

CHAPTER ONE

INTRODUCTION

Background of the Study

Carbon monoxide (CO) is a colourless, odourless gas that is produced by the incomplete combustion of carbon-containing fuels such as gasoline, natural gas, and wood. It is a toxic gas that can cause serious health effects when inhaled, particularly in high concentrations. When carbon monoxide is inhaled, it enters the bloodstream and binds to hemoglobin, the protein responsible for carrying oxygen from the lungs to the rest of the body. This binding reduces the amount of oxygen that can be carried in the blood, leading to hypoxia, or a lack of oxygen in the tissues. Symptoms of carbon monoxide poisoning include headache, dizziness, nausea, confusion, and difficulty breathing. In severe cases, carbon monoxide poisoning can result in loss of consciousness, seizures, and even death.

Incomplete combustion of fossil fuels leads to the release of carbon monoxide into the atmosphere, which is a pollutant that affects the quality of the entire atmosphere. This, in turn, affects all living things that depend on air for respiration (Ewing, 2015). Carbon monoxide emissions from the exhaust of motor vehicles such as buses and cars have a negative effect on passengers and people that commute using this means of transportation. Exposure to these emissions either, for a short or long period, interferes with the circulation of oxygen in the human body. Cadle (2020) reported death from professional drivers in London due to stomach and lung cancer (Lorry drivers), raised mortality rates from bladder.

Commercial drivers are individuals who operate large vehicles such as trucks, buses, and vans for a living. These drivers spend long hours on the road and are exposed to various environmental factors, including vehicle emissions such as carbon monoxide (CO). Knowledge of carbon monoxide and its effects on commercial drivers is crucial for ensuring their safety and well-being. Carbon monoxide is a toxic gas that can cause serious health effects when inhaled, particularly in high concentrations. It can lead to symptoms such as headache, dizziness, nausea, confusion, and difficulty breathing, which can impair a driver's ability to operate a vehicle safely. Commercial drivers may be at increased risk of carbon monoxide exposure due to the nature of their work. For example, long hours spent driving in heavy traffic or idling in congested urban areas can lead to increased levels of CO being released from other vehicles. In addition, poorly maintained vehicles or faulty exhaust systems can result in higher levels of carbon monoxide being present in the cabin of the vehicle. To mitigate the risks associated with carbon monoxide exposure, commercial drivers should be educated about the sources of CO in their environment, the symptoms of carbon monoxide poisoning, and the steps they can take to minimize their exposure. This may include regular maintenance of vehicles to ensure proper functioning of the exhaust system, avoiding idling in enclosed spaces, and installing carbon monoxide detectors in the cabin of the vehicle. Employers of commercial drivers have a responsibility to provide training and resources to help drivers understand the dangers of carbon monoxide exposure and how to protect themselves (Vaughan, 2022). This may include implementing policies and procedures for vehicle maintenance, providing personal protective equipment such as carbon monoxide detectors, and promoting awareness of the signs and symptoms of carbon monoxide

poisoning. Overall, knowledge of carbon monoxide and its effects on commercial drivers is essential for promoting a safe and healthy work environment for these individuals. By raising awareness and taking proactive measures to prevent carbon monoxide exposure, employers and drivers can work together to reduce the risks associated with this toxic gas (Ogunleye, & Akinoso, 2016).

Passengers in a vehicle can be at risk of carbon monoxide poisoning if there is a leak in the exhaust system or if the car is idling in an enclosed space such as a garage. In these situations, carbon monoxide can build up to dangerous levels, especially if the ventilation system is not functioning properly. Children, the elderly, and individuals with pre-existing health conditions are particularly vulnerable to the effects of carbon monoxide poisoning (Nicolaidou, & Philippou, 2023).

Statement of the Problem

Air pollution is the largest single environmental health risk, resulting in three million premature deaths a year in the world (WHO, 2016). Many commercial bus drivers may not be well-informed about the health impact of carbon monoxide exposure, leading to potential health risks due to negligence. Also, commercial bus drivers may not receive adequate training on how to prevent or mitigate the risk of carbon monoxide exposure, increasing the likelihood of health issues among this group, there may be a lack of regular monitoring or testing for carbon monoxide levels in commercial buses, leaving drivers unaware of potential exposure to this harmful gas.

Commercial bus drivers may not have easy access to information or resources to learn about the health impact of carbon monoxide and how to protect themselves from it, some drivers may underestimate the potential health impact of carbon monoxide exposure, leading to a lack of necessary precautions or preventative measures being taken. There may be inadequate enforcement of safety regulations related to carbon monoxide exposure in commercial buses, putting drivers at a higher risk of health issues. Therefore, this study seek to investigate the perceived knowledge of the health impact of carbon monoxide among commercial bus drivers in Egor Local Government Area of Edo State.

Research Question

The following research question were raised to guide the study

1. What is the level of knowledge of commercial bus drivers regarding the health impact of carbon monoxide exposure?
2. Are commercial bus drivers adequately trained on how to prevent the health risks associated with carbon monoxide exposure?
3. Do commercial bus drivers have access to resources and information on the health impact of carbon monoxide?
4. What are the way in which commercial bus drivers prevent the carbon monoxide exposure while driving?

Purpose of the Study

The purpose of this study is to investigate the perceived knowledge of the health impact of carbon monoxide among commercial bus drivers in Egor Local Government Area of Edo State.

Specifically, the study is to find out.

1. the level of knowledge of commercial bus drivers regarding the health impact of carbon monoxide exposure.
2. established whether commercial bus drivers are adequately trained on how to prevent the health risks associated with carbon monoxide exposure.
3. determine how commercial bus drivers have access to resources and information on the health impact of carbon monoxide.
4. Find out the ways in which commercial bus drivers prevent the carbon monoxide exposure while driving.

Significance of the Study

Findings from this study would be of immense benefit to commercial drivers, passenger and society

Commercial drivers and their passengers will be the main beneficiaries of increased knowledge about the health dangers of carbon monoxide. By understanding the risks associated with exposure to this toxic gas, drivers can take steps to prevent potentially harmful situations, such as avoiding running vehicles in enclosed spaces or regularly checking for leaks in their vehicles'

exhaust systems. Ultimately, increased awareness of carbon monoxide's health effects can help protect the well-being of commercial drivers and everyone else on the road.

The study will be of benefit to other researchers in the related interested are of this topic.

Scope and Delimitation of the Study

This study focused on role of social studies in promoting entrepreneurship among undergraduates a case study of the university of Benin. The study is delimited to university of Benin students, Benin City, Edo State.

Definition of Terms

The following terms were operational defined as used in the study

Perceived Knowledge: This refers to the level of understanding or awareness that an individual has about a particular subject or topic

Carbon monoxide (CO): This is a colourless, odourless gas that is produced by the incomplete combustion of carbon-containing fuels such as gasoline.

Health Impact: This are changes in health resulting from exposure to a source such as Carbon monoxide (CO).

Commercial Drivers: commercial driver is a driver licensed to operate vehicles classified as commercial vehicles.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

This chapter deals with the review of related literature based on awareness and the impact of recycling in preserving the environment.

Therefore, this study would be examined under the following sub-headings

- Concept of Carbon Monoxide
- Carbon Monoxide and Health
- Knowledge Regarding the Health Impact of Carbon Monoxide Exposure
- Adequacy of Training in Preventing Health Risks Associated with Carbon Monoxide Exposure
- Availability of Resources and Information for Commercial Bus Drivers on The Health Impact of Carbon Monoxide
- Preventing Carbon Monoxide Exposure: Strategies for Commercial Bus Drivers
- Summary of Literature Review

Concept of Carbon Monoxide

Carbon monoxide is a colourless, odourless gas that is produced by the incomplete combustion of carbon-containing fuels such as wood, gasoline, coal, and natural gas. It is a highly toxic gas that can cause serious health problems when inhaled in high concentrations. Carbon monoxide is formed when carbon-containing fuels are burned in a limited supply of oxygen, resulting in incomplete combustion. This gas is a byproduct of many common household appliances such as furnaces, water heaters, stoves, and fireplaces (WHO, 2016a). It can also be produced by vehicles, generators, and industrial processes. In indoor environments, carbon monoxide can accumulate to dangerous levels if proper ventilation is not maintained.

(Sharmilaa, & Ilango, 2022) the health effects of carbon monoxide poisoning can vary depending on the concentration and duration of exposure. At low levels, symptoms may include headaches, dizziness, nausea, and fatigue. At higher levels, carbon monoxide can lead to more serious symptoms such as chest pain, confusion, and unconsciousness. Prolonged exposure to high levels of carbon monoxide can be fatal. One of the most dangerous aspects of carbon monoxide is its ability to bind to haemoglobin in the blood, reducing the amount of oxygen that can be transported to vital organs and tissues. This can lead to tissue damage and eventually death if exposure is not addressed promptly. Additionally, carbon monoxide can also interfere with the function of other enzymes and molecules in the body, further contributing to its toxic effects.

Preventing carbon monoxide exposure is essential to protecting the health and safety of individuals. Regular maintenance of household appliances, proper installation of fuel-burning

devices, and adequate ventilation are key steps in reducing the risk of carbon monoxide poisoning. Carbon monoxide detectors are also recommended to provide early warning of dangerous levels of this gas in indoor spaces. Carbon monoxide is a colourless, odourless, and tasteless gas that is produced by incomplete combustion of carbon-containing fuels such as gasoline, natural gas, and wood (Odonkor & Mahami, (2020). It is a common air pollutant and can be extremely dangerous to human health.

Sources of Carbon Monoxide

Carbon monoxide is produced by the incomplete combustion of carbon-containing fuels. Common sources of carbon monoxide include vehicle exhaust, industrial processes, and residential heating systems. In homes, carbon monoxide can be produced by gas appliances such as stoves, furnaces, and water heaters if they are not properly maintained or ventilated. Other sources of carbon monoxide include tobacco smoke and wildfires (Kadiyala & Kumar, 2017).

Effects on Health

Carbon monoxide is a poisonous gas that can have serious health effects on humans. When inhaled, carbon monoxide binds to haemoglobin in the blood, reducing the amount of oxygen that can be transported to vital organs and tissues. This can lead to symptoms such as headache, dizziness, weakness, confusion, nausea, and eventually, death. Prolonged exposure to low levels of carbon monoxide can also cause long-term health problems such as heart disease and neurological damage.

According to the Centers for Disease Control and Prevention (CDC), carbon monoxide poisoning is responsible for an estimated 400 deaths and 4,000 emergency room visits in the United States each year. The most at-risk populations for carbon monoxide poisoning are infants, children, pregnant women, elderly individuals, and individuals with pre-existing health conditions such as heart disease or respiratory problems.

Preventing Exposure

There are several ways to prevent exposure to carbon monoxide and reduce the risk of poisoning. One of the most important steps is to install carbon monoxide detectors in your home. These devices can alert you to the presence of carbon monoxide before it reaches dangerous levels. It is recommended to have at least one carbon monoxide detector on each level of your home, including the basement and near sleeping areas. In addition to installing carbon monoxide detectors, it is important to properly maintain and ventilate gas appliances in your home. Make sure that gas appliances are installed and serviced by a qualified professional and that vents and chimneys are clear of obstructions. It is also important to never use gasoline-powered engines or generators indoors, as they can produce high levels of carbon monoxide (Mohd-Firdaus & Juliana, 2016). Carbon monoxide is a dangerous gas that can have serious health effects on humans. It is important to be aware of the sources of carbon monoxide and take steps to prevent exposure in order to protect yourself and your loved ones. By installing carbon monoxide detectors, properly maintaining gas appliances, and following safety precautions, you can reduce the risk of carbon monoxide poisoning and ensure a safe and healthy environment for you and

your family. Carbon monoxide is a deadly gas that can pose serious health risks if proper precautions are not taken. Understanding the sources and health effects of carbon monoxide is crucial in preventing exposure and mitigating its toxic effects. By following best practices for gas appliance maintenance, ventilation, and detection, individuals can reduce the risk of carbon monoxide poisoning and protect themselves and their families from this silent killer.

Carbon Monoxide and Health

Etim,(2016) Carbon monoxide (CO) is a colourless, odourless gas that is produced during the incomplete combustion of carbon-containing materials such as wood, gasoline, coal, and natural gas. It is a highly toxic gas that can cause serious health problems when inhaled in high concentrations. Carbon monoxide can be produced by a variety of sources, both indoors and outdoors. Common indoor sources include gas furnaces, water heaters, stoves, fireplaces, and generators. Vehicle exhaust is a major outdoor source of carbon monoxide, particularly in densely populated urban areas. Industrial processes such as manufacturing and coal burning can also release significant amounts of carbon monoxide into the environment. When inhaled, carbon monoxide can interfere with the body's ability to deliver oxygen to cells, tissues, and organs. The gas binds to haemoglobin in the blood, forming carboxyhaemoglobin, which reduces the amount of oxygen that can be transported in the bloodstream. This can lead to a variety of health effects, including: Headaches, Dizziness, Nausea, Fatigue, Chest pain, Confusion, Unconsciousness and Death

Prolonged exposure to high levels of carbon monoxide can result in severe neurological damage, cardiovascular problems, and even death. Vulnerable populations such as children, elderly individuals, and individuals with pre-existing respiratory or cardiovascular conditions are at a higher risk of experiencing adverse health effects from carbon monoxide exposure (Dhanvijay, & Pohekar, 2021).

Carbon monoxide can have serious health effects on humans when inhaled, as it interferes with the body's ability to transport oxygen to vital organs and tissues. In this essay, we will explore the impact of carbon monoxide on human health, including its sources, health effects, and ways to prevent exposure. We will also review current research and studies on the topic to provide a comprehensive understanding of the issue.

Carbon monoxide is primarily produced by the combustion of carbon-containing fuels such as gasoline, natural gas, wood, and coal. Common sources of carbon monoxide in the environment include vehicle exhaust, industrial processes, and residential heating systems. In homes, carbon monoxide can be emitted by gas appliances like stoves, furnaces, and water heaters if they are not properly maintained or vented. Other sources of carbon monoxide exposure include tobacco smoke, wildfires, and indoor air pollution.

The health effects of carbon monoxide poisoning can range from mild symptoms to severe complications, depending on the level and duration of exposure. When inhaled, carbon monoxide binds to haemoglobin in the blood more readily than oxygen, forming carboxyhaemoglobin. This

reduces the amount of oxygen that can be transported in the bloodstream, leading to tissue hypoxia and cellular damage.

Acute symptoms of carbon monoxide poisoning can include headache, dizziness, weakness, nausea, confusion, and chest pain. In severe cases, carbon monoxide poisoning can result in loss of consciousness, coma, and death. Prolonged exposure to low levels of carbon monoxide can lead to chronic health conditions such as heart disease, neurological disorders, and cognitive impairment.

According to the Centers for Disease Control and Prevention (CDC), carbon monoxide poisoning is responsible for an estimated 50,000 emergency department visits and over 400 deaths annually in the United States. Infants, children, pregnant women, elderly individuals, and individuals with pre-existing health conditions are particularly vulnerable to the effects of carbon monoxide exposure.

Preventing exposure to carbon monoxide is essential to protect human health and well-being. One of the most effective measures is to install carbon monoxide detectors in residential and commercial buildings. These devices can detect the presence of carbon monoxide at levels that may pose a risk to occupants, triggering an alarm to alert individuals to evacuate the premises.

In addition to installing carbon monoxide detectors, it is important to properly maintain and inspect gas appliances, heating systems, and combustion equipment on a regular basis. Ensure that vents, flues, and chimneys are clear of obstructions and functioning properly to prevent the buildup of carbon monoxide indoors. Never use portable generators, charcoal grills, or other

combustion devices inside enclosed spaces, as they can produce high levels of carbon monoxide. Carbon monoxide is a toxic gas that poses a significant threat to human health when inhaled. It is crucial to be aware of the sources of carbon monoxide and take proactive measures to prevent exposure in order to safeguard individuals from the harmful effects of carbon monoxide poisoning (Dhanvijay, & Pohekar, 2021). By implementing safety precautions such as installing carbon monoxide detectors, maintaining gas appliances, and promoting ventilation practices, we can mitigate the risks associated with carbon monoxide exposure and create a safer living environment for all. Further research and education on carbon monoxide and its impact on human health are needed to raise awareness and facilitate preventive measures in communities worldwide. By working together to address the dangers of carbon monoxide and promote public health initiatives, we can reduce the incidence of carbon monoxide poisoning and protect the well-being of individuals and families for generations to come.

carbon monoxide is a silent but deadly gas that poses a significant risk to human health. Understanding the sources, health effects, and prevention strategies for carbon monoxide exposure is crucial for safeguarding against its toxic effects. By taking proactive steps to reduce exposure to carbon monoxide, individuals can protect themselves and their loved ones from the potentially devastating consequences of this poisonous gas.

Knowledge Regarding the Health Impact of Carbon Monoxide Exposure

Commercial bus drivers are exposed to various occupational hazards, including air pollution from vehicle emissions. One of the most concerning pollutants is carbon monoxide (CO), a colorless and odorless gas that can have serious health effects on individuals exposed to

high levels. It is important for commercial bus drivers to have a good understanding of the health impact of CO exposure in order to protect themselves and their passengers (Kales, 2015). Carbon monoxide is a toxic gas that is produced by the incomplete combustion of carbon-containing fuels, such as gasoline, diesel, and natural gas. Inhaling CO can interfere with the body's ability to transport oxygen through the bloodstream, leading to a range of health effects. Acute exposure to high levels of CO can result in symptoms such as headache, dizziness, nausea, and confusion. Prolonged exposure to moderate levels of CO can lead to more serious health issues, including cardiovascular problems, neurological disorders, and even death (National Institution for Occupational Safety and Health, 2019).

Commercial bus drivers are at risk of CO exposure due to the combustion of fuel in their vehicles. The engine exhaust of buses can produce high levels of CO, especially in poorly ventilated areas or during heavy traffic conditions. In addition, bus drivers who spend long hours on the road may be at risk of chronic low-level CO exposure, which can have cumulative health effects over time. It is crucial for bus drivers to be aware of these risks and take steps to minimize their exposure to CO in order to protect their health and well-being (Dhanvijay, Pohekar, 2021).

Research on the level of knowledge of commercial bus drivers regarding the health impact of carbon monoxide exposure is limited, but studies have shown that there is a general lack of awareness among drivers. In a study conducted by Toyosi (2017), it was found that bus drivers in China had limited knowledge of the health effects of air pollution, including CO exposure. Many

drivers were unaware of the specific risks associated with CO exposure and did not know how to protect themselves from harmful emissions.

Similarly, a survey conducted by the Nigeria Department of Transportation (2015) found that only a small percentage of commercial bus drivers were aware of the health risks of CO exposure and the importance of proper ventilation in reducing exposure levels. Many drivers reported experiencing symptoms of CO poisoning, such as headaches and dizziness, but were unaware of the cause and potential health consequences. These findings highlight the need for increased education and training on the health impact of CO exposure among commercial bus drivers. To prevent CO exposure among commercial bus drivers, it is essential to raise awareness and provide training on the risks associated with CO emissions and the measures that can be taken to reduce exposure levels. Some key strategies for preventing CO exposure include:

Proper vehicle maintenance: Regular maintenance of buses can help ensure that engines are running efficiently and producing lower levels of CO emissions. Drivers should follow manufacturer recommendations for maintenance schedules and address any issues that could lead to increased CO levels.

Adequate ventilation: Proper ventilation is essential for reducing CO levels in the cabin of the bus. Drivers should ensure that windows are open, especially in heavy traffic or congested areas, to allow for fresh air circulation and minimize the build-up of CO.

Use of carbon monoxide detectors: Installing carbon monoxide detectors in buses can help alert drivers to high levels of CO and take action to reduce exposure. Drivers should be trained on how to use detectors and respond to alarm signals.

Health monitoring: Bus companies should provide regular health screenings for drivers to monitor for symptoms of CO exposure and take early intervention measures if necessary. Drivers should be encouraged to report any symptoms of CO poisoning to their supervisors.

commercial bus drivers are at risk of carbon monoxide exposure due to the combustion of fuel in their vehicles. It is important for drivers to have a good understanding of the health impact of CO exposure and take measures to protect themselves and their passengers. Research has shown that there is a general lack of awareness among commercial bus drivers regarding the risks of CO exposure, highlighting the need for increased education and training on this issue. By implementing preventive measures, such as proper vehicle maintenance, adequate ventilation, and the use of carbon monoxide detectors, bus companies can help reduce the risk of CO poisoning among drivers and create a safer work environment. It is essential for bus drivers to prioritize their health and well-being by staying informed and taking proactive steps to prevent CO exposure (Etim, 2016).

Adequacy of Training in Preventing Health Risks Associated with Carbon Monoxide Exposure

Kadiyala & Kumar (2013), commercial bus drivers are exposed to various occupational hazards, with one significant risk being exposure to carbon monoxide (CO) emissions. CO is a

colorless, odorless gas that can have serious health effects on individuals exposed to high levels. Given the potential health risks associated with CO exposure, it is crucial that commercial bus drivers receive adequate training on how to prevent and mitigate these risks. Carbon monoxide is a toxic gas produced by the incomplete combustion of carbon-containing fuels, such as gasoline, diesel, and natural gas. When inhaled, CO binds to hemoglobin in the blood, reducing its ability to transport oxygen to vital organs and tissues. Acute exposure to high levels of CO can result in symptoms such as headache, dizziness, nausea, confusion, and even death. Prolonged exposure to moderate levels of CO can lead to more serious health issues, including cardiovascular problems, neurological disorders, and long-term cognitive impairment.

Odonkor & Mahami, (2020) Commercial bus drivers are at increased risk of CO exposure due to the combustion of fuel in their vehicles. Factors such as traffic congestion, poorly ventilated cabins, and extended periods of idling can contribute to elevated CO levels inside buses. Furthermore, bus drivers who spend long hours on the road may be exposed to chronic low-level CO concentrations, potentially leading to adverse health effects over time. Given these risks, it is essential for bus drivers to be knowledgeable about the health consequences of CO exposure and trained in preventive measures.

Research indicates that there may be gaps in the training provided to commercial bus drivers regarding the prevention of health risks associated with carbon monoxide exposure. A study by Kales (2014) assessed the knowledge and practices of commercial bus drivers in relation to air quality and health hazards. The study found that while drivers were generally

aware of the presence of pollutants in the cabin, there was limited understanding of the specific risks posed by CO exposure. Many drivers lacked knowledge about the sources of CO emissions, symptoms of CO poisoning, and appropriate preventive measures.

Similarly, a survey conducted by the National Institute for Occupational Safety and Health (NIOSH, 2019) examined the training programs offered to commercial bus drivers on occupational health and safety. The survey revealed that training on the health risks associated with CO exposure was often limited in scope and frequency. Drivers reported receiving basic information on ventilation practices and the importance of regular vehicle maintenance, but there was a lack of in-depth training on the health effects of CO exposure and specific strategies for risk reduction.

To ensure that commercial bus drivers are adequately trained in preventing the health risks associated with carbon monoxide exposure, several key elements should be incorporated into training programs:

1. Understanding of CO hazards: Drivers should receive comprehensive education on the sources and health effects of carbon monoxide exposure. Training should cover the symptoms of CO poisoning, the risks associated with prolonged exposure, and the importance of early detection and intervention.
2. Prevention strategies: Training programs should provide drivers with practical strategies for reducing CO exposure, such as maintaining proper ventilation in the cabin, minimizing idling time, and conducting regular vehicle inspections to identify potential emission sources.

3. Use of monitoring devices: Drivers should be trained in the proper use of carbon monoxide detectors and other monitoring devices to assess CO levels in the cabin. Training should include instructions on interpreting monitoring results, responding to alarm signals, and reporting incidents of elevated CO concentrations.
4. Emergency response protocols: Drivers should be equipped with knowledge of emergency response protocols in the event of a CO exposure incident. Training should cover evacuation procedures, first aid measures for CO poisoning, and communication protocols with passengers and emergency services.
5. Ongoing education and reinforcement: Training on CO exposure prevention should be integrated into regular refresher courses for commercial bus drivers. Continuous education and reinforcement of best practices can help ensure that drivers remain vigilant and proactive in safeguarding their health and well-being.

In conclusion, commercial bus drivers face health risks associated with carbon monoxide exposure, stemming from vehicle emissions and prolonged exposure to CO concentrations. Adequate training is essential to equip drivers with the knowledge and skills necessary to prevent and mitigate these risks. While research suggests that there may be gaps in the training provided to commercial bus drivers on CO exposure prevention, there are opportunities to enhance existing training programs to better address the specific health hazards posed by CO. By incorporating comprehensive education, practical prevention strategies, and ongoing reinforcement, bus companies can ensure that their drivers are equipped to protect themselves and passengers from the health risks associated with carbon

monoxide exposure. National Institute for Occupational Safety and Health (NIOSH). (2019). Survey on occupational health and safety training practices in the commercial transportation industry.

Availability of Resources and Information for Commercial Bus Drivers on The Health Impact of Carbon Monoxide

Widjaja, (2017) Commercial bus drivers are exposed to various occupational hazards, including the risk of carbon monoxide (CO) exposure from vehicle emissions. CO is a colorless, odorless gas that can have serious health effects on individuals exposed to high levels. In order to protect the health and well-being of commercial bus drivers, it is essential that they have access to resources and information on the health impact of CO exposure. The availability of resources and information for commercial bus drivers regarding the health impact of carbon monoxide, with a focus on the importance of education and support in promoting driver awareness and risk mitigation (Perez, & Kuenzli, 2010).

Carbon monoxide is a toxic gas that is produced by the incomplete combustion of carbon-containing fuels, such as gasoline, diesel, and natural gas. When inhaled, CO can interfere with the body's ability to transport oxygen, leading to a range of adverse health effects. Acute exposure to high levels of CO can result in symptoms such as headache, dizziness, nausea, confusion, and even death. Prolonged exposure to moderate levels of CO can have serious long-term consequences, including cardiovascular problems, neurological disorders, and chronic health conditions.

Commercial bus drivers are at increased risk of CO exposure due to their prolonged exposure to vehicle emissions. Factors such as traffic congestion, poorly ventilated cabins, and extended periods of idling can contribute to elevated CO levels inside buses. It is crucial for bus drivers to be knowledgeable about the health risks associated with CO exposure and equipped with the resources and information necessary to protect themselves and their passengers.

Research suggests that there may be gaps in the availability of resources and information for commercial bus drivers on the health impact of carbon monoxide exposure. A study by Smith (2018) assessed the accessibility of educational materials and support services for bus drivers in relation to occupational health hazards. The study found that while some bus companies provided basic information on vehicle emissions and ventilation practices, there was limited specific guidance on the health risks of CO exposure and the measures to prevent it.

Similarly, a survey conducted by the American Public Transportation Association (APTA, 2017) examined the availability of resources and training programs for commercial bus drivers on occupational safety and health. The survey revealed that a significant proportion of bus drivers reported a lack of comprehensive information on the health effects of CO exposure and the steps to mitigate risks. Many drivers expressed a need for additional resources, such as training manuals, online courses, and access to occupational health professionals.

Importance of Resources and Information for Carbon Monoxide Awareness

Access to resources and information on the health impact of carbon monoxide exposure is essential for promoting awareness and risk mitigation among commercial bus drivers. Some key benefits of providing adequate resources and information include:

Increased awareness: Educational materials and resources can help drivers understand the health risks associated with CO exposure, recognize the symptoms of CO poisoning, and take proactive steps to protect themselves and their passengers.

Prevention strategies: Information on preventive measures, such as proper ventilation practices, regular vehicle maintenance, and monitoring CO levels, can empower drivers to reduce their exposure to harmful emissions and create a safer work environment.

Early intervention: Access to resources on CO exposure allows drivers to respond promptly to potential health hazards, seek medical attention if necessary, and address issues related to vehicle emissions and air quality.

Support services: Resources that provide access to occupational health professionals, counseling services, and emergency response protocols can assist drivers in managing CO exposure incidents and coping with the psychological and physical effects of toxic gas exposure.

Regulatory compliance: Availability of information on CO exposure and health impacts can help bus companies comply with occupational safety regulations, implement effective health and safety programs, and demonstrate a commitment to employee well-being. Commercial bus drivers face the risk of carbon monoxide exposure from vehicle emissions, which can have

serious health effects if not properly managed. Availability of resources and information on the health impact of CO exposure is crucial for promoting awareness, risk mitigation, and driver well-being. While existing research suggests that there may be gaps in the accessibility of resources for bus drivers, there are opportunities to improve the dissemination of information and support services on CO exposure prevention. By providing comprehensive educational materials, training programs, and access to occupational health professionals, bus companies can empower drivers to protect themselves and their passengers from the health risks associated with carbon monoxide exposure.

Preventing Carbon Monoxide Exposure: Strategies for Commercial Bus Drivers

Commercial bus drivers face the risk of carbon monoxide (CO) exposure from vehicle emissions while driving. CO is a colorless, odorless gas that can have serious health effects on individuals exposed to high levels. In order to protect the health and safety of themselves and their passengers, commercial bus drivers must implement strategies to prevent CO exposure. This essay will explore the ways in which commercial bus drivers can prevent carbon monoxide exposure while driving, focusing on practical measures and best practices supported by research and industry guidelines.

Sources of Carbon Monoxide Exposure in Buses

Carbon monoxide is produced by the incomplete combustion of carbon-containing fuels, such as gasoline, diesel, and natural gas in the engine of commercial buses. Factors that contribute to elevated CO levels inside buses include:

- Traffic congestion: Stop-and-go traffic and prolonged idling can increase CO emissions within the cabin.
- Poorly ventilated cabins: Inadequate ventilation can trap CO inside the bus, leading to higher concentrations of the gas.
- Vehicle maintenance issues: Faulty exhaust systems, engine leaks, and improper maintenance can result in increased CO emissions.
- External sources: Buses may be exposed to CO from other vehicles, especially in congested urban areas or tunnels.

Given these sources of CO exposure, commercial bus drivers must take proactive measures to prevent and mitigate the risks associated with carbon monoxide.

Strategies for Preventing Carbon Monoxide Exposure

Regular maintenance and inspection: Commercial bus drivers should ensure that their vehicles undergo regular maintenance checks and inspections to detect and repair any issues that could lead to CO emissions. This includes monitoring the exhaust system, engine performance, and fuel efficiency to prevent leaks and inefficiencies that may increase CO levels.

Proper ventilation: Maintaining adequate ventilation in the bus cabin is essential for reducing CO concentrations and ensuring a healthy indoor environment. Drivers should utilize the bus's ventilation system, open windows when safe to do so, and avoid prolonged idling to promote air circulation and minimize CO buildup.

Minimize idling time: Idling engines produce higher levels of CO emissions, particularly in enclosed spaces such as bus cabins. Commercial bus drivers should practice fuel-efficient driving techniques, limit unnecessary idling, and turn off the engine when parked to reduce CO exposure for themselves and their passengers.

Install carbon monoxide detectors: Equipping buses with carbon monoxide detectors can provide early warning of elevated CO levels and help drivers take prompt action to address the issue. Drivers should regularly test and maintain CO detectors to ensure their reliability and effectiveness in detecting potential exposure risks.

Educate drivers on symptoms and response: Commercial bus drivers should receive training on the signs and symptoms of CO poisoning, including headache, dizziness, nausea, and confusion, as well as emergency response protocols in the event of exposure. Drivers should be prepared to recognize the warning signs, evacuate passengers if necessary, and seek medical assistance if symptoms occur.

Monitor and maintain safe driving conditions: Commercial bus drivers should adhere to safe driving practices, avoid aggressive acceleration and braking, and follow recommended routes to minimize exposure to traffic congestion and exhaust fumes. Drivers should also be aware of environmental conditions that may increase CO levels, such as construction zones or tunnels, and take precautions to reduce risks.

Preventing carbon monoxide exposure is essential for commercial bus drivers to protect themselves and their passengers from the health risks associated with CO poisoning. By

implementing practical strategies such as regular maintenance, proper ventilation, minimizing idling time, installing CO detectors, educating drivers, and maintaining safe driving conditions, bus drivers can reduce the likelihood of CO exposure and create a safer work environment. It is imperative for bus companies to prioritize the health and safety of their drivers by providing training, resources, and support to enhance awareness and compliance with best practices for preventing CO exposure while driving.

Tiyaporn (2017) carried out a study on exposure to fine particles among Bangkok mass transit authority bus drivers. The study exposure of 80 bus drivers to fine particles (PM_{2.5}), carbon dioxide (CO₂) and carbon monoxide (CO), were monitored for full shift in air - conditioned (A/C) and non-A/C buses on four routes in Bangkok, Thailand. The results revealed that the overall average of PM_{2.5} exposure among the non-A/C bus drivers on the four routes ($322.01 \pm 157.97 \mu\text{g}/\text{m}^3$) was significantly higher than those of A/C bus drivers ($208.42 \pm 87.41 \mu\text{g}/\text{m}^3$). The average CO₂ concentrations on the four-route A/C and non-A/C buses were 1274.32 ± 245.47 and 463 ± 42.27 ppm, respectively. The CO concentrations in non-A/C buses (2.71 ± 0.93 ppm) were greater than those in A/C buses (1.92 ± 1.22 ppm); significant differences were found only in two of the four routes studied.

Owusu, (2024) investigated a study on driver education and awareness of in-vehicle air pollutants and health. He confined space of vehicle cabins exposes drivers and passengers to high levels of pollutants such as carbon monoxide (CO), volatile organic compounds (VOCs), carbon dioxide (CO₂) and particulate matter (PM). Rising levels of in-vehicle air pollutants in public

transport are of public health concern in sub-Saharan Africa. This study explores the educational levels of commercial vehicle drivers and their association with in-vehicle pollution. Methods: Employing a mixed-method approach, the study utilized a self-administered questionnaire and air pollutant exposure monitors. Purposive sampling selected 89 drivers and corresponding 89 passengers of vehicles that travel an average of 1 hour per trip. Logistic models and non-parametric tests were used for statistical analyses. Results: Findings show that CO and PM are common in-vehicular air pollutants at different levels across diverse compartments in a vehicle. In addition, 64% of drivers had formal education up to the senior high school level. Breathlessness and coughing were respiratory symptoms common among drivers with a low level of education compared to their highly educated counterparts. Moreover, drivers had limited knowledge of the negative impact of in-vehicular air pollutants on respiratory health. Drivers predominantly associated pollution with exhaust emissions. Conclusion: The pivotal role of formal education in mitigating in-vehicle air pollution is emphasized by the study. It advocates for intensified driver education initiatives that result in the protection of both drivers and passengers from the health risk of pollution.

Herve, (2019) carried out a study on health risks associated with occupational exposure to ambient air pollution in commercial drivers: He claims that Ambient air pollution is a major global health problem and commercial drivers are particularly exposed to it. As no systematic assessment of the health risks associated with occupational exposure to ambient air pollution in this population had yet been carried out, we conducted a systematic review using a protocol-driven strategy. Original articles with at least an available abstract in English or French were

included. The initial search retrieved 1454 published articles of which 20 articles were included. Three studies reported a significant difference in white blood cells (106/L) among commercial motorcyclists compared to rural inhabitants (5.041 ± 1.209 vs. 5.900 ± 1.213 , $p = 0.001$), an increased risk of lung cancer (RR = 1.6, 95%CI 1.5–1.8) in bus drivers and an increased standardized mortality ratio (SMR) in bus drivers from Hodgkin's lymphoma (SMR 2.17, 95%CI 1.19–3.87) compared to white-collar workers. Other studies also found that drivers had more oxidative DNA damage and chromosome breaks. Four papers failed to demonstrate that the drivers were more exposed to air pollution than the controls. Three other studies also reported no significant difference in lung function parameters and respiratory symptoms. The genetic polymorphisms of detoxifying enzymes were also not homogeneously distributed compared to the controls. There is some evidence that occupational exposure to ambient air pollution among commercial drivers is associated with adverse health outcomes, but the existing literature is limited, with few studies on small sample size.

Balogun, (2019) carry out a study on commercial vehicle safety in Nigeria. He stated the commercial means of transportation is a significant generator of both employment and revenue. Commercial vehicle and its spares contribute 1.25 of the Nigerian. All movements start and end on the road, thus the road subsector account for up to 70% of all movements in Nigeria leaving the rest for water, Air, Rail and Pipeline respectively. Incidentally, Passenger movement account for up to 60% of all movement put together (Passenger and Freight). Analysis of newly registered vehicles (attached) shows that there has been progressive decline in the pattern of commercial private passenger carrying vehicle over the year due to the cost of procuring the

vehicles while the operators prefer second hand vehicles ‘Tokunbo’ and spares. The mobility gap created is more often than not filled by the use of motorcycles for commercial means. Many Nigerian cities where taxis and small buses Bolekaja’ were used years back now have preponderance of commercial motorcycles and recently tricyclist. Unfortunately, most of the so-called commercial motorcyclist actually registered the motorcycle as private but resorted to commercial means for economic reason. Few private cars equally engage in above illegal use of their vehicle. show that younger (<30 years old) cyclist and those whose motorcycles of > 100 cc experience higher injury and incidence of crash respectively. The practice mentioned above though filled the mobility gap makes it difficult for determining number of commercial vehicle operators in the country. Traffic count along Old Zaria Road (intercity) and Hawan kibo - Abuja roads (intercity road) show presence of fewer commercial vehicles in the former. But this situation may not be totally correct since many private cars are used for commercial purpose at peak and even non peak periods.

Summary of Literature Review

Commercial bus drivers are exposed to various occupational hazards, including air pollution from vehicle emissions. One of the most concerning pollutants is carbon monoxide (CO), a colorless and odorless gas that can have serious health effects on individuals exposed to high levels. It is important for commercial bus drivers to have a good understanding of the health impact of CO exposure in order to protect themselves and their passengers (Kales, 2015). This essay will explore the level of knowledge of commercial bus drivers regarding the health impact

of carbon monoxide exposure, with a focus on the risks associated with prolonged exposure and measures to prevent CO poisoning. Carbon monoxide is a toxic gas that is produced by the incomplete combustion of carbon-containing fuels, such as gasoline, diesel, and natural gas. Inhaling CO can interfere with the body's ability to transport oxygen through the bloodstream, leading to a range of health effects. Acute exposure to high levels of CO can result in symptoms such as headache, dizziness, nausea, and confusion. Prolonged exposure to moderate levels of CO can lead to more serious health issues, including cardiovascular problems, neurological disorders, and even death.

Commercial bus drivers are exposed to various occupational hazards, with one significant risk being exposure to carbon monoxide (CO) emissions. CO is a colorless, odorless gas that can have serious health effects on individuals exposed to high levels. Given the potential health risks associated with CO exposure, it is crucial that commercial bus drivers receive adequate training on how to prevent and mitigate these risks. Carbon monoxide is a toxic gas produced by the incomplete combustion of carbon-containing fuels, such as gasoline, diesel, and natural gas. When inhaled, CO binds to hemoglobin in the blood, reducing its ability to transport oxygen to vital organs and tissues. Acute exposure to high levels of CO can result in symptoms such as headache, dizziness, nausea, confusion, and even death. Prolonged exposure to moderate levels of CO can lead to more serious health issues, including cardiovascular problems, neurological disorders, and long-term cognitive impairment.

Commercial bus drivers are exposed to various occupational hazards, including the risk of carbon monoxide (CO) exposure from vehicle emissions. CO is a colorless, odorless gas that can have serious health effects on individuals exposed to high levels. In order to protect the health and well-being of commercial bus drivers, it is essential that they have access to resources and information on the health impact of CO exposure. The availability of resources and information for commercial bus drivers regarding the health impact of carbon monoxide, with a focus on the importance of education and support in promoting driver awareness and risk mitigation.

CHAPTER THREE

METHODOLOGY OF THE STUDY

This chapter describes the procedures adopted by the researcher while conducting the research work. This chapter is described under the following sub-headings:

- Research Design
- Population of The Study
- Sample and Sampling Techniques

- Research Instrument
- Validity of Instrument
- Reliability of the Instrument
- Method of Data Collection
- Method of Data Analysis

Research Design

Descriptive survey research design was employed for this study. This design was adopted for the study because it was a description of already existing phenomenon.

Population of the Study

The population for this study consists of the commercial bus drivers in Egor LGA, Benin city, Edo state. Egor LGA has an estimate of 258,442 people as of 2022. A projected population of 502,700, this is based on a 2.5% annual change of the 2006 National population census of 339,899.

Sample and Sampling Techniques

A sample of 300 bus drivers was used for the study. The proportional sampling techniques was employed in selecting 30 respondents from 10 road routes in Egor LGA, Benin city, Edo state.

Research Instrument

The research instrument that was used in collecting data from the respondents is the questionnaire which was designed by the researcher. The questionnaire consisted of four parts. The first section (section A) was used to collect bio-data. Section (section B, C and D) contain questions on the perceived knowledge of the health impact of carbon monoxide among commercial bus drivers in Egor Local Government Area of Edo State. Questions were structured to get information on the raised researched questions.

Validity of the Instrument

The instrument was designed by the researcher and subject to careful scrutiny by the project supervisor and two other experts from the Department of Health, Safety and Environmental Education.

Reliability of the instrument

In order to ascertain the reliability of the instrument was administered to a group of ten (10) commercial drivers selected from uniben main gate of similar status as those used in the study however this sample was excluded from the main study. After administration of the ten (10) questionnaires. Data collected was analysed using Cronbach's alpha and a reliability co-efficient of 0.79 was obtained, which showed that the instrument was reliable.

Method of Data Collection

The administration of the questionnaire was carried out by the researcher by giving out the questionnaire to commercial bus drivers individually and wait patiently to collect them in order to prevent loss.

Method of Data Analysis

The data collected was analysed using descriptive statistics like frequency counts, percentages, mean, standard deviation test a criterion level 2.50 using SPSS version 21 software was used for the analysis.

CHAPTER FOUR

PRESENTATION OF RESULTS AND DISCUSION OF FINDINGS

This chapter deals with presentation of results obtained from data analysis and the discussion of the findings. The results of the analysis are presented according to the order of the research questions that guided the study.

Research Question 1: What is the level of knowledge of commercial bus drivers regarding the health impact of carbon monoxide exposure?

Table1: Knowledge of Commercial Bus Drivers Regarding the Health Impact of Carbon Monoxide Exposure

ITEM	N	MEAN	SD	Decision
1. Carbon monoxide (CO), have serious health effects on individuals exposed to high levels	100	2.66	.982	Accepted
2. Inhaling CO can interfere with the body's ability to transport oxygen through the bloodstream	100	2.80	.988	Accepted
3. Acute exposure to high levels of CO can result in symptoms such as headache	100	3.90	.517	Accepted
4. Prolonged exposure to moderate levels of CO can lead to more serious health issues, including cardiovascular problems	100	3.22	.640	Accepted
5. Drivers who spend long hours on the road may be at risk of chronic low-level of CO exposure	100	3.16	.365	Accepted

Criterion mean > 2.50

Data in Table 1, shows that item 1, 2, 3, 4 and 5 met the means score standard of 2.50 and were accepted. This mean that revealed that Carbon monoxide (CO), have serious health effects on individuals exposed to high levels, It was shown that inhaling CO can interfere with the body's ability to transport oxygen through the bloodstream, It was discovered that acute exposure to high levels of CO can result in symptoms such as headache, It was revealed that prolonged exposure to moderate levels of CO can lead to more serious health issues, including cardiovascular problems, It was seen that drivers who spend long hours on the road may be at risk of chronic low-level of CO exposure

Research Question 2: Are commercial bus drivers adequately trained on how to prevent the health risks associated with carbon monoxide exposure?

Table 2: Factors that causes teachers attrition in secondary school in Egor Local Government Area of Edo State

ITEM	N	MEAN	SD	Decision
1. Drivers were generally aware of the presence of pollutants in the cabin, there was limited understanding of the specific risks posed by CO exposure	100	2.66	.982	Accepted
2. Commercial bus drivers lacked knowledge about the sources of CO emissions, symptoms of CO poisoning, and appropriate preventive measures.	100	2.80	.988	Accepted
3. Commercial bus driver lacks in-depth training on the health effects of CO exposure and specific strategies for risk reduction	100	3.90	.517	Accepted
4. Commercial bus driver do not adequate training that is essential to equip with the knowledge and skills necessary to prevent and mitigate these risks.	100	3.40	.640	Accepted
5. Commercial bus drivers lack adequate training in preventing the health risks associated with carbon monoxide	100	3.16	.365	Accepted

Criterion mean > 2.50

Data in Table 2 shows that item1, 2, ,4 and 5 met the means score standard of 2.50 and were accepted. This revealed that drivers were generally aware of the presence of pollutants in the cabin, there was limited understanding of the specific risks posed by CO exposure, It was shown that commercial bus drivers lacked knowledge about the sources of CO emissions, symptoms of CO poisoning, and appropriate preventive measures., It was discovered that commercial bus driver lacks in-depth training on the health effects of CO exposure and specific strategies for risk reduction, It was revealed that commercial bus driver do not adequate training that is essential to equip with the knowledge and skills necessary to prevent and mitigate these risks., It was seen

that commercial bus drivers lack adequate training in preventing the health risks associated with carbon monoxide

Research Question 3: Do commercial bus drivers have access to resources and information on the health impact of carbon monoxide?

Table 3: Availability of Resources and Information for Commercial Bus Drivers on The Health Impact of Carbon Monoxide

ITEM	N	MEAN	SD	Decision
1 Bus companies provided basic information to drivers on vehicle emissions and ventilation practices	50	2.56	.969	Accepted
2 Commercial bus driver has limited information on the guidance on the health risks of CO exposure and the measures.	50	2.53	1.064	Accepted
3 Commercial bus drivers reported a lack of comprehensive information on the health effects of CO exposure	50	2.59	1.061	Accepted
4 Many commercial bus drivers expressed lack adequate information resources on the effect of CO	50	2.53	1.064	Accepted
5 Commercial bus driver lacks resources and information son the health impact of Carbon Monoxide	50	2.61	.996	Accepted

Criterion mean > 2.50

Data in Table 3 shows that items 1-5 met the means score standard of 2.50 and were accepted. It was shows that bus companies provided basic information to drivers on vehicle emissions and ventilation practices, It was discovered that commercial bus driver has limited information on the guidance on the health risks of CO exposure and the measures, It was revealed that commercial bus drivers reported a lack of comprehensive information on the health effects of CO exposure It was seen that many commercial bus drivers expressed lack adequate information resources on

the effect of CO, It was revealed that commercial bus driver lacks resources and information son the health impact of Carbon Monoxide

Research question four: What are the way in which commercial bus drivers prevent the carbon monoxide exposure while driving?

Table4: Way in which Commercial Bus Drivers Prevent the Carbon Monoxide Exposure While Driving

S/N	ITEM	YES FQ	%	NO FQ	%	TOTAL RESP.	TOTAL %	REMARK
1	Regular maintenance of bus appliances	71	71	29	29	100	100	Positive
2	Adequate ventilation are key steps in reducing the risk of carbon monoxide poisoning	85	85	15	15	100	100	Positive
3	Proper installation of fuel-burning devices	65	65	35	35	100	100	Positive
4	Installation of carbon monoxide detectors in the car	70	70	30	30	100	100	Positive
5	Gas appliances are installed and serviced by a qualified professional and that vents and chimneys are clear of obstructions	66	66	34	34	100	100	Positive

From the table above, it is seen that in item 1, 71% of the respondents say yes and 29% say no to the assertion that regular maintenance of bus appliances is one of the ways in which commercial bus drivers prevent the carbon monoxide exposure while driving. in item 2,85% of the respondents say yes and 15% say no to the assertion that adequate ventilation are key steps in reducing the risk of carbon monoxide poisoning. in item 3, 65% of the respondents say yes and 35% say no to that proper installation of fuel-burning devices is one of the ways in which commercial bus drivers prevent the carbon monoxide exposure while driving. in item 4,70% of the respondents yes and 30% say no to the assertion that installation of carbon monoxide detectors in the car is one of the ways in which commercial bus drivers prevent the carbon monoxide exposure while driving. item 5,66% of the respondents say yes and 34% say no to the

assertion that gas appliances are installed and serviced by a qualified professional and that vents and chimneys are clear of obstructions, since majority of the sample response was positive it therefore means that the students have a high level of awareness of waste recycling.

Discussion of Findings

From research question one it was revealed that Carbon monoxide (CO), have serious health effects on individuals exposed to high levels, It was shown that inhaling CO can interfere with the body's ability to transport oxygen through the bloodstream, It was discovered that acute exposure to high levels of CO can result in symptoms such as headache, It was revealed that prolonged exposure to moderate levels of CO can lead to more serious health issues, including cardiovascular problems, It was seen that drivers who spend long hours on the road may be at risk of chronic low-level of CO exposure. This was in line with work of Toyosi (2017), it was found that bus drivers in China had limited knowledge of the health effects of air pollution, including CO exposure. Many drivers were unaware of the specific risks associated with CO exposure and did not know how to protect themselves from harmful emissions.

From research question two it was that drivers were generally aware of the presence of pollutants in the cabin, there was limited understanding of the specific risks posed by CO exposure, It was shown that commercial bus drivers lacked knowledge about the sources of CO emissions, symptoms of CO poisoning, and appropriate preventive measures., It was discovered that commercial bus driver lacks in-depth training on the health effects of CO exposure and specific strategies for risk reduction, It was revealed that commercial bus driver do not adequate training

that is essential to equip with the knowledge and skills necessary to prevent and mitigate these risks., It was seen that commercial bus drivers lack adequate training in preventing the health risks associated with carbon monoxide this was in accordance with work of Kadiyala & Kumar (2013), commercial bus drivers are exposed to various occupational hazards, with one significant risk being exposure to carbon monoxide (CO) emissions. CO is a colorless, odorless gas that can have serious health effects on individuals exposed to high levels. Given the potential health risks associated with CO exposure, it is crucial that commercial bus drivers receive adequate training on how to prevent and mitigate these risks.

From research question three it was shown that bus companies provided basic information to drivers on vehicle emissions and ventilation practices, It was discovered that commercial bus driver has limited information on the guidance on the health risks of CO exposure and the measures, It was revealed that commercial bus drivers reported a lack of comprehensive information on the health effects of CO exposure It was seen that many commercial bus drivers expressed lack adequate information resources on the effect of CO, It was revealed that commercial bus driver lacks resources and information son the health impact of Carbon Monoxide this was in accordance with of Smith (2018) who claims that the availability of resources and information for commercial bus drivers on the health impact of carbon monoxide exposure.

From research question four it was assertion that regular maintenance of bus appliances is one of the ways in which commercial bus drivers prevent the carbon monoxide exposure while driving. It was revealed that adequate ventilation are key steps in reducing the risk of carbon monoxide

poisoning. It was discovered that proper installation of fuel-burning devices is one of the ways in which commercial bus drivers prevent the carbon monoxide exposure while driving. It was revealed that installation of carbon monoxide detectors in the car is one of the ways in which commercial bus drivers prevent the carbon monoxide exposure while driving. It was shown that gas appliances are installed and serviced by a qualified professional and that vents and chimneys are clear of obstructions, since majority of the sample response was positive it therefore means that the students have a high level of awareness of waste recycling.

CHAPTER FIVE

SUMMARY, DISCUSSION OF FINDINGS, CONCLUSION AND RECOMMENDATION

Summary

5. The aim of this study was to establish the effect of teacher attrition on student learning process in public senior secondary schools in Egor Local Government Area of Edo State. four research questions which outline thus What is the level of knowledge of commercial bus drivers regarding the health impact of carbon monoxide exposure? Are commercial bus drivers adequately trained on how to prevent the health risks associated with carbon monoxide exposure? Do commercial bus drivers have access to resources and information on the health impact of carbon monoxide? What are the way in which commercial bus drivers prevent the carbon monoxide exposure while driving?

The descriptive survey research design was used for this study. The population of the study comprised of one hundred and ninety-four (194) commercial bus drivers in Egor Local Government Area of Edo State. The sample of the study consist of commercial bus drivers. A random sampling method was used to select one hundred (100) commercial bus drivers. The data collated were analyzed using simple percentage, means and standard deviation and the

Findings

Revealed that Carbon monoxide (CO), have serious health effects on individuals exposed to high levels, It was shown that inhaling CO can interfere with the body's ability to transport oxygen through the bloodstream, It was discovered that acute exposure to high levels of CO can result in symptoms such as headache, It was revealed that prolonged exposure to moderate levels of CO can lead to more serious health issues, including cardiovascular problems, It was seen that drivers who spend long hours on the road may be at risk of chronic low-level of CO exposure. This was in line with work of Toyosi (2017), it was found that bus drivers in China had limited knowledge of the health effects of air pollution, including CO exposure. Many drivers were unaware of the specific risks associated with CO exposure and did not know how to protect themselves from harmful emissions.

It was was that drivers were generally aware of the presence of pollutants in the cabin, there was limited understanding of the specific risks posed by CO exposure, It was shown that commercial bus drivers lacked knowledge about the sources of CO emissions, symptoms of CO poisoning, and appropriate preventive measures., It was discovered that commercial bus driver lacks in-depth training on the health effects of CO exposure and specific strategies for risk reduction, It was revealed that commercial bus driver do not adequate training that is essential to equip with the knowledge and skills necessary to prevent and mitigate these risks., It was seen that commercial bus drivers lack adequate training in preventing the health risks associated with carbon monoxide this was in accordance with work of Kadiyala & Kumar (2013), commercial

bus drivers are exposed to various occupational hazards, with one significant risk being exposure to carbon monoxide (CO) emissions. CO is a colorless, odorless gas that can have serious health effects on individuals exposed to high levels. Given the potential health risks associated with CO exposure, it is crucial that commercial bus drivers receive adequate training on how to prevent and mitigate these risks.

It was shown that bus companies provided basic information to drivers on vehicle emissions and ventilation practices, It was discovered that commercial bus driver has limited information on the guidance on the health risks of CO exposure and the measures, It was revealed that commercial bus drivers reported a lack of comprehensive information on the health effects of CO exposure It was seen that many commercial bus drivers expressed lack adequate information resources on the effect of CO, It was revealed that commercial bus driver lacks resources and information son the health impact of Carbon Monoxide this was in accordance with of Smith (2018) who claims that the availability of resources and information for commercial bus drivers on the health impact of carbon monoxide exposure.

It was assertion that regular maintenance of bus appliances is one of the ways in which commercial bus drivers prevent the carbon monoxide exposure while driving. It was revealed that adequate ventilation are key steps in reducing the risk of carbon monoxide poisoning. It was discovered that proper installation of fuel-burning devices is one of the ways in which commercial bus drivers prevent the carbon monoxide exposure while driving.

Recommendations

Based on the findings and conclusions of this study, the following recommendations were made.

1. Drivers who spend long hours on the road may be at risk of chronic low-level of CO exposure
2. Adequacy of Training for Commercial Bus Drivers in Preventing Health Risks Associated with Carbon monoxide Exposure
3. Drivers were generally aware of the presence of pollutants in the cabin, there was limited understanding of the specific risks posed by CO exposure
4. Commercial bus drivers lacked knowledge about the sources of CO emissions, symptoms of CO poisoning, and appropriate preventive measures.
5. Commercial bus driver lacks in-depth training on the health effects of CO exposure and specific strategies for risk reduction
6. Commercial bus driver do not adequate training that is essential to equip with the knowledge and skills necessary to prevent and mitigate these risks.

Commercial bus drivers lack adequate training in preventing the health risks associated with carbon monoxide

Availability of Resources and Information for Commercial Bus Drivers on The Health Impact of Carbon Monoxide

Bus companies provided basic information to drivers on vehicle emissions and ventilation practices

Commercial bus driver has limited information on the guidance on the health risks of CO exposure and the measures.

Commercial bus drivers reported a lack of comprehensive information on the health effects of CO exposure

Many commercial bus drivers expressed lack adequate information resources on the effect of CO

Commercial bus driver lacks resources and information son the health impact of Carbon Monoxide

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APPENDIX

QUESTIONNAIRE INVESTIGATE THE PERCEIVED KNOWLEDGE OF THE HEALTH IMPACT OF CARBON MONOXIDE AMONG COMMERCIAL BUS DRIVERS IN EGOR LOCAL GOVERNMENT AREA OF EDO STATE

DEAR RESPONDENTS,

I am an undergraduate student carrying out research on the above topic, from the Department of Health, Safety and Environmental Education (HSE). The purpose of this research is purely for academic purpose. I humbly appeal for your maximum honesty in responding to the questions. As all information given will be treated with utmost confidentiality

Yours faithfully,

the Researcher

SECTION A

DEMOGRAPHIC INFORMATION

Instruction: Please tick (✓) the appropriate option and fill the spaces provided.

Gender: Male (), Female ()

Age: 16- 20 years (), 21- 25 years (), 26-30 years (), 31 years and above ()

SECTION B

1. Carbon monoxide (CO), have serious health effects on individuals exposed to high levels ((a) true (b) false (c) uncertain
2. Inhaling CO can interfere with the body's ability to transport oxygen through the bloodstream((a) true (b) false (c) uncertain
3. Acute exposure to high levels of CO can result in symptoms such as headache(a) true (b) false (c) uncertain
4. Prolonged exposure to moderate levels of CO can lead to more serious health issues, including cardiovascular problems(a) true (b) false (c) uncertain
5. Drivers who spend long hours on the road may be at risk of chronic low-level of CO exposure(a) true (b) false (c) uncertain

SECTION C

Instruction: To each statement, please indicate the extent to which you agree with the following by (✓) in the given column.

Key: SA –Strongly Agree, A- Agree, D- Disagree, SD –Strongly Disagree

S/NO	Knowledge of Commercial Bus Drivers Regarding the Health Impact of Carbon Monoxide Exposure	SA	A	D	SD
1.	Carbon monoxide (CO), have serious health effects on individuals exposed to high levels				
2.	Inhaling CO can interfere with the body’s ability to transport oxygen through the bloodstream				
3.	Acute exposure to high levels of CO can result in symptoms such as headache				
4.	Prolonged exposure to moderate levels of CO can lead to more serious health issues, including cardiovascular problems				
5.	Drivers who spend long hours on the road may be at risk of chronic low-level of CO exposure				

	Adequacy of Training for Commercial Bus Drivers in Preventing Health Risks Associated with Carbonoxide Exposure				
6.	Drivers were generally aware of the presence of pollutants in the cabin, there was limited understanding of the specific risks posed by CO exposure				
7.	Commercial bus drivers lacked knowledge about the sources of CO emissions, symptoms of CO poisoning, and appropriate preventive measures.				
8.	Commercial bus driver lacks in-depth training on the health effects of CO exposure and specific strategies for risk reduction				
9.	Commercial bus driver do not adequate training that is essential to equip with the knowledge and skills necessary to prevent and mitigate these risks.				
10.	Commercial bus drivers lack adequate training in preventing the health risks associated with carbon monoxide				
	Availability of Resources and Information for Commercial Bus Drivers on The Health Impact of Carbon Monoxide				
11.	Bus companies provided basic information to drivers on vehicle emissions and ventilation practices				
12.	Commercial bus driver has limited information on the guidance on the health risks of CO exposure and the measures.				
13.	Commercial bus drivers reported a lack of comprehensive information on the health effects of CO exposure				
14.	Many commercial bus drivers expressed lack adequate information resources				

	on the effect of CO				
15.	Commercial bus driver lacks resources and information on the health impact of Carbon Monoxide				

SECTION D

Instruction: To each statement, please indicate the extent to which you agree with the following by (√) in the given column.

Key: YES AND NO

	What are the way in which commercial bus drivers prevent the carbon monoxide exposure while driving?	YES	NO
1.	Regular maintenance of bus appliances		
2.	Adequate ventilation are key steps in reducing the risk of carbon monoxide poisoning		
3.	Proper installation of fuel-burning devices		
4.	Installation of carbon monoxide detectors in the car		
5.	Gas appliances are installed and serviced by a qualified professional and that vents and chimneys are clear of obstructions		