.2.2 Marital Status, Working Hours per day and Working Days

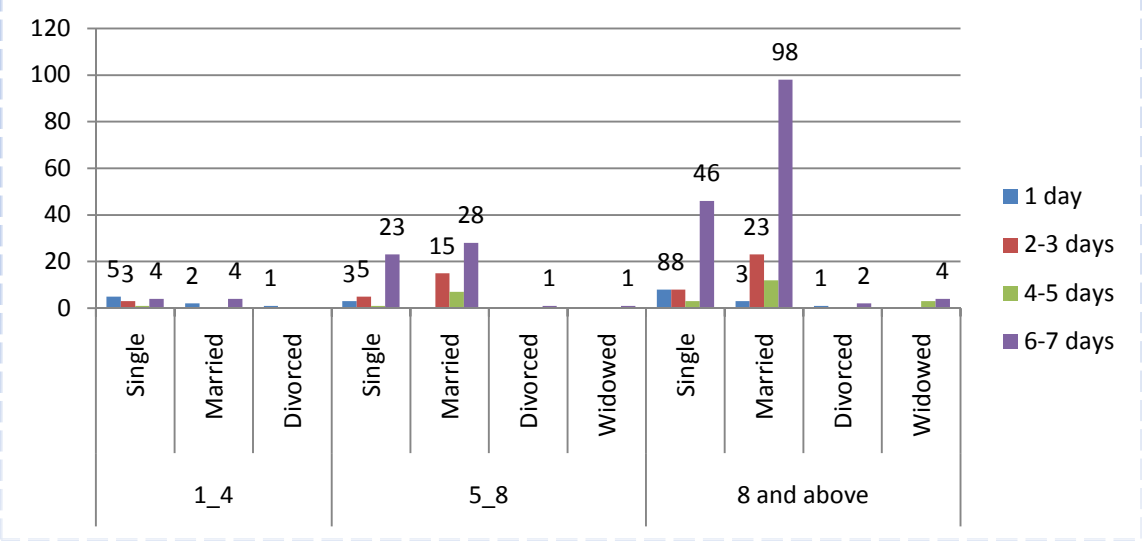

Figure 4.1 Distribution of marital status with working hours per day and working days.

Figure 4 shows the distribution of marital status with working hour per day and working days, revealed that about 36.5%, were not married working from 1-4 hours/per-day, between 2-3 days was 23.1%, between 4-5 days was 7.7% and 6-7 days was 30.8%, between 5-8 hours/day was 9.4%, between 2-3 days was 15.6%, between 4-5 days was 3.1% and between 6-7 days was 23 71.9%. More also the result for those working above 8 hours in 1 day was 12.3%, between 2-3 days was 12.3% between 4-5 days was 4.6% and between 6-7 was 70.8%. In addition, the result indicated that about 33.3% of the respondents were married working from 1-4 hours/day, between 6-7 days was 66.7%. Also between 5-8 hours/days working between 2-3 days was 15 30%, between 4-5 days was 14% and between 6-7 days was 56%. More also, the result for those working above 8 hours in 1 day was 2.2%, while those between 2-3 days was 16.9%, between 4-5 days was 8.8% and between 6-7 days was 72.1%. The result indicated that about 33.3% were divorced working above 8 hours in 1 day and between 6-7 days was 66.7%. The result indicated that about 42.9% was widowed working above 8 hours in 4-5 days; between 6-7 days was 57.1%. This shows that majority of respondents were married, working for more than 8 hours in 1 day and worked for 6-7 day in a week was 72.1%. It may be because most of the married tricycle drivers are responsible men in the society which they spent most of their working days and hours to earn income. It can also view that, some of the tricycles used by married tricycle drivers were on lease which they are required to return certain amount to the owner on daily, weekly or monthly basis based on the agreement between the owner and users, while some owned by the drivers. Similarly, some of the tricycles were given on hire purchase in which the drivers were required to complete the certain negotiated amount given to him.

In a view to present the socio-demographic characteristic of respondents, data on the distribution of daily income earned and marital status were analyzed in table 6.

4.2.3 Daily Income and Marital Status

Table 6 Distribution of daily income earned and marital status

Daily income earned	**Marital status**				**Total**
	Single	Married	Divorced	Widow	
Less than 2000	15(23.1%)	42(30.9%)	2(66.7%)	5(71.4%)	64(30.3%)
2000-4000	38(58.5%)	75(55.1%)	1(33.3%)	1(14.3%)	115(54.5%)
4000 and above	12(18.5%)	19(14.0%)	0(0.0%)	1(14.3%)	32(15.2%)
Total	65(100.0%)	136(100.0%)	3(100.0%)	7(100.0%)	211(100.0%)

Table 6 shows the distribution of daily income and marital status, It revealed that single respondents had 23.1% and earned less than 2000 Naira as their daily income, of the married respondents had 30.9% and earned less than 2000 Naira, Also 66.7% of divorced respondents earned less than 2000 and 71.4% of the respondents earned less than 2000 are widowed. In addition, single respondents had 58.5% and earned between 2000-4000, married respondents had 55.1% and earned between 2000-4000, while 33.3% of divorced respondents earned 2000-4000, while 14.3% of married respondents earned 2000-4000. More also, 18.5% of single respondents earned 4000 and above, 14% of married respondents earned 4000 and above, 14.3% of widowed respondents earned 4000 and above. This is an indication that majority of married tricycle drivers in the study area earned between 2000 and 4000 which recorded 55.1%. It may be observed that married drivers are believed to be responsible men in the society. This is because the income received is spent on family responsibilities such as schooling, rent and transportation among others and also part of the income is expended on the maintenance of the vehicle and fuel.

This finding is similar to the work of Adetunji (2017), whose findings revealed that 78.9% of the tricycle operators realized between N 2000 and N 4000 per day which enable the tricycle operators to maintain themselves, their families and vehicle maintenance.

4.3 The Occupational hazards prevalence among the tricycle drivers

Occupational disease and hazard are the risks that occur during the course of work. The prevalent occupational hazard that exist among tricycle drivers in the study area such as eye irritation, stomach pain, diseases as well as Musculoskeletal disorders among the drivers, due to their daily activities in the environment. The occupation involves prolonged sitting, a fixed posture and vibration, and which could directly lead to musculoskeletal trouble (back pain, neck, shoulder and knee pain and elbow). This disorder represent a serious public health problem, being one of the most important causes of disability among the tricycle drivers (Drivers, 2012).

4.3.1 Symptoms Experience with Working Hours per day and Daily Income.

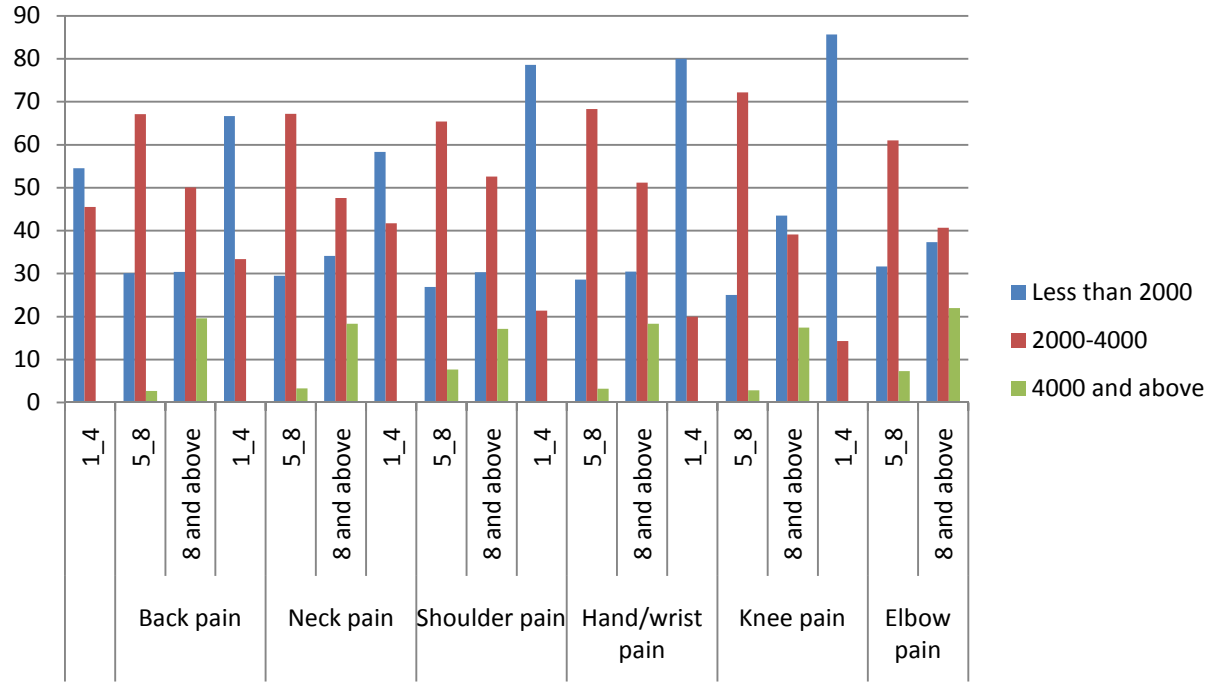

Figure 4.2 Distribution of symptoms experience with working hours per day and daily income.

Figure 4.2 shows the distribution of income earned, working hours/days and symptoms experience, Respondents with back pain had 54.5% and working from 1-4 hours per day with daily income of less than ₦2000, while 67.1% of the respondents with back pain working from 5-8 hours per day with daily income between ₦2000-4000, Also 50.1% of respondents with back pain working for more than 8 hours/days with daily income between ₦2000-4000. More also, respondents with neck pain had 66.7% working from 1-4 hour/day with daily income earned of less than 2000, while 67.2% of the respondents with neck pain working from 5-8 hour/day with daily income earned between ₦2000-4000, 47.6% of the respondents with neck pain working from 8 hour and above with daily income earned between ₦2000-4000. Also, respondents with shoulder pain had 58.3% working from 1-4 hour/day with daily income earned of less than

₦2000, Out of 100% drivers, 65.4% of the respondents with shoulder pain working from 5-8 hours/day with daily income earned between ₦2000-4000, While respondents with shoulder pain had 52.6% working for more than 8 hours with daily income earned between ₦2000-4000. Respondents with hand/wrist pain had 78.6% working from 1-4 hours/day with daily income earned of less than ₦2000, while respondents with hand/wrist pain had 68.3% working from 5-8 hours/day with daily income earned between ₦2000-4000. However, respondents with hand/wrist pain had 51.2% working from 8 hour and above with daily income earned between ₦2000-4000. In the same vein, respondents with knee pain had 80% working from 1-4 hours/day with daily income earned of less than ₦2000. Also respondents with knee pain had 72.2% working from 5-8 hours/day with daily income earned between ₦2000-4000. The respondents with knee pain had 43.5% working from 8 hour and above with daily income earned of less than ₦2000. Similarly, the respondents with elbow pain had 85.7% working from 1-4 hours/day with daily income earned of less than ₦2000. Also respondents with elbow pain had 61% working from 5-8 hours/day with daily income earned between ₦2000-4000. The respondents with elbow pain had 40.7% working from 8 hour and above with daily income earned between ₦2000-4000. From the result above it shows the significant relationship between musculoskeletal pain with working hours per day and daily income earned, because the long working hours may increase the income earned and their by influence the rate of musculoskeletal disorder, where by the short working hours will yield to low income and may reduce the incidence of musculoskeletal disorder. This indicates that the drivers were exposed to high level of risk which could result in musculoskeletal problem, poor performance, injury and accidents. Respondents with back pain working from 5-8 hours per day earned ₦2000-4000 income daily recorded highest among the symptoms 67.1%. This is in line with the work of Virendra et al., (2017) whose findings revealed

that 80 (50.3%) low back pain among auto rickshaw drivers works for more than 10 hours. Also, the work of Borle et al (2012) conducted study among M.S.R.T.C. bus drivers reported about similar prevalence of MSD. They found out a significant relationship between musculoskeletal discomfort and age, duration of driving(linear trend), daily average driving (linear trend), hours of driving (p value < 0.001) and BMI ≥ 30 (p value < 0.05). The findings also relate to the work of Shaik et al., (2014), which shows the 12 months prevalence of LBP is 63.66%. One of the reasons for auto-rickshaw drivers to exhibit a high prevalence could be that they tend to sit in awkward postures resulting in musculoskeletal disorders while driving. This study is also in line with the work of Debasish and Mitra (2017), whose findings shows that most of the auto rickshaw drivers suffer from musculoskeletal problem that includes lower back pain 96.42%, knee pain 88.09%, wrist pain 71.43%, shoulder pain 100% and body ache 88.10%, Were the most common frequency among all age group of auto rickshaw service provider.

The occupational hazards prevalence among the respondents, the result on the distribution of diseases, ergonomic hazards and occurrence of accident/injury among the respondents were analyzed in table 7.

4.3.2 Prevalence hazards

Table 7 Distribution of diseases among the respondents

Diseases	Frequency	Percentage
High blood pressure		
Affected	5	2.4
Non Affected	206	97.6
Total	211	100.0
Cardiovascular disease		
Non Affected	211	100.0
Asthma		
Affected	9	4.3
Non Affected	202	95.7
Total	211	100.0
Cancer		
Non Affected	211	100.0
Diabetes		
Affected	6	2.8
Non Affected	205	97.2
Total	211	100.0
HIV/AIDS		
Non Affected	211	100.0
Prolonged sitting may cause ergonomics hazards		
Strongly Agree	108	51.2
Agree	75	35.5
Strongly Disagree	9	4.3
Disagree	19	9.0
Total	211	100.0
Within last two or one year have you had an accident or injury when driving		
Yes	15	7.1
No	196	92.9
Total	211	100.0

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Table 7 shows the distribution of between diseases among the respondents, Out of 100% tricycle drivers, the participants affected with high blood pressure have 2.4%, while the none affected

participant have 97.6%, Also the participant affected with asthma have 4.3%, while the none affected participant have 95.7%. The participants affected with diabetes have 2.8%, while none affected participant have 97.2%. None of the participant affected with cardiovascular diseases, cancer and HIV/AIDS. While only few of the drivers were infected with headache 4.7%, body pain 6.6%, ulcer 41.9% and pile 18.5%. The results revealed that majority of tricycle drivers in the study area were not affected with (High blood pressure, Cardiovascular, Asthma, cancer, Diabetes, and HIV/AIDs), This could be because most of them did not known their health status and they were aware of the hazard of driving tricycles and majority of them used 4 stroke tricycle engines which are more fuel efficient compared to 2 stroke engines. They produce less smoke, less noise and are known to be environmentally friendly. The finding is contrary to the work of Bindu and Seema (2012), Finding reveals that 98% respondents suffer from asthma. This is perhaps due to inhaling of dust particle for long hours of work and constant exposure to diesel may lead to asthma. Also the result of the study is contrary to the finding of Satheesh (2016), from findings it revealed that 85 % of auto-rickshaw drivers of ten years of profession are suffering from pollution induced health issue such as cardiac diseases, asthma, and having treatment and certain have stopped profession because of advent diseases even before reaching 55 years of age. The findings is similar to the work of Ojolo et al., (2007), from findings show that asthmatic effects were very small 3% in Mushin area. This is due to the fact that the small buses plying this area are not usually overloaded which gives room for more air spaces inside the vehicles. Therefore, there are more spaces for the rapid diffusion of the emission from the vehicles.

In term of ergonomic hazards, respondents that strongly agreed and agreed that prolonged sitting may cause ergonomic hazard is more than the respondents that strongly disagreed and disagreed

that prolonged sitting may cause ergonomic hazards. The findings revealed that 86.7% of tricycle divers in the study area agree that prolonged sitting may cause ergonomics hazards among tricycle drivers. This show that Ergonomics hazards among the tricycle drivers was due to prolonged sitting and whole body vibration of the drivers over long hour of driving which may lead to musculoskeletal pain. However, it may be as a result of movement of tricycles on the bad or old road in most of our localities, also the existence of pothole, bumps along the roads which cause vibration on the body. The finding is similar with the result of Anupriya et al., (2018); the study revealed that 68.15% of the auto rickshaw drivers reported presence of one or more musculoskeletal symptoms and this was associated with age of the driver, years of driving and age of the vehicle. Also the finding is in line with the work of Omawumi et al., (2016), the findings revealed that 40% of the respondents reported that they always or often spent more than 8 hours per day as the regulated working hour limit. This indicated that the driver is exposed to high level of risk which could result in musculoskeletal problems, poor performance, injury and/or accident.

The result on the study of occurrence of accident/injury as presented in table 7 shows few of the respondents had an accident, while majority had no accidents. This shows that majority of tricycle drivers in study area had no accident when driving tricycle. It may be because most of them can identify road marking, signs and abide by the road safety rules. The study is in contrast with the findings of Amoran et al (2005) in Igbora which shows that 45.5% of the respondents have been involved in at least one accident in the preceding years. Also the finding is contrary with the work of Yunusa et al., (2014), shows that 66.7% of the respondents involved in road traffic accidents sustained bruises, 23.3% had laceration and 6.7% had fracture to the limb.

In order to show the prevalence hazards among the respondents, data on rate of accidents and eye irritation among the respondents were analyzed in table 8

4.3.4 Rate of accident/injury and eye irritation

Table 8 Distribution between rate of accidents and eye irritation

Rate of accident/injury	Do you feel eye irritation		Total
	Yes	No	
Fatal	1(50%)	1(50%)	2(100%)
Serious	0(0.0%)	2(100%)	2(100%)
Minor	2(18.2%)	9(81.8%)	11(100%)
Total	3(20%)	12(80%)	15(100%)

Table 8 shows the rate of accidents/injury and eye irritation, 50% of the participants with eye irritation had fatal and 50% of the participants with no eye irritation but had fatal accident, while 100% of the participants with no eye irritation but had serious accident and 0.0% with serious accident were none. 18.2 % with eye irritation and 81.8% had no eye irritation but with minor accidents. 20% of the participants with eye irritation and 80% with no eye irritation but had minor accidents. This indicated that rate of accident may not be determine by eye irritation. But those with eye problems or not may be through hereditary. The tricycle glass and eye goggle used by drivers may serve as protection instrument against dust and insect that may harm or enter their eyes which may result to accident/injury. Also it may occur due to reckless attitude and rough driving or overtaking at wrong side of the road.

4.4 Causes of occupational hazards associated with tricycle driving

In order to discuss about causes of occupational hazards among the respondents, the increase in the numbers of tricycle in the environment has lead to the increase in the number of traffic accident, as a result of reckless driving, violating the traffic rule and regulation, lack of proper training on driving, overloading and under age driving.

4.4.1 Causes of Occupational Hazards

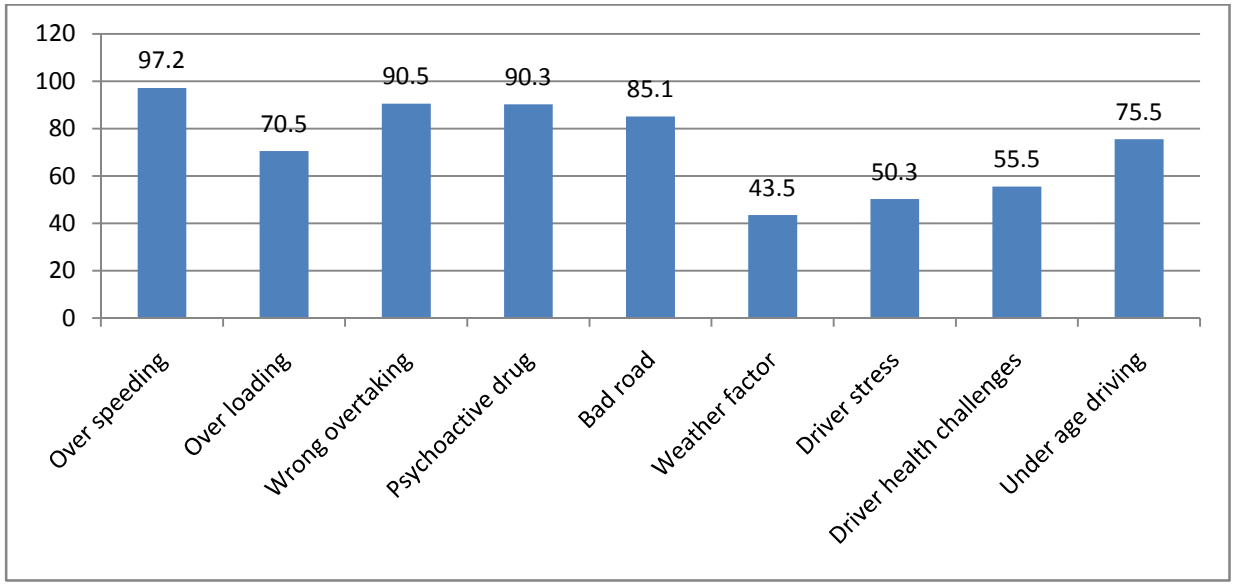

Figure 4.3 Causes of occupational hazard among tricycle drivers.

Figure 4.3 shows the responses on the causes of occupational hazards. It revealed that 97.2% of the respondents agreed that over speeding can cause hazard. 70.5% agreed that overloading can cause hazard as presented in plate (4.1). 90.5% of the respondents agreed that wrong overtaking can cause hazard, 90.3% of the respondents agreed that psychoactive drug can cause hazard, 85.1% agreed that bad road can also cause hazards and 43.5% agreed that weather factor can also cause hazard. However; 50.3% and 55.5% % of the respondents agreed that driver stress and driver health challenge respectively can also result to hazard. Lastly; 75.5% of the respondents

agreed that under age driving can cause hazard. The finding of the study indicated that 97.2% of the respondents agreed that over speeding, over loading of luggage and passengers by both side of the driver which is frequently among tricycle drivers and wrong overtaking, psychoactive drug, Reckless driving and bad/old road, driver's attitude, neglecting traffic rules and regulation and inexperience among the drivers may result to accidents or occupational hazard when driving. This survey is similar to work of Yunusa et al., (2014), from his findings shows that (69.9%) of the respondents were of the view that over speeding, bad road condition, reckless driving, use of psychoactive substance and lack of patience are the major causes of accidents among motorcyclists. Also the study is in line with the study of Jubrilla and Fashola (2017), the study revealed that over speeding 42% bad road 30% and recklessness 28% were the opinion made by the drivers. More also Chador et al., (2017), revealed that reckless driving 42%, drunkenness 16.1%, over speeding 8.4% and not giving the right way 13%.

Plate 4.1 Showing overloading of passengers

The responses of overloading of passengers and luggage account for 70.5% of the respondents agreed that overloading can cause hazards. This problem is persistence among the drivers especially overloading of passengers and luggage which was observed in the study area. This may causes accident of tricycles which will lead to injuries and even some cases death of drivers or passengers.

4.5 The effects of Tricycle driving on the Environment.

In order to discuss about the effect of tricycle driving in environment, the release and emission of tricycle smoke and noise pollution affect human health such as: eye redness, eye watering, breathlessness, coughing, intensifying asthma, and also affect ear drum as shown in plate (2). But due to introduction of 4 stroke tricycle engine had reduced the level of noise and smoke emitted into the environment, as majority of the tricycle had been converted to petrol engine which is environmental friendly compared to previous one which is two-stroke engines are older and known to produce more exhaust gas and noise pollution.

In the view to show the effect of tricycle driving on their health, the data on the effect of tricycle smoke, noise and breathlessness were analyzed in table 9

Table 9 Responses on the implication of tricycle on their health

Variables	Frequency	Percent
Do you feel tricycle smoke affect your health		
Yes	9	4.3
No	202	95.7
Total	211	100.0
Do you feel tricycle noise affect your health		
Yes	17	8.1
No	194	91.9
Total	211	100.0
Are you troubled by breathlessness		
Affected	14	6.6
Non affected	197	93.4
Total	211	100.0

The results on the effect of tricycle smoke on human health, as shown in table (9) revealed that 4.3% of the respondents feel the tricycle smoke, while 95.7% of the respondents are indifferent towards the tricycle smoke. But those that feel it said it causes eye redness with 33.3% of the respondent, while 22.2% of the respondents with eye watering. While 22.2% of the respondents sees it as an intensifying asthma and 22.2% of the respondents are in the view of causing coughing. This is an indication that majority of tricycle drivers in the study area were not affected with tricycle smoke. This could be as a result of introduction of 4 stroke tricycle engines which has low level smoke emission into the environment. The study is in line with the work of Hany et al., (2015), finding shows that 77.14% were not affected with air pollution. More also this findings is contrary with work of Satheesh (2016), findings indicated that 85 % of Auto-rickshaw drivers of ten years of profession suffers from any one pollution induced health issue such as cardiac diseases, asthma, etc and having treatment and certain have stopped profession because of advent diseases even before reaching 55 years of age.

The result on the effect of tricycle noise on human health, 8.1% of the respondents feel tricycle noise which disturb their hearing. While 91.9% of the respondents are indifferent towards the tricycle noise. This shows that majority of tricycle drivers in the study area did not feel tricycle noise. This could be as a result of introduction of 4 stroke tricycle engines which has low level noise. The study is in line with the work of Hany et al., (2015), finding shows that 83.80% were not affected with noise pollution.

Responses on breathing show that 6.6% of the respondents were troubled by breathing. While 93.4% of the respondent were not troubled by breathing. The finding of the study shows that majority of the tricycle drivers were not troubled by breathlessness. It may be due to low incidence of smoking and the type of machine being used among the tricycle drivers, especially

the use of 4 stroke tricycle engine which has low level pollution discharge. This study is similar with the findings of Debasish and Mitra (2017), which found that 7.14 % in 40-50 age groups of auto drivers were suffering from breathless. Also, the result contradicts with the work of Shubhankar and Animesh (2018), which shows that 28.7% were suffering from breathlessness. Also, Singh et al., (2015), reported that prevalence of breathlessness among auto rickshaw drivers shows that 13.18% of the drivers in Agra city were not suffering from breathless.

Source: Whatsapp

Plate 4.2 Showing traffic congestion of tricycles along a major road.

The plate 4.2 above shows the negative effects of traffic congestion on the drivers and the passengers in term of economic cost (fuel wasted) and emission of smoke and noise pollution which affects human health such as eye redness, eye watering coughing, ear drum, asthma and other respiratory illness. The traffic congestion may be caused by:

i. Too many cars for the roadway due to inadequate mass transit options.

ii. Obstacles in the road causing a blockage like double parking, lane closure due to the road work and accidents.

iii. Malfunctioning of traffic signals.

iv. Too many pedestrians crossing not permitting cars to turn and

v. Too many trucks on the road.

4.6 Awareness of Occupational Hazards among the Tricycle Drivers.

The result on the awareness of occupational hazard among the respondents, data on the high speed, lack of concentration, bad road, lack of experience, weather condition and wrong driving were analyzed in table (10), shows that public enlightenment, awareness and educational campaign and law enforcement strategies playing important roles in reduction of occupational hazards among tricycle drivers. It was discovered that most of the tricycle drivers were aware of the occupational hazards.

Table 10 Awareness of occupational hazards among tricycle drivers

High speed	Frequency	Percent
Yes	197	93.4
No	17	6.6
Total	211	100.0
Lack of concentration		
Yes	191	90.5
No	20	9.5
Total	211	100.0
Bad /old road		
Yes	194	91.9
No	17	8.1
Total	211	100.0
Lack of experience		
Yes	181	85.8
No	30	14.2
Total	211	100.0
Weather condition		
Yes	179	84.8
No	32	15.2
Total	211	100.0
Wrong driving		
Yes	193	91.5
No	18	8.5
Total	211	100.0

Table 10 presents the awareness of occupational hazards. Majority of the respondents were aware that high speed can cause hazard with 93.4%, while 6.6% were not aware. Also 90.5% of the respondents were aware that lack of concentration can cause hazard, While 9.5% were not

aware. 91.9% of the respondent were aware that bad/old road can cause hazard and remaining 8.1% were not aware. 85.8% of the respondent were aware that lack of experience can cause hazard, while 14.2% of the respondents were not aware. 84.8% of the respondent were aware that weather condition can cause hazard but 15.2% of them were not aware. 91.5% of the respondents were aware that wrong driving can cause hazard then 8.5% of the respondents were not aware. This shows that majority of tricycle drivers in the study area were aware about the possible causes of occupational hazard. It may be due to their level of education which play important role in understanding road safety rules and also enlightenment by the association especially during the organized weekly meeting. Emhaidy and Ahmad (2011), findings shows that a high percentage of participants were knowledgeable of wrong driving practices in which excessive speed have (100%), lack of attention (84%), incompliance with traffic regulations (68%), stunts (62%), and lack of experience (55%). Also the work of Ahmad and Yousuf (2015), shows that participant were aware about the following may cause accidents with high speed (96.1%), lack of attention (63%), fatigue (14.8%), no lighted road (59.3%), traffic system (81.5%), weather condition (44.4%), old road (77.8%), lack of experience (74.1%) and other reasons (76.7%) participants.

In orders to show the source of information among the respondents, the data on media, working experience, association and school were analyzed in table 11.

4.6.1 Sources of information

Table 11 Source of information

Variable					
If yes, what are the sources	Media (Radio, Television and Newspaper)	Working experience	Association	School	Total
Total	45(22.8%)	84(42.6%)	48(24.4%)	20(10.2%)	197(100%)

Table 11 presents the source of information for those that were aware about occupational hazard associated with tricycle driving. 22.8% of the respondents heard the information from the media (radio, television and newspaper), while 42.6% respondents from their working experience as tricycle drivers. Also 24.4% of the respondents heard the information from the tricycle drivers association, while 10.2% respondents heard it from school. This shows that majority of the information were source from the media, school, working experience and tricycle drivers association. This indicated that 42.6% of the drivers' agreed that working experience could be the way of sourcing the information about awareness on occupational hazards as a result of duration of years spent in driving tricycle.

4.7 Mitigation of the Hazards Discovered

Road traffic accidents among tricycle drivers are frequent because of reckless driving and bad or old road network in most of the areas. Therefore, there is need for public awareness campaigns on road safety education and also improving standard of road network across the localities. In order to mitigate the hazard, the law enforcement agencies such as (VIO, Kano road transport

agency and FRSC) need to collaborate so as to curb the problem of substance among tricycle drivers in our society and reduce the rate of accidents on Nigerian roads.

Figure 4.4 revealed that 73.5% of the respondents strongly agreed that providing and improving standard of road network by government, 20.9% of the respondent agreed that providing and improving standard of road network by government, while 5.2% strongly disagreed that providing and improving standard of road network by government and only 0.5% disagreed that providing and improving standard of road network by the government.

Figure 4.5 showed that 60.7% of the respondents strongly agreed that traffic education and awareness campaign should be encourage by the association, 30.8% of the respondents agreed that traffic education and awareness campaign should be encourage by the association, 7.1% strongly disagreed that traffic education and awareness campaign should be encourage by the association and 1.4% disagreed that traffic education and awareness campaign should be encouraged by the association.

Figure 4.6 showed that 63.5% of the respondent strongly agreed that formulating and enforcing law and policies on the use of road by tricycle drivers can reduce the occurrence of road accidents, 27.5% agreed that formulation, enforcing law and policies on the use of road by tricycle drivers can reduce the occurrence of road accidents, while 5.7% strongly disagreed and 3.3% disagreed that formulating and enforcing law and policies on the use of road by tricycle drivers can reduce the occurrence of road accidents. This shows that majority of tricycle drivers in the study area agreed with mitigation of the hazards with 94.4% of tricycle drivers agreed on the improving standard of road network by the government. While 91.5% of the tricycle drivers agreed that traffic education and awareness campaign by the association should be encouraged

and 91% of the tricycle drivers agreed that formulating and enforcing law and policy on the use of road by tricycle drivers can reduce the occurrence of road accident.

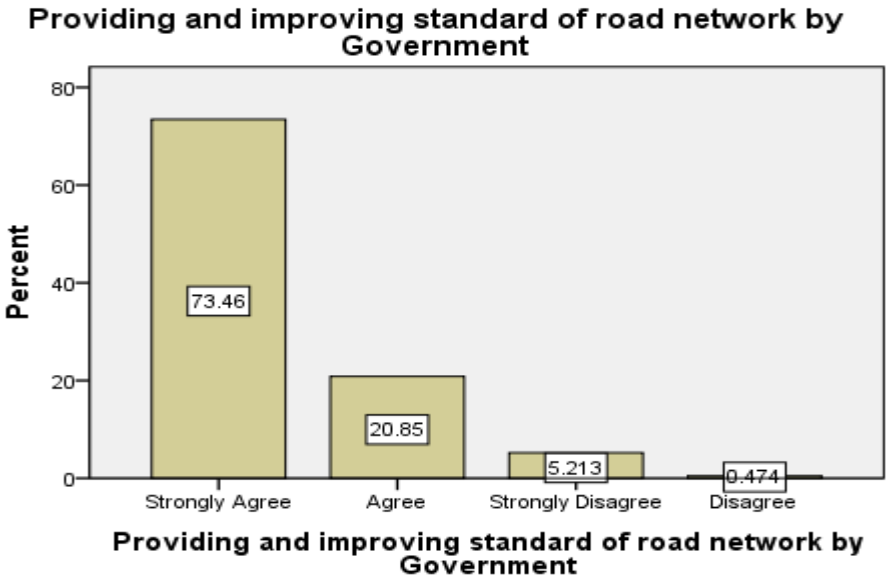

Figure 4.4 Mitigation of the hazards discovered.

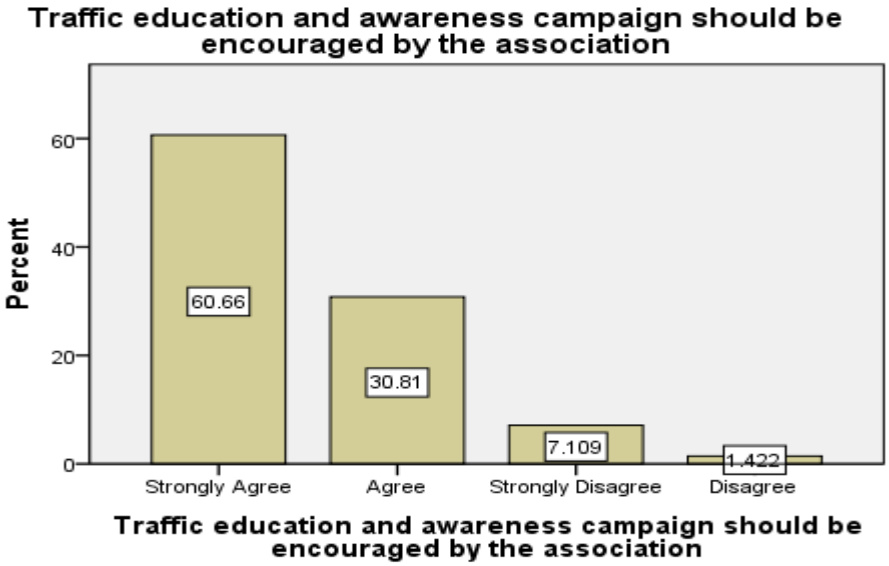

Figure 4.5 Mitigation of the hazards discovered.

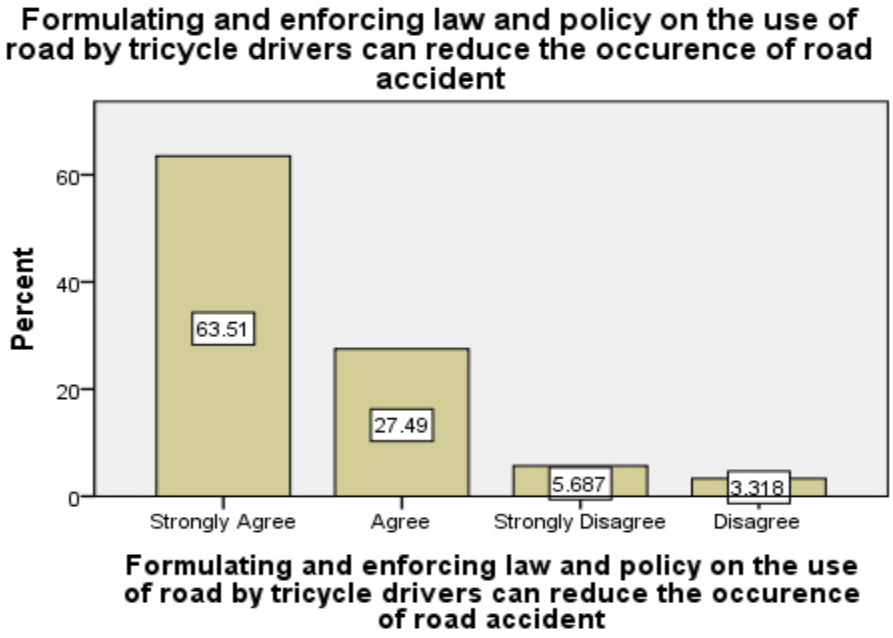

Figure 4.6 Mitigation of the hazards discovered.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter contains a summary of the proceeding chapters, conclusion reached from the findings of the study and recommendation have also been offered based on those findings.

5.2 Summary

Evaluation of occupational health hazards among tricycle drivers in Tarauni local Government area, Kano. This research examine the prevalent occupational hazards among tricycle drivers; reveal the major causes of occupational hazards among tricycle drivers; implication of tricycle driving in the environment; assess the awareness of tricycle drivers on occupational hazards and suggest the possible ways to minimize the causes of occupational hazards. Cross sectional survey method were used in sourcing the data (Questionnaire) from the tricycle drivers in the specified loading points.

The result from the analysis indicated that tricycle driving is highly dominated by male, Tricycle driving in particular is largely the job for the adults, it was also observed that no relationship exist between educational status and driving school attendance because the proportion of driving school attendance is low among different level of education. It is believed that married drivers were responsible men in the society because of strong relationship between working hours per day with marital status and working days and this resulted in their daily income earned and their by increase their level of risk which could result in musculoskeletal problem, poor performance, injury and or accidents. There is low incidence of diseases among the tricycle drivers because majority of tricycle driver did not known their health status and majority of them used 4 stroke

tricycle engines which are more fuel efficient compared to 2 stroke engines. They produce less smoke, less noise and are known to be environmentally friendly. From the findings it was observed that no relationship exist between rate of accident/injury and eye irritation.

In addition, Reckless driving, government attitude towards providing standards of road, driver's attitude, neglecting traffic rules and regulation and inexperience and under age driving may result to accidents or injury when driving. Educational campaign, public enlightenment and awareness have made the drivers to aware about the causes of occupational hazards. Finally, the result from the analysis revealed that improving standard of road network by the government, traffic education and awareness campaign by the association and formulation of law and policy on the road usage by the drivers.

5.3 Conclusion

The introduction of 4 stroke tricycle engine had reduced the incidence of pollution (noise and air) into the environment, especially the tricycle smoke which causes eye irritation among tricycle drivers had significantly reduced. The tricycle glass and eye goggle used by drivers may serve as protection against dust and any insect that may harm or enter their eyes, also hereditary play important role in determining eye irritation among the drivers.

Prolonged sitting and long term exposure to whole-body vibration and driving over bumps on roads and rough road surfaces had resulted to musculoskeletal problem especially back pain among tricycle drivers. The low rate of diseases is may be as a result of the drivers were not aware of their health status and most of them used 4 stroke tricycle engines which are more fuel efficient compared to 2 stroke engines. They produce less smoke, less noise and are known to be environmentally friendly.

The occurrence of accident or injuries was low and could be as a result of tricycle drivers having some level of knowledge and awareness, and also abide by the law and policy on traffic. Ergonomics hazards among the tricycle drivers was due to the drivers being exposed to high risk of prolonged sitting and whole body vibration of the drivers over long hour of driving which may lead to musculoskeletal pain.

Prominent cause's occupational hazard was wrong overtaking, over speeding, overloading, psychoactive drug, bad road, drivers stress, and driver's health challenge and under age driving. This has made tricycle driver susceptible to injuries and accidents. In the same vein, Public enlightenment, awareness and educational campaign among tricycle drivers in the study area has lead to the reduction of tricycle accidents on the road. The tricycle drivers were aware that high speed can cause occupational hazard. Lastly, the occurrence of road traffic accidents has lead to creating of road traffic regulation, public enlightenment and awareness campaign as well as improving standard of road network across the localities.

5.4 Recommendation

In the light of this research, the following recommendations have been made towards the major findings on the evaluation of occupational health hazards among tricycle drivers.

Government is the strongest responsible institution to initiate, encourage and enforce positive changes into tricycle occupation. In order to ensure good health condition of tricycle drivers in the study area.

The following recommendations are made:

i. Government should ensure the provision of good roads network across the localities and rehabilitate and maintain the old one's from time to time. Also it should intensify traffic education and awareness campaign to the tricycle drivers on road safety measures by road transport authorities.

ii. Regular monitoring of the activities of tricycle drivers to ensure that they abide with safety measures such as use of personal protective equipment (goggle), abiding to road signs and symbols and maintaining speed limits.

iii. It is recommended that the drivers should further to higher institution and making driving schools compulsory so that driving license holders will have a full knowledge of traffic rules

iv. Government and association should provide good healthcare facilities for the tricycle drivers in case of accident/injury.

v. The association should encourage regular examination and medical checkup in hospital so as to know their health status especially HIV/AIDS.

vi. It is recommended that most participants were knowledgeable of wrong driving behaviors; government agencies such as (KAROTA, FRSC, and VIO) should increase the efforts to enforce traffic regulations especially over speeding, and the usage of mobile phones while driving.

vii. In addition, both the government and tricycle union should carry out appropriate sanctions against overloading.

viii. Introducing of electric tricycles by the government and encourage the use of four stroke tricycle engine for public transportation should be encouraged as this will reduce the emission of toxic substances into the atmosphere.

ix. Age restriction of tricycle drivers especially under age driving should be abolished to avoid tricycle accidents.

x. It is recommended that the tricycle drivers should further their education up to tertiary institution and also attend driving school.

xi. Improving tricycle design and structure (seat design, steering wheel design etc) and a little more comfortable space for passengers in order to prevent prolonged strain from riding the tricycle. Also door should be created on both side of the tricycle will protect the drivers and passengers especially during the rainy season.

xii. Government and the association should tries to seek out information on how to improve the working condition by organizing seminar, education programmes and ergonomics intervention so as to ensure that workers remain healthy.

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APPENDIX I

QUESTIONNAIRE ON EVALUATION OF OCCUPATIONAL HEALTH HAZARD AMONG TRICYCLE DRIVERS IN TARAUNI LOCAL GOVERMENT AREA, KANO

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT,

FACULTY OF EARTH AND ENVIRONMENTAL SCIENCE,

BAYERO UNIVERSITY, KANO.

Dear Sir/Madam

I am IbrahimTaofik Ahmad, with registration number: SPS/17/MEV/00050, studying Msc. Environmental Management in Bayero University, Kano. This questionnaire will be administered as part of my Dissertation at the university. It aims to obtain relevant information on occupational hazards among tricycle driver(s). You are hereby requested to go through the questions and answer them carefully in the space provided. All the information kindly obtained from you will be given maximum confidentiality and will only be used for the purpose of this study. I would be most grateful if you could spare some minutes to respond or complete this questionnaire for me.

Thank you.

Section: A

Instructions: Choose only one appropriate option and thick. You will be notified in situations where you are required to select multiple options.

Background Information of the Respondents

1. Gender: Male { } Female { }
2. Age of respondent: (a) 19-29 { } (b) 30-39 { }(c) 40-49(d) 50-59 { }(e) 60 and above { }
3. Marital status: (a) Single { }(b) Married { } (c) Divorced { } (d) Widow { }
4. Educational status: (a) never attended { }(b) primary { } (c) Secondary { }(d) Tertiary { } (d) Qur'anic school { }.
5. Have you attended driving school: (a) Yes { } (b) No { }
6. Working hours per-day: (a) 1-4 { }(b) 5-8 { }(c) 8 and above { }
7. Working days per week: (a) 1 day { }(b) 2-3days { }(c) 4-5days { }(d) 6-7days { }
8. Daily income earned: (a) less than ₦2000 { }(b) ₦ 2000-₦ 4000 { }(c) ₦4000 and above { }
9. For how long have you been driving? (a) >3 years { } (b) 3-5 years { } (c) 6-9 years {}(d) 9 and above { }

Section: B

Prevalence Hazards

1. Do you feel eye irritation? Yes { } No { }

2. Which of these symptoms do you experience?

Back pain { }

Neck pain { }

Shoulder pain { }

Elbow { }

Hand { }

Knee pain { }

Wrist { }

3. Do you have any of the following diseases?

S/N	Diseases	Affected	Non Affected
A	Blood pressure		
B	Cardiovascular diseases		
C	Asthma		
D	Cancer		
E	Diabetes		
F	HIV/AID		

4. Others specify? ----------

5. Within last two or one year have you had an accident or injury when driving? Yes { }

No { }

6. How serious was it?

(a) Fatal

(b) Serious

(c) Minor

7. Prolonged sitting may cause ergonomics hazards because of heavy traffic?

(a) Strongly Agree { } (b) Agree { } (c) Strongly Disagree{ } (d) Disagree{ }

Section C

Cause of Occupational Hazards.

8. What do you think is the major causes of occupational hazard?

- Over speeding { }
- Overloading { }

- Wrong overtaking { }
- Drunkenness { }
- Bad /old road { }
- Weather factor { }
- Drivers stress { }
- Driver health challenges { }
- Under age driving { }
- Other specify { }

Section: **D**

Implication of Tricycle Driving on Environment

9. Do you feel tricycle smoke affect your health? Yes { } No { }

10. If yes, how? _____

11. Do you feel tricycle noise affect your health? Yes { } No { }

12. If yes, how? _____

13. Are you troubled by breathlessness? Yes { } No { }

Section: E

Awareness of Occupational Hazards among Tricycle Drivers.

14. Are you aware the following can cause hazards?

Awareness	Yes	No
High speed		
Lack of concentration		
Bad or old road		
Lack of experience		
Weather condition		
Wrong driving		

15. If yes, what is the source of information? ----------

Section: F

Mitigate the Hazards Discovered

16. Providing and improving standard of road network by the Government? (a) Strongly Agree (b) Agree (c) Strongly Disagree (d) Disagree.

17. Traffic education and awareness campaign should be encouraged by the association? (a) Strongly Agree (b) Agree (c) Strongly Disagree (d) Disagree.

18. Formulating and enforcing of law and policy on the use of roads by tricycle drivers can reduce occurrence of road accidents? (a) Strongly Agree (b) Agree (c) Strongly Disagree (d) Disagree.

APPENDIX II

Cross tabulation of working hours per day with marital status and working days

Working hours per day with marital status		Working days				Total
1-4		1 day	2-3 days	4-5 days	6-7 days	
	Single	5(38.5%)	3(23.1%)	1(7.7%)	4(30%)	13(100%)
	Married	2(33.3%)	0(0.0%)	0(0.0%)	4(66.7%)	6(100%)
	Divorced	1(100%)	0(0.0%)	0(0.0%)	0(0.0%)	1(100%)
	Widowed					
Total		8(40%)	3(15%)	1(5%)	8(40%)	20(100%)
Working hours per day with marital status			Working days			total
5-8		1 day	2-3 days	4-5 days	6-7 days	
	Single	3(9.4%)	5(15%)	1(3.1%)	23(71.9%)	32(100%)
	Married	0(0.0%)	15(30%)	7(14%)	28(56%)	50(100%)
	Divorced	0(0.0%)	0(0.0%)	0(0.0%)	1(100%)	1(100%)
	Widowed	0(0.0%)	0(0.0%)	0(0.0%)	1(100%)	1(100%)
Total		3(3.6%)	20(23.8%)	9(10.7%)	52(61.9%)	84(100%)
Working hours per			Working days			total

day with marital status						
1-4		1 day	2-3 days	4-5 days	6-7 days	
	Single	8(12.3%)	8(12.3%)	3(4.6%)	46(70.8%)	65(100%)
	Married	3(2.2%)	23(16.9%)	12(8.8%)	98(72.1%)	136(100%)
	Divorced	1(33.3%)	0(0.0%)	0(0.0%)	2(66.7%)	3(100%)
	Widowed	0(0.0%)	0(0.0%)	3(42.9%)	4(57.1%)	7(100%)
Total		12(5.7%)	31(14.7%)	18(8.5%)	150(71.1%)	211(100%)

Cross tabulation of working hours per day with symptoms experience and daily income

Working hours per day with Back pain		**Daily income earned**				**Total**
1-4		% within back pain	Less than 2000	2000-4000	4000 and above	
1-4	Unchecked		7(77.8%)	2(22.2%)		9(100%)
	Checked		6(54.5%)	5(45.5%)		11(100%)
	Total		13(65%)	7(35%0		20(100%)
5-8	Unchecked		1(9.1%)	8(72.7%)	2(18.2%)	11(100%)
	Checked		22(30.1%)	49(67.1%)	2(2.7%)	73(100%)

	Total		23(27.1%)	57(67.9%)	4(4.8%)	84(100%)
8 and above	Unchecked		0(0.0%)	5(33.3%)	10(66.7%)	15(100%)
	Checked		28(30.4%)	46(50.1%)	18(19.6%)	92(100%)
	Total		28(30.8%)	51(47.7%)	28(26.2%)	107(100%)
Total	Unchecked		8(22.9%)	15(42.9%)	12(34.3%)	35(100%)
	Checked		56(31.8%)	100(56.8%)	20(11.4%)	176(100%)
	Total		64(30.3%)	115(54.5%)	32(15.2%)	211(100%)
Working hours per day with Neck pain			Daily income earned			Total
1-4		% within neck pain	Less than 2000	2000-4000	4000 and above	
1-4	Unchecked		5(62.5%)	3(37.5%)		8(100%)
	Checked		8(66.7%)	4(33.4%)		12(100%)
	Total		13(65%)	7(35%)		20(100%)
5-8	Unchecked		5(21.7%)	16(69.6%)	2(8.7%)	23(100%)
	Checked		18(29.5%)	41(67.2%)	2(3.3%)	61(100%)
	Total		23(27.4%)	57(69.7%)	4(4.8%)	84(100%)
8 and above	Unchecked		0(0.0%)	12(48%)	13(52%)	25(100%)
	Checked		28(34.1%)	39(47.6%)	15(18.3%)	82(100%)

	Total		28(26.2%)	51(55.4%)	15(26.8%)	56(100%)
Total	Unchecked		10(17.9%)	31(55.4%)	15(26.8%)	56(100%)
	Checked		54(34.8%)	84(54.2%)	17(11%)	155(100%)
	Total		64(30.3%)	115(54.5%)	32(15.2%)	211(100%)
Working hours per day with shoulder pain			Daily income earned			Total
1-4		% within shoulder pain	Less than 2000	2000-4000	4000 and above	
1-4	Unchecked		6(75%)	2(25%)		8(100%)
	Checked		7(58.3%)	5(41.7%)		12(100%)
	Total		13(65%)	7(35%)		20(100%)
5-8	Unchecked		9(28.1%)	23(71.9%)	0(0.0%)	32(100%)
	Checked		14(26.9%)	34(65.4%)	4(7.7%)	52(100%)
	Total		23(27.4%)	57(67.9%)	4(4.8%)	84(100%)
8 and above	Unchecked		5(16.1%)	11(35.5%)	15(48.4%)	31(100%)
	Checked		23(30.3%)	40(52.6%)	13(17.1%)	76(100%)
	Total		28(26.2%)	51(47.7%)	28(26.2%)	107(100%)
Total	Unchecked		20(28.2%)	36(50.7%)	15(21.1%)	71(100%)

	Checked		44(31.4%)	79(56.4%)	17(12.1%)	140(100)
	Total		64(30.2%)	115(54.5%)	32(15.2%)	211(1005)
Working hours per day with hand/wrist pain		Daily income earned				Total
1-4		% within hand/wrist pain	Less than 2000	2000-4000	4000 and above	
1-4	Unchecked		2(33.3%)	4(66.7%)		6(100%)
	Checked		11(78.6%)	3(21.4%)		14(100%)
	Total		13(65%)	7(35%)		20(100%)
5-8	Unchecked		5(23.8%)	14(66.7%)	2(9.5%)	21(100%)
	Checked		18(28.6%)	43(68.3%)	2(3.2%)	63(100%)
	Total		23(27.4%)	57(67.9%)	4(4.8%)	84(100%)
8 and above	Unchecked		3(12%)	9(36%)	13(52%)	25(100%)
	Checked		25(30.5%)	42(51.2%)	15(18.3%)	82(100%)
	Total		28(26.2%)	51(47.7%)	28(26.2%)	107(100%)
Total	Unchecked		10(19.2%)	27(51.9%)	15(28.8%)	52(100%)
	Checked		54(34%)	88(55.3%)	17(10.7%)	159(100%)
	Total		64(30.4%)	115(54.5%)	32(15.2%)	211(100%)

Working hours per day with knee pain		Daily income earned			Total
		% within knee pain	Less than 2000	2000-4000	4000 and above	
1-4	Unchecked		9(60%)	6(40%)		15(100%)
	Checked		4(80%)	1(20%)		5(100%)
	Total		13(65%)	7(35%)		20(100%)
5-8	Unchecked		14(29.2%)	31(64.6%)	3(6.2%)	48(100%)
	Checked		9(25%)	26(72.2%)	1(2.8%)	36(100%)
	Total		23(27.4%)	57(67.9%)	4(4.8%)	84(100%)
8 and above	Unchecked		8(13.1%)	33(54.1%)	20(32.8%)	61(100%)
	Checked		20(43.5%)	18(39.1%)	8(17.4%)	46(100%)
	Total		28(26.2%)	51(47.7%)	28(26.2%)	107(100%)
Total	Unchecked		31(25%)	70(56.5%)	23(18.5%)	124(100%)
	Checked		33(37.9%)	45(51.7%)	9(10.3%)	87(100%)
	Total		64(30.3%)	115(54.5%)	32(15.2%)	211(100%)
Working hours per day with elbow		Daily income earned				Total

pain						
		% within elbow pain	Less than 2000	2000-4000	4000 and above	
1-4	Unchecked		7(53.8%)	6(46.2%)		13(100%)
	Checked		6(85.7%)	1(14.3%)		7(100%)
	Total		13(65%)	7(35%)		20(100%)
5-8	Unchecked		10(23.3%)	32(74.4%)	1(2.3%)	43(100%)
	Checked		13(31.7%)	25(61%)	3(7.3%)	41(100%)
	Total		23(27.4%)	57(67.9%)	4(4.8%)	84(100%)
8 and above	Unchecked		6(12.5%)	27(56.2%)	15(31.2%)	48(100%)
	Checked		22(37.3%)	24(40.7%)	13(22%)	59(100%)
	Total		28(26.2%)	51(47.7%)	28(26.2%)	107(100%)
Total	Unchecked		23(22.1%)	65(62.5%)	16(15.4%)	104(100%)
	Checked		41(38.3%)	50(46.7%)	16(15%)	107(100%)
	Total		64(30.3%)	115(54.5%)	32(15.2%)	211(100%)