

UNIVERSITY OF GHANA, LEGON



**PREVALENCE, AWARENESS AND FACTORS ASSOCIATED WITH
RESPIRATORY MORBIDITIES AMONG FUEL PUMP ATTENDANTS IN THE
GREATER ACCRA REGION, GHANA**

**BY
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**A DISSERTATION PROPOSAL SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENT FOR THE AWARD OF THE MASTER OF PUBLIC HEALTH
DEGREE**

(JANUARY, 2023)

I, Bonaparte Desmond hereby declare that except for references made to other people's work which have been duly acknowledged, this proposal is my own work.



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DEDICATION

I dedicate this dissertation to my father Mr. Frederick Edward Bonaparte, my mother Mrs. Faustina Bonaparte and my sister Harriet Bonaparte whose continuous love, support, motivation and guidance have made it possible for me to complete this academic work.



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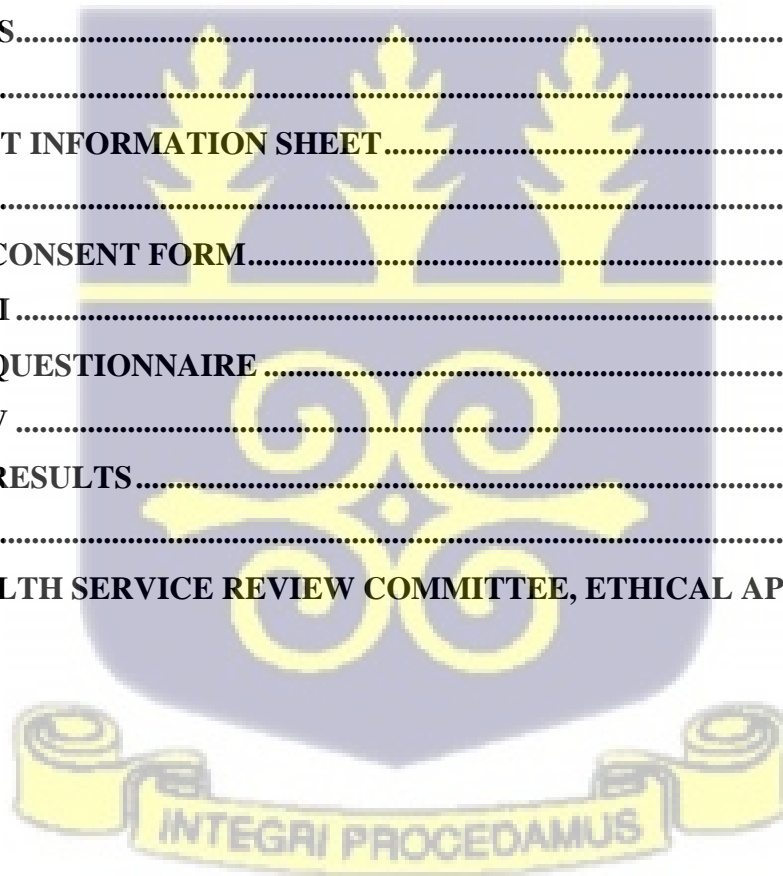


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LIST OF ABBREVIATIONS

- BMRC** - British Medical Research Council
- BTEX** - Benzene, Toluene, Ethylbenzene and Xylene
- COPD** - Chronic Obstructive Pulmonary Disease
- FSS** - Fuel Service Station
- FVC** - Forced Vital Capacity
- ILO** - International Labour Organisation
- LPG** - Liquefied Petroleum Gas
- OHS** - Occupational Health and Safety
- OMC** - Oil Marketing Companies
- PPE** - Personal Protective Equipment
- VOC** - Volatile Organic Compound
- WHO** - World Health Organisation



DEFINITION OF TERMS

Fuel Service Station Forecourt: An open space either with or without roof where the sale of fuel such as petrol, diesel, kerosene and other products take place at the fuel stations (GOIL, 2013; Shell Australia, 2017).

Fuel Service Stations: Established fuel dispensing stations where petrol, diesel, kerosene, and various engine oils are sold to the public (GOIL, 2013; Shell Australia, 2017).

Hazards: A situation, condition, or environment which has the potential to cause harm, damage, human injury or ill health or a combination of these (Shell Australia, 2017).

PPE: All equipment that are intended to be worn at work and which protects workers against one or more risks to health or safety, e.g. safety helmets, gloves, eye protection, and respiratory protection (Chilcott, 2016; Shell Australia, 2017).

Presenteeism: This is being at work despite poor or compromised health and performing below working capacity (Brown et al., 2014).

Psychosocial Safety Climate/Safety Climate: Includes ‘policies, practices, and procedures for the protection of workers psychological health, safety, and well-being. It is measured through the perceptions of the workers (Dollard et al., 2015).

Pump/Forecourt Attendants: Fuel station workers who normally sell fuel to customers at the forecourt.

Workplace Accidents: They include accidents, assaults, abuses, related incidents and illnesses resulting from work related stress (Sullivan et al., 2017).

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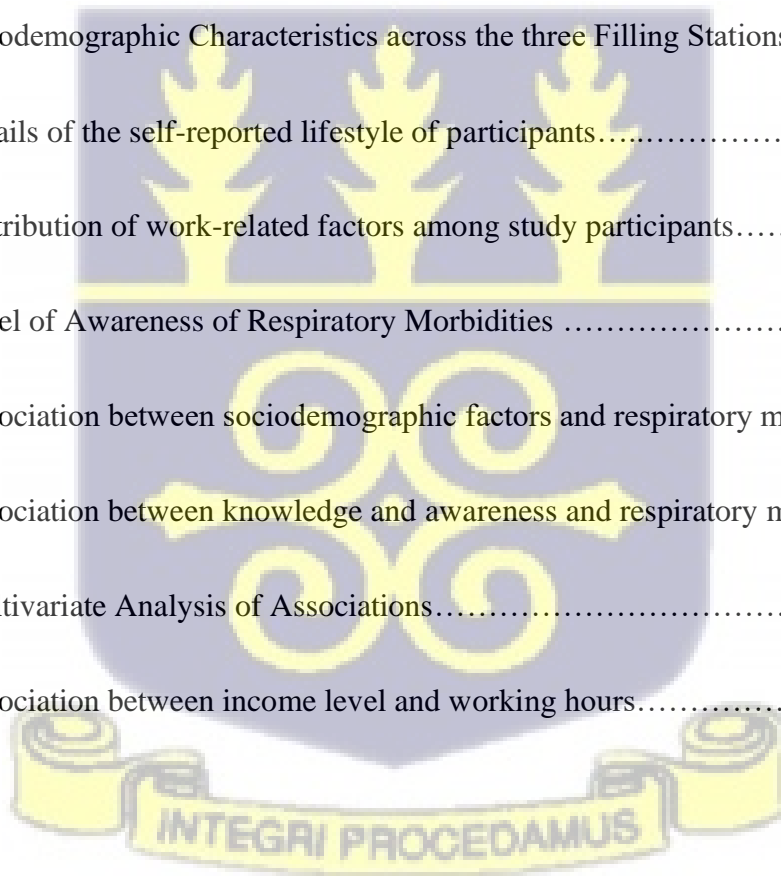
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ABSTRACT

Background: Petroleum has disastrous effects on the respiratory health of humans. Exposure to petroleum products when fuelling vehicles and by-products make fuel attendants susceptible to several respiratory illnesses, including asthma, pneumonia, and chronic obstructive pulmonary disease. Despite the effects of petroleum products on respiratory health, studies investigating the effects of such exposure among fuel pump attendants in Ghana remain scant.

Aim: This study evaluated the prevalence, knowledge, and risk factors for respiratory morbidities among gas station attendants at a sample of stations in the Greater Accra region.

Methods: A cross-sectional design, using a quantitative approach was used to measure the awareness, prevalence and factors associated with respiratory morbidities among 141 fuel pump attendants in Accra, Ghana. A semi-structured questionnaire was used to evaluate chronic respiratory disease symptoms. Next, lung function tests were performed using a peak flow meter to assess the respiratory health of each participant. Multiple regression analysis was performed to determine which factors might influence the occurrence of respiratory morbidities among fuel pump attendants. Data collected was analysed using STATA® version 16 software.

Results: The majority (86.5%) of the fuel pump attendants were males. Nearly all (95%) of the fuel pump workers were aware of the dangers associated with working in the fuel pump stations and how exposure to the hazards can affect their health. Approximately 36% of the fuel pump attendants suffered respiratory morbidity (signs, symptoms, decreased PEF, and abnormal auscultatory findings). Work-related factors such as years of working experience, working hours, and monthly income were significantly associated with the prevalence of respiratory morbidities among fuel pump attendants.

Conclusion: Fuel pump attendants are aware of the respiratory risks associated with their job tasks; however, factors such as work duration, experience, and income were significantly associated with a high prevalence of respiratory morbidities among them. This highlights the

need for employers and health officials to implement evidence-based strategies to reduce the risk of respiratory morbidities.



CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Ghana's petroleum sector has drawn the interest of numerous investors both domestically and abroad during the last few years. This was brought on by the large-scale oil discovery in 2007 and the subsequent commercial oil production in the final quarter of 2010. (Petroleum Commission Ghana, 2019). In parallel, the number of Fuel Service Stations (FSS) has skyrocketed, becoming a common sight in city centres all over the country. Petroleum pump stations are vital to contemporary autos and are not just necessary in today's technology world. Fuel has therefore become one of Ghana's most profitable enterprises as a result of its high demand. The expansion of these stations has helped provide job possibilities in addition to giving the public easily accessible fuel retail outlets. However, there are serious issues with these FSS's health and safety regulations.

There are several known occupational illnesses that affect fuel pump attendants differently. However, because most occupational diseases only become apparent later in life, young employees being exposed to unhealthy working circumstances is a major public health concern (Gilbreath et al., 2012). While the World Health Organization (WHO) defines a healthy workplace as one where everyone collaborates to realize a shared vision for the health and well-being of employees and the community at large, some authors have claimed that FSS is a suitable setting for people with respiratory conditions like asthma, chest infections, and other restrictive lung diseases (Thomas et al., 2020). Others have claimed that exposure to diesel, petroleum fumes, and fuel additives like benzene and formaldehyde, especially in the case of pump attendants, has harmful respiratory, mutagenic, and cancerous effects (Maciel et al., 2019). Apart from this, pump attendants are at risk for a number of occupational ailments, including a decline in hearing acuity, respiratory infections, and physical stress due to

exposures including highway noise, standing for extended periods of time, and monotonous movements. Despite obvious evidence of the threats to health and safety posed by Ghana's developing oil and gas industry, this has largely escaped the attention of experts and regulatory bodies. Since the beginning of commercial oil and gas production in Ghana, the majority of studies have concentrated on the socioeconomic advantages and environmental implications, ignoring the hazards to worker health and safety along the sector's value chain. Particularly, there are little information on the respiratory morbidity or lung function of fuel pump attendants.

Health concerns have been raised regarding pump attendants' exposure to benzene and naphthalene-containing fuel vapour, especially in nations with warmer temperatures (Thomas et al., 2020; Zamanian et al., 2018). This is partly because higher ambient temperatures cause more gasoline to vaporize and because there is a greater danger of inhalation absorption than in countries with temperate climates (Kuranchie et al., 2019). Between 20 and 200 ppm is the reference range for the amount of gasoline vapour in the air during vehicle refuelling. Meanwhile, even short-term exposure to active gasoline-containing chemicals such as butane, pentane, and isopentane at ambient gaseous concentrations of roughly 2000 ppm is considered unsafe (Antunez et al., 2012). Given this context, the purpose of this study is to determine whether fuel pump attendants are aware of the respiratory morbidities that are related to their line of work, to determine the prevalence of respiratory morbidities among a sample of fuel pump attendants, and to determine the work-related factors that are related to respiratory morbidities among fuel pump attendants.

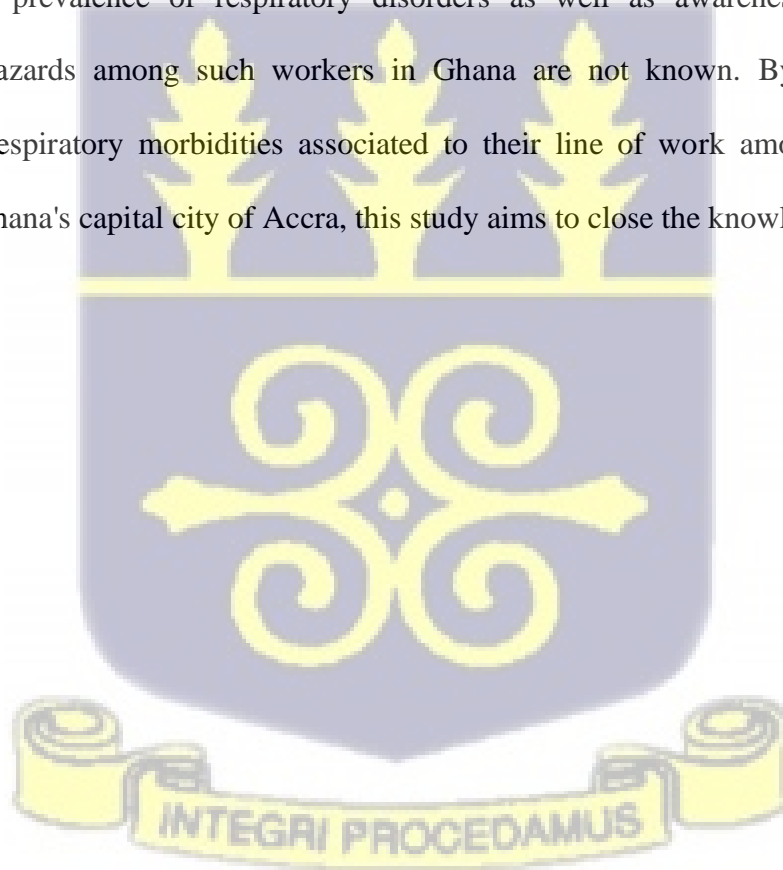
1.2 Problem Statement

The commercial discovery of oil in Ghana has sparked the proliferation and establishment of fuel service stations across the nation, especially in major cities like Accra, Tema, Kumasi, and Takoradi, despite the fact that workplace health and safety practices have received little research attention in the developing world to date (Annan et al., 2015). (Ansah et. al, 2012). Despite the fact that this development has improved employment opportunities in the industry, gas station employees may constantly be exposed to fuel fumes and car pollution (Zafar, 2016). These are confirmed by several epidemiological research, who have reported increased prevalence of respiratory disorders like asthma in human populations exposed to petroleum fumes (Moghadam et al., 2019). Unlike some parts of the world where car owners pump their fuel into their own cars, usually in Ghana, there are fuel pump attendants stationed at various gas stations to aid in filling the tanks of cars.

Volatile petrol-containing chemicals including benzene, toluene, xylene, cadmium and lead, when in the vaporised state and inhaled, or penetrates through the skin of the pump attendants causes detrimental respiratory effects such as migraines, asthma, nausea, wheezing, cough, severe chest pains, reduced pulmonary function (Thomas et al., 2020). Such deleterious effects accompanied with high prevalence (61%) of respiratory morbidity among fuel pump attendants in countries like India (Thomas et al., 2020). Exposure to volatile compounds in fuel may be associated with respiratory tract inflammation, pulmonary haemorrhage, as well as pulmonary function impairment (Antunez et al., 2012). Unfortunately, data on the prevalence of such exposure among fuel pump attendants in Ghana remains scanty. Despite the health effects associated with the exposure to petroleum products, petrol stations in Ghana lacked adequate personal protective equipment like nose masks, protective clothing, goggles, etc. To buttress the above point, workers at fuel stations operate for 8 to 12 hours every day and the majority of them do not wear any protective clothing. As a result, fuel station personnel may be

continuously exposed to hazardous fuel contents (Ansah et al., 2012). The ambient flow of VOCs around the station is further increased by the existence of a canopy over the pump, such as a roof (Kuranchie et al., 2019). As a result, station employees are probably going to experience severe health problems that will affect their ability to breathe (Batta & Dhir, 2015). This might be due to its lack of availability; implying it was not made available for them or discomfort from its use.

Current evidences point ambient air pollution due to petroleum exposure, as responsible for 4.2 million deaths worldwide (Meht et al., 2018; WHO, 2020). Meanwhile, with the increasing citation of fuel stations and recruitment of pump attendants, coupled with prevailing ambient exposures, the prevalence of respiratory disorders as well as awareness of associated occupational hazards among such workers in Ghana are not known. By examining the awareness of respiratory morbidities associated to their line of work among petrol pump attendants in Ghana's capital city of Accra, this study aims to close the knowledge gap.



1.3 Conceptual Framework

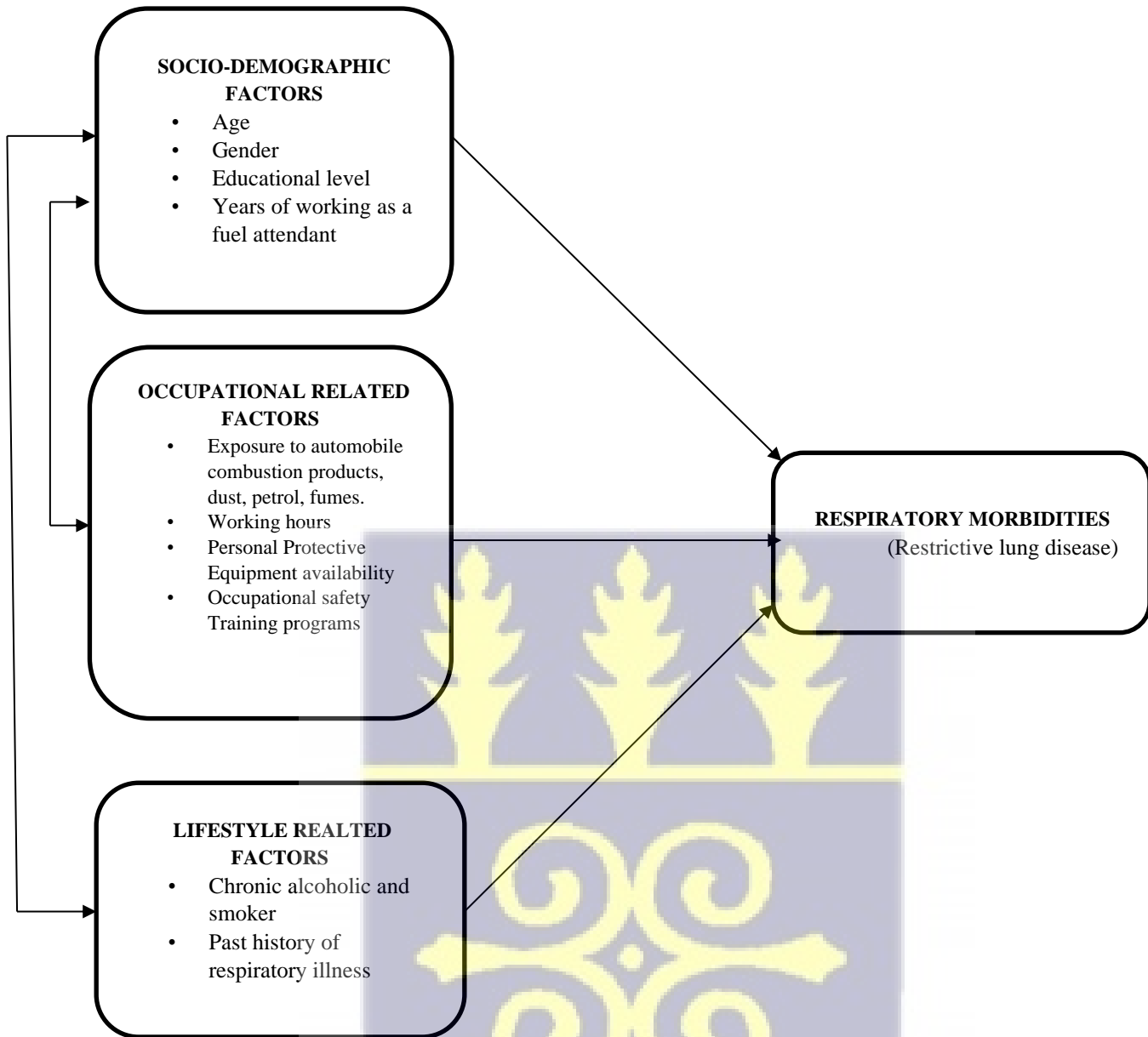


Figure 1: Conceptual Framework displaying the relationship between socio-demographic, occupational related factors and lifestyle related factors and Respiratory Morbidities.

The conceptual framework (figure 1) above demonstrates how the many variables are related to one another and result in respiratory morbidities. Socio-demographic characteristics including age and gender may affect the frequency of respiratory symptoms amongst workers, given older workers may have immunocompromised status thus are likely to present with

respiratory morbidities. Male pump attendants are more likely to be exposed to dangers because they typically work in jobs where exposures to hazards are most significant. The worker's lifestyle, such as smoking or drinking, can also predispose them to respiratory symptoms and potential morbidities because a body of evidence states substantial connections between such behaviours and respiratory deterioration. Further, increased exposure to petrol, toxic products and automobile combustion products results in the relative prevalence of respiratory morbidities in these individuals. Working hours are also critical, given increased contact time with toxic products may increase the degree of exposure. Occupation safety programs organised by employers tend to educate the employees on the various ways to avoid exposing themselves to occupational hazards, and may significantly play a role in the incidence of respiratory morbidities among pump attendants. The study will therefore examine how each of these variables individually affects the respiratory health of the fuel pump attendants.

1.4 Justification of the study

In Sub-Saharan Africa, ten to twenty percent of all chronic respiratory diseases, which affect hundreds of millions of individuals of all ages, are caused by occupational respiratory difficulties. The statistics are stark (Dalju et al., 2019). The study's findings can be used to support the need for a national comprehensive health and safety policy that improves the health, safety, and general wellbeing of Ghanaian workers, particularly those who work at fuel service stations. For Ghana's downstream oil industry, the findings may also be used as a resource when creating and implementing national and organizational health and safety rules.

The findings of this study will have a favourable effect on organisational approaches, especially in the area of hazard management in fuel service stations. This research will educate management and employees on the importance of following safety procedures to live a healthy

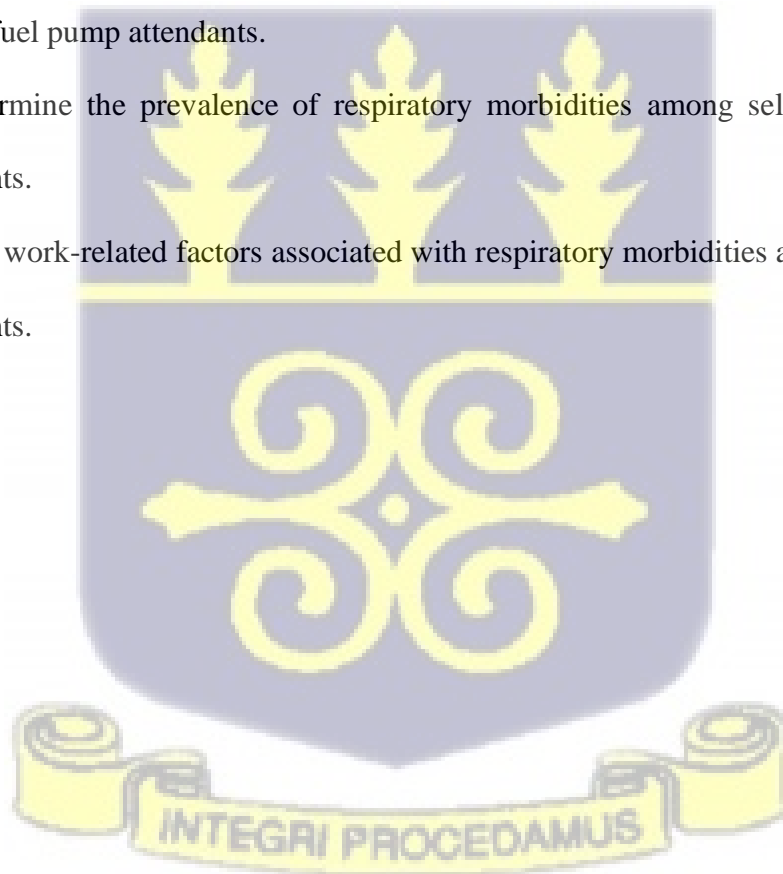
life. The research will allow the petroleum industry, government and other policymakers to devote greater attention to ensuring regulatory compliance and serve as a baseline for policymakers. The Research will be helpful to researchers, as it will serve as the basis for future research.

1.6 General Objective

To assess the and awareness of respiratory morbidities among fuel pump attendants in the Greater Accra region.

1.6.1 Specific Objectives

- To describe the awareness regarding respiratory morbidities related to their occupation among fuel pump attendants.
- To determine the prevalence of respiratory morbidities among selected fuel pump attendants.
- Identify work-related factors associated with respiratory morbidities among fuel pump attendants.



CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Ghana's Petroleum Industry and the proliferation of Oil Marketing Companies in Ghana

Up until the commercially significant offshore finding of crude oil in July 2007, Ghana's oil industry was more dominant in the downstream sector. However, the upstream and downstream sectors of Ghana's oil and gas business may now be distinguished thanks to the anticipated start of crude oil production in the last quarter of 2010. Exploration, development, and production of crude oil and natural gas are among the upstream industry's activities. The downstream industry includes the refining, storage, internal transportation, marketing, and sales of oil and gas products like gasoline, diesel, liquefied petroleum gas (LPG), and kerosene (Prempeh, 2019). The downstream oil sector in Ghana has existed since the very beginning. During this time, only foreign OMCs like Shell Ghana Limited, Texaco Ghana Limited, British Petroleum Ghana Limited, Mobil Ghana Limited, and Total Oil Company Limited operated. These OMCs brought fuel and fuel-related products into the nation, distributed them, and sold them. Additionally, they built fuel service/filling stations where they offered and sold oil products to drivers in a variety of urban and rural settings (Prempeh, 2019). Taking Ghana into consideration, OMCs hire predominantly young, active men and women to work as sales girls and boys in supermarkets and marts across Africa (Bakidamteh et al., 2022). Products ranging from brake fluids to insecticides and consumables are sold in supermarkets or marts. Pump attendants also serve customers on the forecourts of service stations. These attendants check the levels of water, brake fluid, and engine oil in addition to cleaning windshields. Additionally, most stations offer lube bay amenities, which are often staffed by young technicians. Most gas stations are open 24 hours a day, with the pump attendants and sales personnel working in

groups. Although some are owned and operated by individuals known as dealers under the various OMCs, most gas stations are established and run by OMCs (Ward, 2017). Every station has a manager who is in charge of day-to-day operations and who is supported by station supervisors. The majority of these outlets are located in Ghana's townships, cities, and metropolitan areas, with the biggest stations in Accra, Tema, Kumasi, Takoradi, Tamale, Cape Coast, and Ho (AOMCs, 2011; Total Petroleum Ghana, 2015). Apart from GOIL, all of the OMCs are private limited liability businesses. The largest stations are found in Accra, Tema, Kumasi, Takoradi, Tamale, Cape Coast, and Ho, though they can be found in all of Ghana's cities, towns, and communities (Bakidamteh et al., 2022).

2.2 Respiratory morbidity knowledge and awareness among fuel pump attendants

Inhaling gasoline fumes poses a serious risk to the health of both gasoline workers and the general public (Sangotola et al. 2015). According to Thomas et al. (2020), The general knowledge of gasoline pump attendants regarding occupational risks, respiratory morbidities seen in their line of work, and preventative methods was found to be minimal. According to Bakker et al. (2012) older employees' attitudes of workplace safety and the respiratory ailments they are exposed to were more favourable and constructive than younger ones. Compared to their younger co-workers, they were more enthusiastic about the safety standards at their workplaces. A different study discovered that experienced workers perceived their workplaces as safer than less experienced workers. Education alters how thinking works, makes it more strategic, affects how information is processed, and strengthens problem-solving skills. (Bakker et al., 2012; Parker & Bindl, 2016). Education is therefore likely to have an impact on how employees perceive safety and react to safety situations.

There is proof that proactive people, like the experienced, can influence their surroundings by refraining from harmful behaviours like cutting corners (Yan et al., 2021). Furthermore, other findings suggest little knowledge and awareness of respiratory morbidity among fuel pump attendants, especially among the inexperienced and less educated (Goni, 2019). In this regard, the current study will assess the awareness of fuel pump attendants in the capital city, in order to ascertain their risk of respiratory disorders, regarding their job tasks performed.

2.3 Occupational Hazards in the Petroleum Industry

The majority of occupational exposure to the estimated 3000 allergenic chemicals in the environment (WHO, 2020) is linked. Such dangerous substances enter the body through the skin or respiratory system during work. Many occupational health related illnesses affect the respiratory system, more specifically the lungs; This supports the idea that any occupational health program should put a special emphasis on occupational respiratory disorders. (Kulkarni, 2017). For instance, exposure to numerous organic dusts, germs, bacteria, fungus, and many chemicals including BTEX at the fuel service stations might result in occupational asthma. A steady rise in the reported number of occupational asthma cases has been observed in various industrialized countries due to an increased prevalence of allergic reactions, high occupational allergic exposure rates, and improved diagnostic techniques (WHO, 2013).

These harmful compounds in the workplace primarily enter the body via an aerosol route, this makes the lung the most vulnerable organ in the workplace (Thapa & Ghimire, 2012). For a long time, occupational problems among pump attendants at gas stations have been observed. Although they have different effects on workers, they are nevertheless an issue everywhere in the world (Mtunzi et al., 2017). A quick increase in air pollution through exposure to petroleum has been linked to an immediate increase in morbidity and mortality in epidemiological studies

especially among fuel pump attendants (Begum, 2012). The World Health Organisation (WHO, 2020) report posits that in 2016, 4.2 million died worldwide due to ambient air pollution, with petroleum being one of the major culprits. Almost 87 percent of these deaths occur in low- and middle-income countries (LMICs), which house 82 percent of the world's population. In Sub-Saharan Africa, about 211 000 people pass away each year (Mehta et al., 2018). Numerous studies have shown how a dirty environment affects the respiratory system (Meo et al., 2018).

Pump attendants are exposed to volatile organic compounds (VOCs) such benzene, ethyl benzene, nitrobenzene, 1,3-butadiene, ethylbenzene, n-Hexane, and toluene xylene while refuelling automobiles and checking fluid levels (Udonwa et al., 2019). Pump attendants' haematological characteristics, including their red blood cell morphology, have reportedly changed noticeably as a result of VOC exposure, both singly and in combination (Tunsaringkarn et al., 2013).

Although other studies have established the fact that these fuel pump attendants are exposed to composite exposures, but however the individual exposure agents responsible for these respiratory illnesses have not been ascertained.

2.4 Concept of Occupational Health and Safety in the Petroleum Industry

Since the beginning of the mid-1500s, the significance of worker health and safety has been recognized and documented (Kakwi, 2020). The industrial revolution, however, led to a greater emphasis on worker health and safety issues. A lot of labour-saving technology and new working practices were also developed as a result of the industrial revolution. Workers' carelessness and inexperience with the use of working equipment were noted during this time period. The period also resulted in a heavy workload for workers. However, the workforce endured a high risk of occupational accidents, injuries, illnesses, and deaths since workers had

little to no expertise using these instruments or technologies. Many employees, according to Kakwi (2020), worked under pressure to fulfil demands and please employers. Every human endeavour carries with it certain risks. Over the years, people have become aware of the risks connected to employment and the workplace (Comaru & Werna, 2013). Furthermore, risks arise from employee actions related to work procedures, work processes, or adherence to workplace norms or regulations (Gorman et al., 2013). The employee and their families, the business, and society at large are all impacted by these OHS issues (Gahan et al., 2014). As a result, the demand for worker safety shifts from a personal worker health protection problem to one of corporate social responsibility.

The goal is to increase workplace health promotion while reducing health disparities between and among workers in different nations. OHS therefore makes sure that all employees have access to preventative health services. OHS strengthens the information foundation for taking action to protect the health and safety of the workforce and further integrates occupational health to primary healthcare. Additionally, it supports workers' health and creates a connection between work and health. Therefore, OHS attempts to implement policies and practices that improve a pleasant work environment and safeguard, maintain, and advance the health, safety, and general wellbeing of employees both on and off the job. OHS is a broad and diversified field. It covers a variety of topics, including ergonomics, risk assessment for health and safety, industrial or occupational psychology, occupational engineering, occupational or safety hygiene, occupational medicine, nursing, and research (Dollard et al., 2012; European Commission, 2013). Health is defined as the worker's ideal or improved condition of physical, psychological, emotional, and environmental well-being. Safety can also be defined as the absence of events or conditions that unintentionally or deliberately harm, maim, or kill people while they are working. Perhaps management and the workplace need to pay much more practical attention to the workers' health and safety, which has become an indivisible entity

(Kirsten, 2010). Therefore, extensive safety programs are required to offer all employees a secure and comfortable workplace, regardless of their gender, age, level of education, or social standing (Punnett et al., 2013).

OHS is an essential tactic for guaranteeing the well-being, safety, and health of employees. It advances the productivity objectives of both large and medium-sized businesses (Songstad et al., 2012). Additionally, it encourages healthier employees, results in greater job satisfaction, and increases return on investment through productivity and service provision (Gilbreath & Karimi, 2012; Seidler et al., 2014). Therefore, OHS should not be undervalued, especially by employers and worker unions, as it improves the general quality of life for workers, their families, the organization, and society. In this sense, senior organizational managers have a moral and legal obligation to consciously implement effective procedures that safeguard each employee's overall health. On the other hand, employees have a moral obligation to safeguard their health and safety at work by following all rules and regulations, as well as additional precautions (Ansah, 2012). Senior organizational managers' implementation of safety measures to protect employees' wellbeing is how occupational health and safety are manifest. Safety measures are intentional, practical steps made by senior management to safeguard, uphold, and promote the workforce's health, safety, and wellbeing both inside and beyond the workplace. Safety measures are signs of management commitment to, importance for, and support for employee health and safety. Offering such safety precautions is a proactive action employer can take to protect employees' physical and mental wellbeing (Iavicoli et al., 2015).

A typical organization's safety measures can involve establishing safety policies, creating a committee for workplace safety, and monitoring and enforcing adherence to these rules or laws. The provision of PPE, instruction in safe work practices, and the provision of medical care, including pre-employment medical screening and carrying out safety risk assessment and management, all contribute to increased safety (Boustras & Hadjimanolis, 2012). These safety

precautions are connected. Workers are still exposed to risks at work even when one safety measure (PPE) is provided and another (enforcement) is neglected.

2.5 Chronic obstructive pulmonary disease

A widespread, preventable, and treatable chronic lung illness that affects both men and women worldwide is chronic obstructive pulmonary disease (COPD). Airflow into and out of the lungs is restricted as a result of abnormalities in the tiny airways of the lungs. The airways narrow due to a number of factors. Parts of the lung may be destroyed, the airways may be obstructed by mucus, and the lining of the airways may become inflamed and swollen. Chronic bronchitis or emphysema are other names for COPD. Emphysema typically refers to the lungs' small air sacs at the end of airways being destroyed. A chronic cough that produces phlegm as a result of airway irritation is referred to as chronic bronchitis. Coughing, wheezing, and breathing difficulties are frequent symptoms of both COPD and asthma, and some patients may have both illnesses (WHO, 2022). The majority of studies used within-community exposure contrasts, which primarily assessed the impact of transportation on air pollution. Overall, the evidence of the chronic effects of air pollution on the prevalence and incidence of COPD among adults was suggestive but not conclusive, despite plausible biological mechanisms and strong evidence that air pollution affects lung development in children and causes exacerbations in COPD patients (Schikowski et al., 2014).

Even though COPD is a chronic, progressively worsening condition, it is treatable. With proper management, most COPD patients can experience reasonable symptom control, a high quality of life, and a lower risk of contracting other diseases. A crucial indicator is the persistent, escalating shortness of breath that characterizes COPD. According to the National Institute of Health, breathlessness (shortness of breath) is frequently the most upsetting symptom, increasing the underlying anxiety and degree of disability (Gold Report, 2021).

Coughing is a further indication of COPD. The most prevalent early indication of COPD by far is a persistent cough that may or may not generate mucus in the form of phlegm. Phlegm is frequently coughed up as sputum, and depending on social or cultural factors, it may be ingested or spit out, making it challenging to evaluate (Gold Report, 2021). On the other hand, a productive cough is only observed in up to 30% of cases. Air flow restriction can happen even when there isn't a cough. A quick worsening of signs and symptoms is referred to as an acute exacerbation. The most noticeable sign is an increase in dyspnoea; other symptoms that are more noticeable are an abundance of mucus, coughing, and wheezing.

2.6 Prevalence of Respiratory Diseases Among Fuel Pump Attendants

According to the International Respiratory Societies (IRS) in 2013, chronic obstructive pulmonary disease, asthma, acute respiratory infection, tuberculosis, and lung cancer were the top five global burdens for respiratory ailments. About 200 million people worldwide are estimated to develop COPD as a result of indoor smoke, excessive cigarette smoking, occupational toxins, and asthma. Over 235 million people are estimated to have asthma, which can be brought on by genetic predisposition (or an aberrant immune response), environmental and occupational allergies, or air pollutants (Ferkol & Schraufnagel, 2014).

According to a study conducted in Nigeria's Enugu metropolis, fuel pump attendants had much more respiratory symptoms and diseases than the control group (Okemuo et al., 2020). The significant amounts of benzene and other hazardous chemicals that are always present in their breathing zone as a result of fuel and exhaust fume discharge are what caused the fuel pump attendants' respiratory problems. These contaminants induce serious respiratory symptoms and dysfunction by irritating the airways. This study supports earlier research by Adeniyi (2014) and Zafar (2019), who both found that pump attendants had a higher prevalence of respiratory problems than the control group. The most typical respiratory symptoms among pump

attendants were cough and chest aches. Cough, sputum production, dyspnoea, and chest discomfort were all found to be considerably more common in pump attendants who had worked for one or more years, according to further analysis of the observed respiratory symptoms with respect to term of employment (Okemuo et al., 2020).

A cross-sectional study conducted in Algeria in 2012 found that petrol station personnel had a higher prevalence of respiratory symptoms. According to this Study, the prevalence of at least one respiratory symptom was higher in the exposed group than in the control group (Sekkal et al., 2012). Similarly, in a study done in Nigeria, the prevalence of URTI among fuel station workers was higher as compared to the control group (Adeniye, 2014).

2.7 Occupation related factors

Personal Protective Equipment (PPE) and Respiratory Protective Equipment (RPE) use

Fuel station attendants are exposed to a variety of risks and health hazards in the workplace, which should be regarded as detrimental to their overall health. These workers are exposed to a variety of chemical compounds, including solvents, gasoline additives, aromatic hydrocarbons, benzene, toluene, ethylbenzene, and xylene (BTEX). Inhalation is the main way by which these substances enter the body. Petrol is the most widely used fuel because it has a lower boiling point and greater combustibility than other fuel types, unlike diesel. It is utilized in systems and low- and medium-duty vehicles. The fuel poses a significant risk because it can easily turn into vapour and inhaled (Awasthi et al., 2016).

According to the International Labour Organisation (ILO), protective equipment must be used when it is not reasonably practicable to eliminate or control the hazardous substance. However, findings from different studies indicate low PPE and RPE utilisation among fuel station workers (Rocha, 2014; Emokpae, 2020). For example, in a self-reported survey in Brazil, 3.2%

of workers reported use of RPE, but only one worker from the total of 221 study subjects was found to use an RPE (Kakwi, 2020).

Meanwhile, the exposure to BTEX is designated by the World Health Organisation as a group I carcinogen and is known to pose serious health risks to petrol pump operators (Moolla, 2015). When workers do not wear protective clothing, they inhale gasoline vapours and expose their hands and arms, increasing their exposure to BTEX substances (Alves et al., 2017). The eyes, neurological system, throat, and skin may experience itching or burning due to exposure to these toxic compounds (Awasthi et al., 2016). Exposure is greater when there are no safeguards in place, such as vapour recovery devices integrated into the pump nozzles, to reduce leakage at the nozzles in petrol stations. In addition, most petrol pump stations are not equipped with a device that allows the operator to walk away while the tank is filling, thus prolonging the duration of exposure each time a vehicle is filled (Adeniyi, 2014).

An important study on FSS safety in India showed that pump attendants' exposure to hazardous fuel fumes is caused by a lack of Personal Protective Equipment (PPE) being provided to them. They discovered that out of 158 fuel station workers, 96 (61%) had respiratory morbidity (defined as the presence of any signs and symptoms, abnormal auscultatory findings and reduced peaked expiratory flow rate). They also revealed that the specific prevalence is approximately 83 percent among workers aged 37 onwards and those who have worked for more than ten years was 81 per cent (Thomas et al., 2020). In another study, it was found that all petrol pump attendants used incomplete means of protection. This study sought to determine the extent of lung infection among fuel pump attendants and to investigate the connection between lung function and exposure to gasoline vapour. Reduced Pre-FVC% and post-FVC% together with a normal or raised FEVI/FVC ratio in cases as compared to controls demonstrated a significant decline in pulmonary function in cases as compared to controls. The rate of respiratory impairments was lower in the unexposed controls than it was in the exposed people

(Adeniyi, 2014). Most of these studies only assessed the respiratory function without auscultatory findings, however the current study seeks to assess the auscultatory findings as well to buttress the fact that, there are respiratory morbidities in these fuel pump attendants.

In addition, several studies have found that petrol pump attendants have an increased risk of cancer due to daily exposure to toxins, including benzene and formaldehyde (Tunsarinkarn et al., 2012). This necessitates the usage of personal protection equipment by all employees at the gas station for their safety. They reported that, because of the lack of suitable regulatory and personal protective equipment, petrol pump attendants and workers in petrochemical sectors in underdeveloped nations are especially prone to negative consequences. Explaining further, they stated that around 5,000 petrol stations in Nigeria, with over a hundred thousand petrol pump attendants, get exposed to petrol fumes daily as they dispense petroleum into the tanks of vehicles. The lack of personal protective equipment like gloves, nose masks and others make them very vulnerable. Meanwhile, According to Adiniye (2014) it is essential that petrol attendants wear protective equipment or get better engineering controls on their equipment while on duty, as it will help decrease their exposure to petrol vapours.

2.8 Work-related factors and respiratory morbidities

Duration of employment is an essential epidemiological factor that determines the occurrence of respiratory symptoms in workers. More extended work experience (>10 years) and higher earnings likely equated to longer working hours and more prolonged exposure to toxic fumes and vapour, leading to respiratory illness. Furthermore, it was found that fuel pump attendants with more than ten years of experience are likely to suffer more respiratory illness than those with lesser years of experience, which implies that the more a person works at the filling station, the more he or she is prone to respiratory illness (Thomas et al., 2020). According to Amritsar

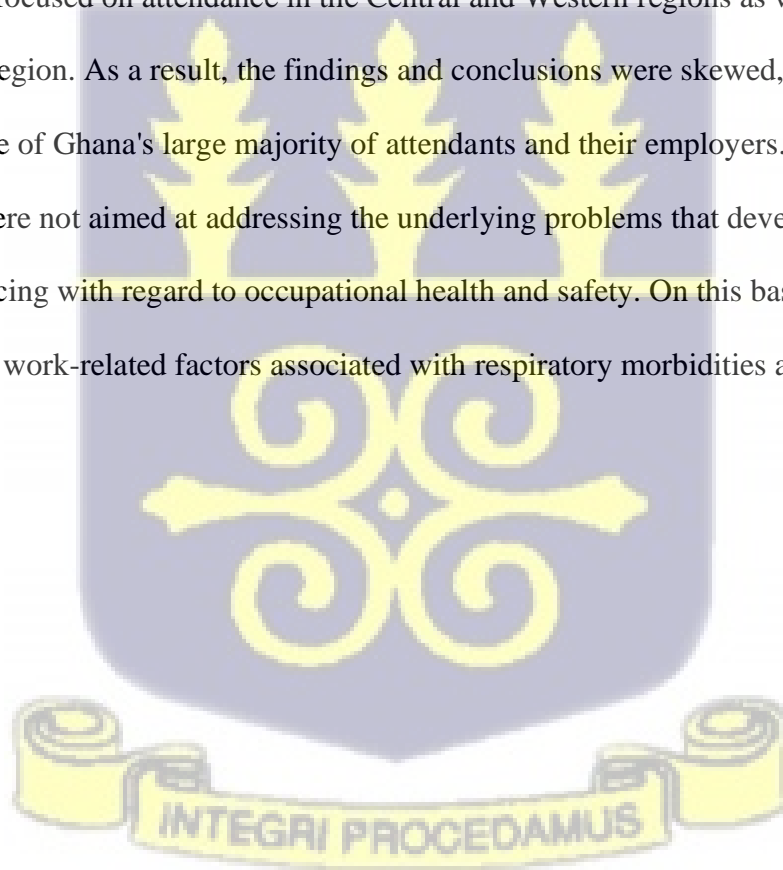
(2014), it was found that the worker's lung function decreases as the year of service increases. The Mean value of forced vital capacity (FVC) for workers with less than one year of service, between one and five years and above five years, showed 3.05 ± 0.46 , 2.77 ± 0.42 and 2.38 ± 0.61 , respectively. The decline of forced vital capacity (FVC) among less than one year and between one and five years of service is prominent among service years of between one and five years and more than five year of service. However, this reduction was statistically different for FEV1 parameters for less than one year and between one and five years of service. Meanwhile, in India, the study divided the group into two distinct groups based on the duration of exposure; one above five years and the other below five years then compared with the control group. Chemical exposures, primarily from gasoline contact and inhalation, are known to influence petrol attendants significantly. These personnel are vulnerable to the adverse reactions of hydrocarbons in fuel (Jonhson & Umoren, 2018).

According to Accra's typical work schedule, each attendant works a 12-hour shift; diurnal hours begin at 6 am and conclude at 6 pm, while nocturnal shifts begin at 6 pm and end at 6 am at certain other smaller or local stations (Monney et al., 2015). This shows that fuel pump attendants work for a very long period within a day. Extended periods of standing and repetitive actions by pump attendants expose them to a variety of occupational ailments, including hearing loss, respiratory infections, and physical stress (Cezar-Vaz, 2012).

Petrol stations are located near busy roads, workers are exposed to a variety of toxins in addition to automotive exhaust. Soot, gases such as sulphur and nitrogen oxides, carbon monoxide, and liquid aerosols and particles are all present in automobile exhaust. It causes a variety of pulmonary diseases, carcinogenesis, and haematological abnormalities (Chavan & Jadhav, 2017). The FSS have been demonstrated in several empirical studies to produce favourable conditions for fire disasters and to expose employees to a variety of physical,

chemical, and ergonomic dangers (Sakyi et al, 2012). More significantly, only a few studies have sought to shed light on the health and safety procedures used by FSS in Ghana (Ansah & Mintah, 2012; Monney et al., 2015).

The first ever study in Ghana done in relation to safety measures of fuel pump attendants in OMCs concluded that adequate safety measures are vital to increase the attendants' safety behaviours (Ansah & Mintah, 2012). In another study, there was exploration of health and safety standards, occupational hazards and health problems among attendants. They found that attendants face serious health risks as a result of their working conditions, and they urgently need protective measures (Monney et al., 2015). These two studies, although commendable, focused on attendance in the Central and Western regions as well as Kumasi in the Ashanti region. As a result, the findings and conclusions were skewed, making them unrepresentative of Ghana's large majority of attendants and their employers. Furthermore, these studies were not aimed at addressing the underlying problems that developing countries are currently facing with regard to occupational health and safety. On this basis, the current study identifies work-related factors associated with respiratory morbidities among fuel pump attendants.



CHAPTER THREE

3.0 METHODOLOGY

3.1 Introduction

The chapter describes the study's techniques and tools. It covers the research design, sample size and sampling procedure, study region or location, study population, data collection technique and tools, data processing and analysis, quality control, and ethical consideration.

3.1 Study Design

The research used a cross-sectional approach. A cross-sectional design involves studying people who differ on certain characteristics but share some other characteristics at a specific point in time. Using a quantitative approach, the prevalence and associated factors of respiratory co-morbidities among fuel pump attendants in selected fuel stations in the Greater Accra Region of Ghana were determined.

3.3 Study Area

The study area was conducted in the Greater Accra Region, in the national capital, Accra. This capital has the largest number of fuel service stations and 95% of Oil marketing companies' headquarters situated in the capital. Accra situated on the southern coast of the Gulf of Guinea, a portion of the Atlantic Ocean. Accra has a total size of 225.67 km² (87.13 sq. mi), and as of 2020, there were 4.2 million people living in metropolitan areas there. It is divided into 12 local government districts, including the Accra Metropolitan District, the only district in the capital to be given city status, and 11 municipal districts. The district under the control of the Accra Metropolitan Assembly is distinguished from the rest of the capital as the "City of Accra," while "Accra" typically refers to the Accra Metropolitan Area, which serves as Ghana's capital.

On March 20, 2018, eighteen (18) new district assemblies were inaugurated in addition to twenty (20) existing district assemblies in the Greater Accra region making a total of 38 districts.

Every district has a huge number of fuel service stations within a 200 metres radius, aside the international OMCs are also the local OMCs who are scattered across the region within same radius from each other as indicated in the map below (Figure 2) which has a minimum 4 fuel pump attendants serving customers on a daily basis.



Figure 2: Map of selected fuel service stations of local Oil Marketing Companies' in the Greater Accra region.

3.4 Study Population

The study population consisted all fuel pump attendants working in pump stations of local Oiling Marketing companies (OMCs) in the Greater Accra Region of Ghana. From this

population a sample of the local OMCs fuel pump attendants were recruited for the study. The selected OMCs consisted of Glory Oil Ghana, Allied Oil and IBM Petroleum Limited Ghana.

3.5 Inclusion and Exclusion Criteria

3.5.1 Inclusion Criteria

All fuel station attendants in Accra who were 18 years and above were recruited for the study from randomly selected local fuel stations. The study focused on fuel pump attendants who worked with local Oil Marketing Companies (OMCs) in Accra.

3.5.2 Exclusion Criteria

Fuel pump attendants with past medical history of severe respiratory illness (asthma/ COPD/TB/Pneumonia) before joining the job and chest injuries or operations were excluded.

3.6 Variable of interest

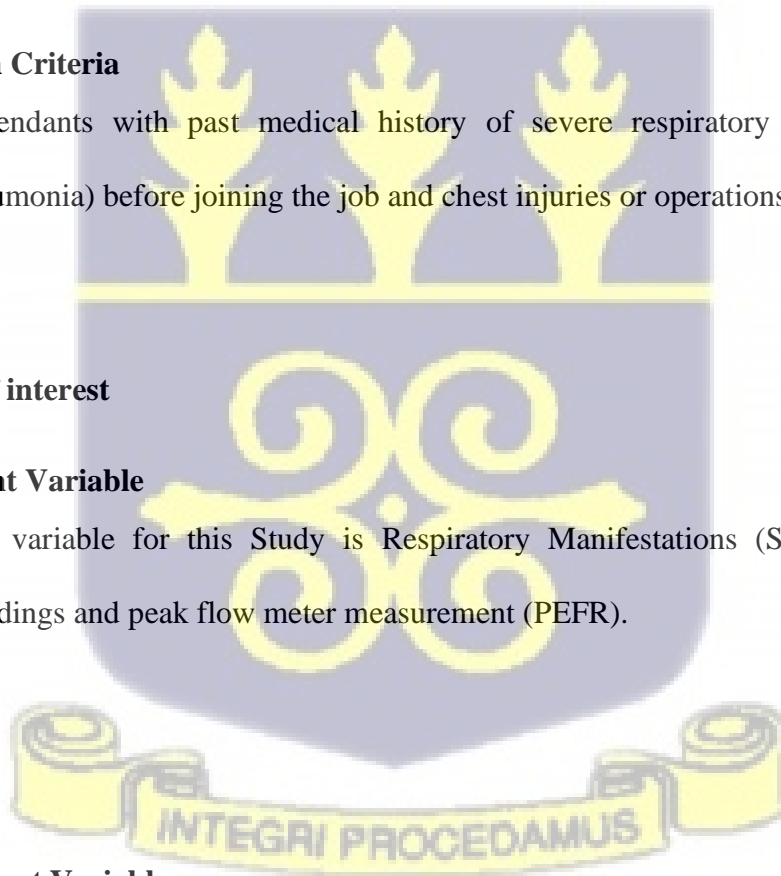
3.6.1 Dependent Variable

The dependent variable for this Study is Respiratory Manifestations (Signs, symptoms, auscultatory findings and peak flow meter measurement (PEFR).

3.6.2 Independent Variables

Independent variables consist of the following:

- Socio-demographic factors (pump attendants' age, gender, level of education, years of work experience)



- Lifestyle factors (chronic alcoholic or smoker, past history of respiratory illness)
- Occupational related factors (exposure to automobile combustion products, petrol, fumes, dust, working hours, personal protective equipment availability, occupational safety training).

3.7 Sampling

3.7.1 Sample Size

Sample size was calculated using the formula below:

$$n = \frac{z^2 p(1-p)}{e^2}$$

Where;

n= minimum sample size required

Z= Z value (1.96, that corresponds to 95% CI)

e = Marginal error or precision required (0.05)

P= Prevalence respiratory morbidity was 10.1% in a recent study conducted among fuel pump attendants in selected petrol pumps in Bangalore City using both respiratory signs and symptoms and lung function (Thomas et al., 2020).

Thus

$$n = \frac{1.96^2 \times 0.101(1-0.101)}{0.05^2}$$

n = 138.5

Adjusting for 2% non-response rate, $138.5 \times 0.02 = 2.76$

n = $138.5 + 2.76 = 140.26$

Therefore, the estimated total sample size for this study was 141 fuel pump attendants.

All the various local OMCs were noted and STATA was used to randomly select the local OMC's included in the study. These include; Glory Oil Ghana, Allied Oil Ghana and IBM Ghana.

For this study,

The total population (N) of the fuel pump attendants in the three selected OMCs in Greater Accra region (Glory Oil (66), Allied Oil (98), and IBM (23) was 187 (Source: Estimate provided by an executive of the Human Resource department at all three selected Marketing Oil Companies).

Number of fuel pump attendants to be recruited per each selected OMC

Table 1. Representation of sample sizes for selected OMCs

Local Oil Marketing Company (OMC)	Total Number of Fuel Pump Attendants	Proportion of Fuel Pump attendants to be recruited
Glory Oil Ghana	66	50
Allied Oil Ghana	98	74
IBM Petroleum limited	23	17

3.6.2 Sampling Procedure

Using STATA® version 17, three local Oil marketing companies (OMCs) in the Greater Accra region were randomly selected from the various ones for this study. Next, the total population of fuel pump attendants of each selected OMC was obtained. Each oil marketing company formed a stratum from which the study participants were selected. An appropriate sampling fraction was used across all strata to ensure proportionate selection of study participants from each local OMC. Using the sampling frame consisting of fuel pump attendants for each of the selected local OMC, a proportion of participants were selected for this study, using the simple random approach. A list of all the fuel pump attendants in each of the selected local OMC fuel stations were taken and assigned numbers and excel was used to randomly select the proportion

of fuel attendants to be recruited in each station from the total number of the fuel pump attendants found in that particular local OMC.

3.8 Data collection

The randomly selected participants from each local OMC were contacted and informed consent was obtained prior to the start of the data collection process. The informed consent was in English language; however, for those who were not able to read, it was translated to a local dialect of choice. Afterwards, an online survey questionnaire (see appendix 1) was used to interview the selected participants. A maximum of 10 minutes per attendant was allocated to reduce the contact time with each participant. Subject to the present COVID-19 situation in Ghana, all defined processes in accordance with the GHS ERC Guidelines on COVID-19 were followed during the data collecting period. Before the interview began, all participants and interviewers were given a nose mask and hand sanitizers. They also followed the GHS ERC Guidelines on COVID – 19 on hand washing measures.

3.8.1 Questionnaire design and administration

A modified questionnaire from the British Medical Research Council (BMRC) was used to obtain the data. This questionnaire was coded into the Google Forms® App (online software) and used to capture respondent's social demographic characteristics, lung function, exposure to respiratory illnesses etc. The Semi-structured questionnaires were coded into the App for an easier and more accessible mode of collecting the quantitative data across the selected study sites. The online questionnaire was divided into seven segments with the first measuring participants' demographic data, namely gender, age, marital status, religion, highest educational level and years of experience. The second segment measures self-reported lifestyle information, the third section capturing the knowledge background of the selected sample, the fourth section measuring self-reported symptoms, the fifth capturing past respiratory illness,

the sixth reporting occupational and exposure history of the respondents, the seventh capturing the occupational safety and personal protective equipment and finally the last segment focused on physical examination and lung function test results of the respondents.

3.8.2 Measurement of Respiratory System Variables

3.8.2.1 Spirometry

Using peak flow meter, the Peak Expiratory Flow Rate (PEFR) of the participants were measured. The subjects were given 10-15 minutes of rest before performing the procedure. Before performing the actual procedure, the participants were made to sit in an upright position in a chair with armrest and feet in a dependent position to avoid falling due to syncope. Participants were introduced to the instruments, and procedures explained and demonstrated, handling, and use of instruments were also explained. The test was repeated two times and for each pulmonary parameter. The best result was considered for analysis. All pulmonary function tests were carried out at a fixed time of the day to minimise diurnal variation.

3.8.2.2 Auscultatory Finding

The chest of the selected fuel pump attendants was auscultated using a stethoscope and the various chest findings which entails air entry, breath sounds and any other respiratory added sounds of the participants was documented to help give an objective overview of the respiratory findings being reported.

3.9 Data processing and Analysis

Data obtained was exported from the Google forms App in a Microsoft Excel document format into and the STATA software for statistical analysis of data obtained. Data was cross-checked to ensure completeness and cleanliness. The data was presented using descriptive statistics (ie. Mean, Standard Deviation etc). Frequency distribution tables and charts were equally used for

representing the data from the field. Furthermore, the relationship between awareness, associated factors and the specific respiratory morbidities was determined using bivariate and multivariate logistic regression methods.

3.10 Ethical Consideration

Ethical Clearance

The proposal was submitted to the Ghana Health Service Ethics Review Committee for ethical clearance. Permission was sought from the Managements of selected Local Oil Marketing Companies to conduct the Study at the selected fuel service stations. To carry out the study, permission was sought by presenting documented proof of ethical approval and an introductory letter from the School of Public Health, University of Ghana.

Voluntary Participation and Informed Consent

Potential study participants were made aware that their participation in the study is completely voluntary and that they are free to opt to stop participating at any time. In addition, appropriate permission was sought from all selected fuel service station heads selected for the Study. An introductory letter was used to obtain permission from the service stations before data collection. Informed consent was obtained from the study participant before data collection.

Data Storage and Usage

The lead investigator was the only person privy to the password-code for accessing the Google cloud, where completed questionnaires were saved directly. Within 24 hours of data collection, coding and cleaning were completed and kept on the primary investigator's cloud. The lead investigator will keep an external hard drive and a CD-ROM to store copies of the data for around 3 to 4 years for possible future publication of the study, after which it will be destroyed.

Result Dissemination

A copy of the research shall be forwarded to the University of Ghana's School of Public Health libraries after completion, and it would also be posted online on UG space as a reference source. The findings of the study would also be communicated to university of Ghana management in order to support the implementation and strengthening of appropriate policies to have a beneficial impact on the respiratory health of fuel pump attendants. Findings would be presented at national and international conferences and further published in a peer-reviewed journal.

Risks and Benefits

While still remain in the era of Covid-19, there was a need to adhere to safety precautions. The spirometer spirettes were singly wrapped and every participant was offered a new spirette to be used to reduce the risk of infection of covid-19. The spirometer was also disinfected with 70% alcohol rub prior to usage by every participant. The participants were also be provided with hand sanitizers prior to touching any of the devices and also afterwards. This ensured reduction of the transmission of the virus to the barest minimum. The participants were informed about the general nature of the study and assured of the measures put in place to minimize the potential risk of transmission of infection during the study. The length of the interview was also be a drawback. Given this, the questionnaire's design was thoughtfully constructed to encourage conversation. Although the study's participants did not receive any direct or immediate benefits, their input was valuable in developing guidelines and policies to encourage a safe working environment for their respiratory health.

Compensation

No tangible rewards were given for taking part in this study.

Conflict of interest

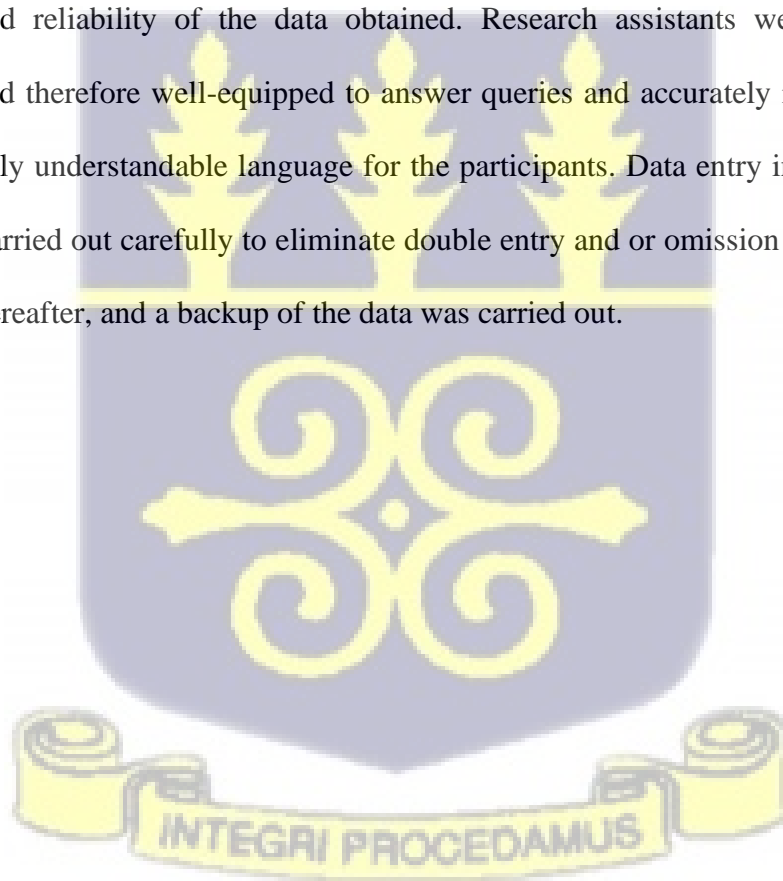
The Principal Investigator affirms that he had no competing interests with this investigation.

Funding

The principal investigator solely funded for this project

3.11 Quality Control

Research assistants were trained on interviewing ethics, how to properly introduce themselves to participants to effectively develop rapport, and the purpose of the study in order to guarantee the validity and reliability of the data obtained. Research assistants were also medical practitioners and therefore well-equipped to answer queries and accurately interpret medical jargon into easily understandable language for the participants. Data entry into the computer program was carried out carefully to eliminate double entry and or omission of data, raw data was cleaned thereafter, and a backup of the data was carried out.



CHAPTER FOUR

RESULTS

4.1 Sociodemographic Characteristics of participants

The study consisted of 141 fuel pump workers from three fuel stations in the Greater Accra region: Glory Oil, Allied Oil and IBM Oil. Majority (86.5%) of the participants were males and single (70.92%). The age of the individuals ranged from 18-50 years. Most (83.7%) of the fuel were Christians and had at least a secondary school level of education (68.79%). More than half (68.8%) of the pump attendants had their salary range from GHC 600 to GHC 1000, while 31% of them received less than GHC 600. Nearly half (46.8%) of the fuel pump workers had more than 3 years to 7 years of working experience. The sociodemographic characteristics of the study participants are displayed in Table 4.1 below. Furthermore, the sociodemographic characteristics of fuel pump attendants per the three fuel pump stations are detailed in Table A1 in appendix.



Table 4.1: Sociodemographic Characteristics of Fuel Pump Workers

Characteristics	Frequency (N=141)	Percentage (%)
Age		
>50	1	0.7
18-35	80	56.7
36-50	60	42.6
Gender		
Female	19	13.5
Male	122	86.5
Level of education		
Primary-Junior	44	31.2
Secondary	97	68.8
Marital Status		
Divorced	2	1.4
Married	36	25.5
Separated	3	2.1
Single	100	70.9
Monthly Income (GHC)		
300-599	44	31.2
600-1000	97	68.8
Working Experience		
≥3 years	41	29.1
>3-7 years	66	46.8
> 7 years	34	24.1
Religion		
Christian	118	83.7
Muslim	23	16.3

4.1.1 Sociodemographic characteristics of participants for each filling station

The sociodemographic characteristics of participants for each of the three filling stations are presented in Table A.1 in the Appendix IV.

The table shows that the majority of workers in Glory and IBM filling stations fall between the ages of 18 and 35, making up 64.0% and 64.7 % of the total workers, respectively. In comparison, the Allied filling station has half of workers each between the ages of 36 and 50, and 18 and 35 age groups.

In terms of gender, the majority of workers in all three filling stations are male, with 76.0% in Glory, 90.5% in Allied, and 94.1% in IBM. The proportion of female workers is much lower, making up 24.0% in Glory, 9.5% in Allied and 5.9% in IBM.

In terms of education, the majority of workers in Glory and Allied filling stations have secondary education, accounting for 54.0% and 77.0% of workers respectively. In comparison, the IBM filling station has a higher proportion of workers with primary education, accounting for 23.5% of workers.

In terms of marital status, the majority of workers in Glory, Allied and IBM filling stations are single, making up 66.0%, 73% and 76.5% of workers respectively.

Regarding monthly income, the majority of workers in Glory and Allied filling stations earn between GHC300 and GHC500 and GHC600 and GHC1000 respectively. In comparison, all workers in the IBM filling station earn between GHC600 and GHC1000.

In terms of religion, the majority of workers in Allied and IBM filling stations are Christian, accounting for 82.4% and 100.0% of workers respectively. In contrast, the Glory filling station has a higher proportion of workers who are Muslim, accounting for 20% of workers.

Finally, in terms of experience, all of workers in IBM filling station have more than 1 year of experience. In contrast, the Allied and IBM filling stations have a lower proportion of workers with less than 1 year of experience, accounting for 8.2% and 6.0 % of workers respectively

4.2 Self-Reported Lifestyle Information of Participants

About 94% of participants in this study were non-smokers and non-alcoholics and 6% were smokers and alcoholics in this study were defined as workers who have past history (at least for 1 year) of smoking/taking alcohol and are currently smoking/ taking alcohol.

Details of the self-reported lifestyle of participants can be found in Table A.2 in Appendix.

4.3 Distribution of work-related factors among participants

Most (71%) fuel pump attendants worked for more than 12 hours each day, 19% worked for between 8 to 12 hours daily, and 10% had working hours of less than 8 hours. Majority (94%) of participants were exposed to respiratory hazards (Petroleum fumes and vapours, Dust and particles from fuel and gasoline, Chemical exposure from gasoline and other fuel additives). Nearly all (97%) reported using personal protective equipment while working. Table A.3 in Appendix shows the distribution of work-related factors among participants in this study.

4.4 Knowledge and Awareness of Fuel Pump Attendants about Respiratory Morbidities

Majority (95%) of the fuel pump workers are aware of the dangers associated with working in the fuel pump stations and how exposure to the hazards can affect their health (Table 4.2 below). Similarly, 94% of the pump attendants were also aware of the effect of continuous exposure to petroleum products emissions on respiratory illnesses. Largely (95%) the fuel pump attendants reported their awareness of the possible negative effect that length of days working in the pump station has on their respiratory health. Moreover, nearly all (97.2%) pump attendants were aware of the importance of personal protectives in protecting themselves from respiratory diseases while working in the fuel pump stations. Regarding the level of knowledge and awareness among participants for each filling station, all (100%) pump attendants of IBM reported their awareness of their work being able to affect their health, as compared to participants from Allied Oil (94.6%), and Glory Oil (94%) (see Appendix Table A.4). This is reflected across all the knowledge and awareness criteria on which the workers were tested.

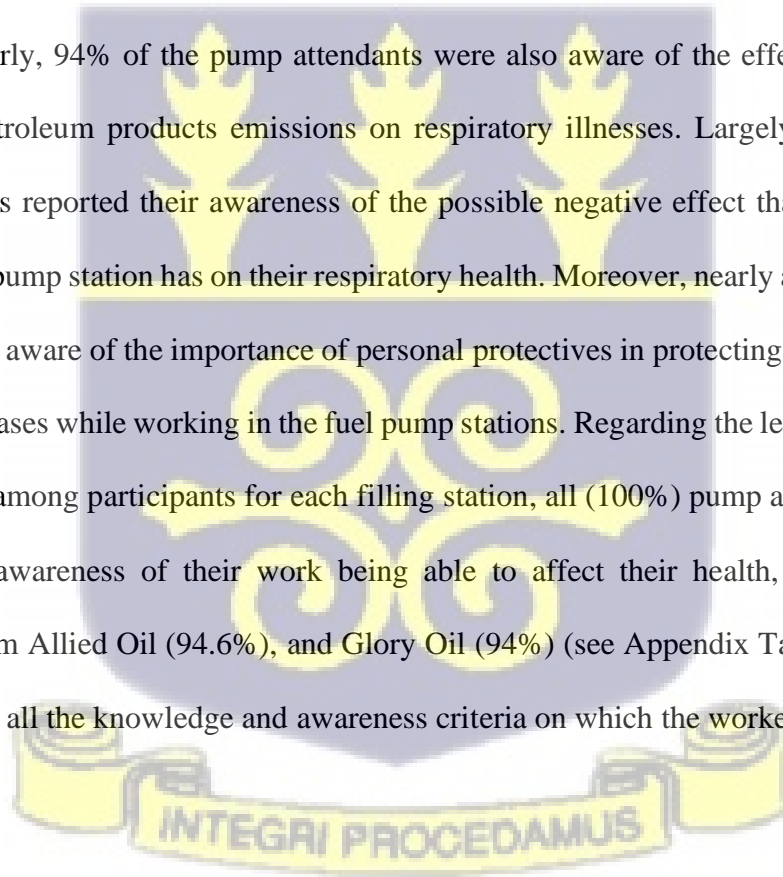


Table 4.2: Knowledge and Awareness of Respiratory Morbidities among Fuel Workers

Pre-amble	Response	Frequency	Percentage (%)
Knowledge on the effect of their line of work on their health	Yes	134	95.0
	Disagree	2	1.4
	Indifferent	5	3.5
Knowledge on any adverse effect of petroleum emissions on the respiratory system	Agree	16	11.3
	Totally Agree	118	83.7
	Disagree	2	1.4
Knowledge on continuous exposure to petroleum products relation to respiratory illness	Indifferent	6	4.3
	Agree	13	9.2
	Totally Agree	120	85.1
Knowledge on length of daily working hours in relation to respiratory disease	Disagree	3	2.1
	Indifferent	4	2.8
	Agree	15	10.6
Knowledge on the importance of the use of PPE during their duty hours	Totally Agree	119	84.4
	Indifferent	4	2.8
	Agree	22	15.6
	Totally Agree	115	81.6

4.5 Prevalence of Respiratory Morbidities among Selected Fuel Pump Attendants

The prevalence of respiratory morbidity was determined using the presence of signs and symptoms and decreased peak respiratory flow rate (PEFR) of participants. Approximately 36% of the fuel pump workers suffered from respiratory morbidity (had signs, symptoms, decreased PEFR, and abnormal auscultatory findings). While 18% of the fuel pump workers had reduced PEFR only, 15.6% of the workers presented respiratory signs and symptoms (reduced air entry, bronchial, wheezing and cackles), and then less than 3% had both respiratory symptoms and signs and reduced PEFR (Table 4.3). Across the three (3) filling stations, Allied Oil showed the highest prevalence (23.40%) of respiratory signs and symptoms and or reduced PEFR among participants of the study (Table 4.4). This was followed by IBM which had a prevalence of 9.93%, and Glory Oil which had a prevalence of 2.84%. Further details of the

prevalence of respiratory signs, symptoms, and reduced PEFR among participants of this study is presented in table 4.3 and figure 4.1 below.

Table 4.3: Distribution of petrol pump workers according to the presence of signs and symptoms and decreased PEFR

	Frequency	Percentage (%)
Reduced PEFR Only	25	17.7
Respiratory Symptoms and Signs Only	22	15.6
Both Respiratory Symptoms and Signs and Reduced PEFR Only	4	2.8

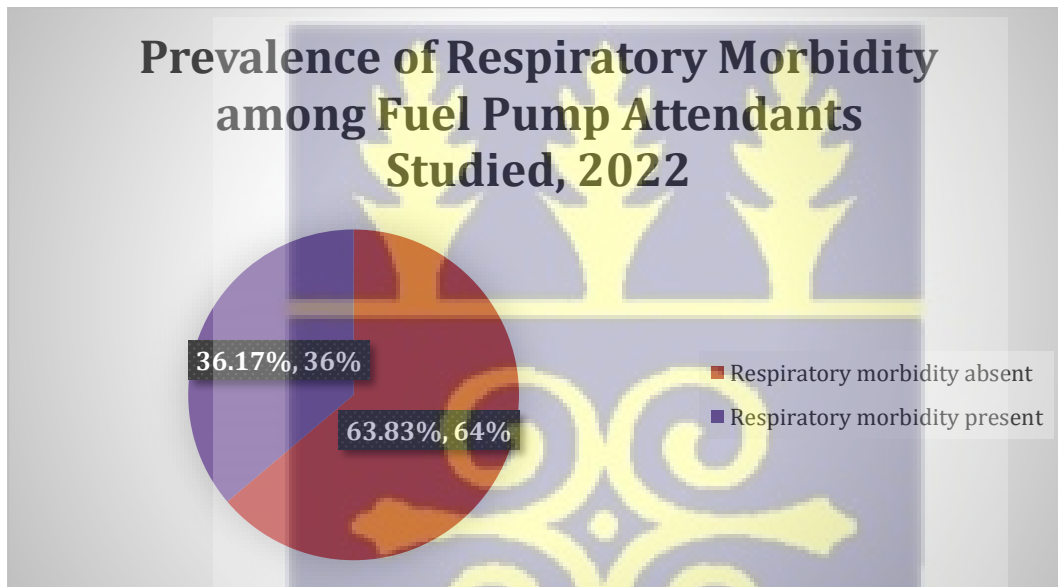


Figure 4.1: Prevalence of respiratory morbidity among fuel pump attendants studied

Table 4.4: Distribution of petrol pump workers according to the presence of signs and symptoms and decreased PEFR Across Three Fuel Pumps

Characteristics	Allied Oil		Glory Oil		IBM	
	Freq.	%	Freq.	%	Freq.	%
Reduced PEFR Only	16	21.6	0	0	9	52.9
Respiratory Symptoms and Signs Only	14	18.9	3	6.0	5	29.4
Both Respiratory Symptoms and Signs Only and Reduced PEFR Only	3	4.0	1	2.0	0	0

4.6 Association between sociodemographic and lifestyle characteristics of participants and prevalence of respiratory morbidities.

The results from the Pearson's Chi-square test of independence and the univariate binary logistic regression analysis showed that sex of participants, level of education, monthly income, and religion were significantly associated with the prevalence of respiratory morbidities among fuel pump attendants.

Male fuel pump attendants had 12.5-fold increased odds of respiratory morbidity as compared to female fuel pump attendants in this study. Fuel pump attendant with a secondary level of education had 2.97-fold increased odds of respiratory morbidity as compared to those with a primary to Junior high-level education. Participants whose monthly income was between GHC 600-1000 had 9.4-fold increased odds of respiratory morbidity as compared to those whose monthly income was less than GHC 600, and Muslim fuel pump attendants had 70% decreased odds of respiratory morbidity as compared to Christian fuel pump attendants. Table A.5 in Appendix shows the association between sociodemographic and lifestyle factors and prevalence of respiratory morbidities.

4.8 Association between work-related factors and prevalence of respiratory morbidities

The work-related factors found to be significantly associated with the prevalence of respiratory morbidities among participants were years of working experience (p-value=0.036) and working hours (p-value <0.01). Participants who had worked as fuel pump attendants for more than 7 years 3.36-fold increased odds of respiratory morbidity as compared to those who had worked for 3 years or less. Similarly, fuel pump attendants who worked for more than 12 hours

a day 31% increased odds of respiratory morbidity as compared to those who worked for less than 8 hours a day.

Table 4.5 below shows the association between work-related factors and prevalence of respiratory morbidities.

Table 4.5: Association between work-related factors and prevalence of respiratory morbidities.

Variables	Respiratory Morbidity Present no. (%)	Odds Ratio	Confidence Interval	<i>p</i> -value	Chi-Square Statistic (X ²)	<i>p</i> -value
Years of Working					8.5350	0.036
≤ 3 years (base)	11 (21.57)	1 (base)				
>3-7 years	23 (45.10)	2.15	0.92 - 5.04	0.079		
> 7 years	17 (33.33)	3.36	1.30 - 8.71	0.012		
Working hours					18.821	<0.001
< 8 hours (base)	10 (19.61)	1 (base)				
8-12 hours	16 (31.37)	1.18	0.64 - 2.34	0.445		
> 12 hours	25 (49.02)	1.31	0.40 - 1.52	0.002		
Training					0.1775	0.674
No (base)	3 (5.88)	1 (base)				
Yes	48 (94.12)	1.35	0.33 - 5.46	0.674		

4.8 Association between knowledge and awareness of respiratory morbidities and prevalence of respiratory morbidities

The results from the Pearson's Chi-square test of independence showed that Fuel pump attendants' knowledge and awareness of respiratory morbidities was not significantly associated with the prevalence of respiratory signs and symptoms, and or reduced PEFr among them (see appendix, Table A.6).

4.9 Multivariate Analysis of the Association between independent variables and respiratory morbidities among fuel pump attendants.

The results of the multivariable binary logistic regression, using independent variables that were significant at the univariate level showed that the monthly income of fuel pump attendants (p-value=0.003), years of working experience (p-value= 0.027 for 3-7 years' experience; p-value=0.001 for more than 7 years of experience), and working hours (p-value < 0.01 for more than 12 working hours) were significantly associated with prevalence of respiratory morbidities (see appendix, Table A.7).

Fuel pump attendants who earned a monthly income of GHC 600-1000 had 10.1-fold increased odds of respiratory morbidity as compared to those who earned GHC 300-500. Participants who had more than 3 years to 7 years working experience had 4.7-fold increased odds, and those who had more than 7 years working experience had 15.26-fold increased odds of respiratory morbidity as compared to participants who had less than 3 years working experience as fuel pump attendants. Additionally, fuel pump attendants who worked for more than 12 hours a day had 2.13-fold increased odds of respiratory morbidity as compared to those who worked for less than 8 hours a day.

4.10 Association between income level and working hours of participants studied

The results from the Fisher's exact test showed a significant association between monthly income and working hours of participants (Fisher's value, p-value=0.018) (see appendix IV, Table A.8). A higher number (62) of participants who earned GHC 600-1000 worked for more than 12 hours daily as compared to the number of participants who earned GHC 300-500 who worked for more than 12 hours (38).

CHAPTER FIVE

DISCUSSION

5.1 Prevalence of Respiratory Morbidities

The study shows that 36.2% of participants had signs and symptoms of decreased peak respiratory flow rates, or abnormal auscultatory findings, with the majority of these cases having decreased peak respiratory flow rates. This prevalence is relatively higher than the reported 22.2% prevalence of respiratory morbidities such as COPD across African countries (Erhabor, 2021). This is consistent with previous studies such as Thomas et al., 2020; Al-Ayyadhi & Akhtar, 2018 which found a higher prevalence of respiratory morbidities among fuel pump workers as compared to the general population. Similarly, Thomas et al. (2020), found that fuel pump workers in Iran had a significantly higher prevalence (61%) of respiratory symptoms as compared to a control group, and the majority of these symptoms being related to the upper respiratory tract.

This study also reveals some differences in the prevalence of respiratory morbidities across different filling stations. Allied Oil was found to have the highest prevalence of respiratory signs and symptoms and or reduced PEFr among participants of the study, followed by IBM, and then Glory Oil. This is similar to Al-Abdul-Rahman et al's (2018) study which also found variations in levels of exposure to hazardous substances among fuel workers across different filling stations in Saudi Arabia. These differences may be due to variations in working conditions and exposure to hazardous substances across the different filling stations. Differences in frequent refresher training on the dangers of hazardous substances, proper handling of petroleum products, and the level of usage of personal protective equipment could also be linked to the differences noted, as they may influence the level of exposure and the prevalence of respiratory morbidities among workers in different filling stations.

Additionally, different filling stations may have varying levels of adherence to regulations and safety guidelines, leading to differences in exposure and respiratory morbidities among workers. Moreover, older or less technologically advanced filling stations may not have adequate ventilation systems or protective measures in place to reduce exposure to hazardous substances, leading to higher levels of exposure and respiratory morbidities among workers. On the other hand, more technologically advanced filling stations may have invested in state-of-the-art ventilation and protective equipment, reducing exposure and respiratory morbidities among workers.

5.2 Knowledge and Awareness of respiratory morbidities Among Fuel Pump Workers

A high level of awareness among fuel pump attendants was found as almost all workers were knowledgeable about work-related respiratory morbidities. The high level of awareness among fuel pump attendants in this study is consistent with another study in Turkey which found that workers in the fuel industry were generally aware of the potential health risks associated with their work (Sohrabi et al., 2022). Despite this high level of awareness, this study still found respiratory morbidities to be prevalent among fuel pump attendants due to exposure to hazardous substances. This is corroborated by the findings of Ghiasi et al., 2013 which showed that fuel workers may still be at an increased risk for respiratory morbidities due to their continued exposure to hazardous substances. This suggests that while knowledge and awareness of the risks are important, they may not be sufficient in protecting workers from respiratory morbidities.

The results of this study also reveal some disparities in awareness levels across different filling stations. For example, a higher percentage of participants from IBM responded that they were aware that their work could affect their health, as compared to participants from Allied Oil, and Glory Oil. One reason for this disparity could be the level of health and safety training provided

to employees in each filling station. This could be attributed to IBM possibly having a more robust training program on potential health risks associated with their work as compared to the others. Another reason for the disparity in awareness levels could be the level of health and safety culture within each filling station. A positive health and safety culture can be fostered by Senior Management and can play a significant role in increasing awareness among employees, as appropriate governance is essential in promoting occupational health safety in the workplace (Cohen, 1995; Lehrer, 2006)(International Labour Organization, 2023).

5.3 Factors Associated with Respiratory Morbidities among Fuel Pump Workers

Male fuel pump attendants had 12.5-fold increased odds of respiratory morbidity as compared to female fuel pump attendants. This finding is in line with a study by Sohrabi et al., (2022) which found male fuel workers to be at a higher risk of respiratory morbidities due to their higher levels of exposure to hazardous substances due to the tasks assigned them. Another study by Al-Otaibi et al., (2019) also reported that male fuel workers in Kuwait had higher levels of respiratory symptoms compared to female workers, suggesting that gender may be a risk factor for respiratory morbidities in this population.

In a similar vein, fuel pump attendants with a secondary level of education had increased odds of respiratory morbidity as compared to those with a primary to Junior high level of education. This finding contradicts a study by Shah et al., (2020), where fuel workers in India with a higher level of education reported fewer respiratory symptoms and a lower prevalence of respiratory morbidities as compared to those with lower levels of education. However, a possible explanation for the discrepancy across both studies could be that effect of educational level is being confounded by or modified by another factor and therefore may have different effects on respiratory morbidities depending on the specific context and population. For example, in some cases, higher levels of education may provide individuals with better access

to information and resources that can help them to protect themselves from respiratory hazards and improve their respiratory health. In other cases, however, higher levels of education may be associated with different types of jobs or work conditions, or increased number of working hours that increase the odds of respiratory morbidities. This is made evident in this study as working conditions such as longer hours was associated with increased odds of respiratory morbidities among participants.

Conversely, Muslim fuel pump attendants had 70% decreased odds of respiratory morbidity as compared to Christian fuel pump attendants in this study. It is unclear why this relationship exists, and further research is needed to understand the potential factors contributing to this discrepancy.

Years of working experience as a fuel pump attendant was significantly associated with the prevalence of respiratory morbidities among participants of this study. This finding is consistent with a study by Deeb et al., (2017), which reported that fuel workers in Lebanon who had worked in the industry for more than 10 years had a higher prevalence of respiratory symptoms compared to those who had worked for shorter periods of time. There are several potential reasons why longer duration of work in the fuel industry may increase the risk of respiratory morbidities. One possibility is that longer duration of work is associated with increased exposure to hazardous substances, such as gasoline and benzene, which can lead to respiratory morbidities. Additionally, longer duration of work may also be associated with the development of chronic respiratory diseases, such as chronic obstructive pulmonary disease (COPD) and asthma, which can result in respiratory morbidities (Swai et al., 2020).

Number of working hours was also significantly associated with the prevalence of respiratory morbidities among fuel pump attendants, as those who worked for longer hours had increased odds of respiratory morbidities. This finding is supported by recent research which also found

long working hour to be associated with an increased risk of respiratory morbidities among fuel workers (Indumathy, 2023). The relationship between working hours and respiratory morbidities may be due attributed to a number of factors. First, longer working hours have been associated with increased exposure to hazardous substances, as well as increased fatigue and stress (Cunningham et al., 2022). These stressors have been reported to affect respiratory health, as some studies have found that fatigue and stress can lead to a range of respiratory problems, including increased inflammation and decreased lung function (Hemilä et al., 2017; (Trueba & Ritz, 2013)(Cohen, 1995; Lehrer, 2006).

The findings of this study also indicate that higher salary workers had increased odds respiratory morbidities. This can be attributed to the significant association found between the income level of fuel pump attendants and their number of working hours, as higher earners had longer working hours in this study. Given the increased working hours pump attendants may be exposed to pollutants such as gasoline and diesel exhaust, which can cause respiratory symptoms and increase the risk of respiratory diseases such as asthma and COPD. Meanwhile, other studies have found that working long hours is associated with a higher risk of respiratory problems, independent of exposure to pollutants. For example, Jarvis et al., 2016 found that individuals who work more than 55 hours per week have a higher risk of developing respiratory symptoms and diseases than those who work 35-40 hours per week.

5.4 Strengths of the Study

The study has three main strengths in its findings. Firstly, the study used both signs and symptoms as well as a physiological measure, Peak Expiratory Flow Rate (PEFR) to assess respiratory morbidities among fuel pump attendants. This provides a more comprehensive assessment of respiratory health and increases the accuracy of the findings. Furthermore, the use of PEFR allows for the detection of early changes in lung function, which can provide

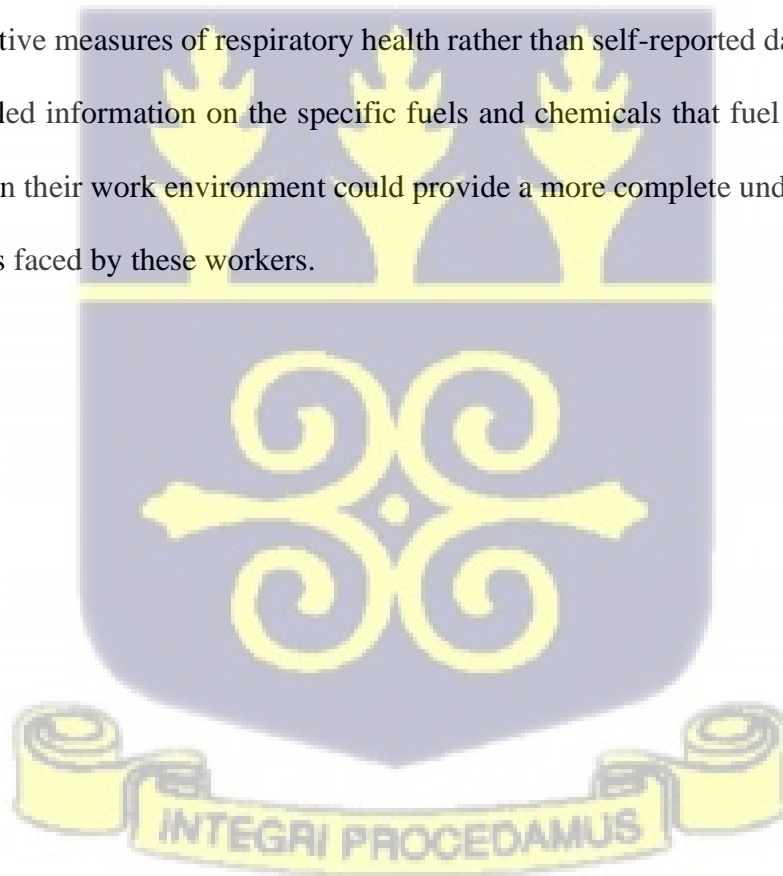
important information for interventions to prevent the progression of respiratory diseases. Secondly, the study used a comparative analysis of three filling stations, which allows for the identification of potential variations in working conditions and exposure to hazardous substances across different filling stations. This provides valuable information for understanding the reasons for disparities in respiratory morbidities across different filling stations and for designing interventions to protect fuel pump attendants from respiratory morbidities. Lastly, the study found a relatively high prevalence of respiratory morbidities among fuel pump attendants, which highlights the importance of addressing this issue among this population. Also, the study found a significant association between sex, years of working, working hours, education, monthly income and the prevalence of respiratory morbidities among fuel pump attendants, which may provide significant insight in addressing respiratory morbidities among the three filling stations.

5.5 Limitations of the Study

This study faced some limitations. One limitation was the use of self-reported data, which may be subject to recall and social desirability bias. Additionally, the sample size was relatively small and only included fuel pump attendants from three filling stations in one region of Ghana, which may not be representative of the entire population of fuel pump attendants in the country. Another limitation was the lack of information on the specific types of fuels and chemicals that fuel pump attendants were exposed to in their work environment, which could have provided additional insight into the potential respiratory risks faced by these workers. Another limitation of this study was the use of a peak flowmeter rather than a spirometer to assess respiratory function. While the peak flowmeter is a widely used tool for measuring respiratory function, it has been shown to be less accurate than the spirometer in certain situations, particularly in individuals with severe respiratory illness or those with high levels of airflow obstruction. The

use of a peak flowmeter in this study may have resulted in an underestimation of the prevalence of respiratory morbidities among fuel pump attendants.

To address this limitation, future research should consider using a spirometer to assess respiratory function among fuel pump attendants. The spirometer is a more accurate and reliable tool for measuring respiratory function, and its use could provide a more accurate assessment of the respiratory health of fuel pump attendants. Additionally, using a spirometer could provide more detailed information about the specific respiratory issues faced by fuel pump attendants, which could be used to develop targeted interventions to reduce the risk of respiratory morbidities among these workers. In addition, future research should consider expanding the sample size to include a larger number of filling stations and regions in Ghana, and using objective measures of respiratory health rather than self-reported data. Additionally, collecting detailed information on the specific fuels and chemicals that fuel pump attendants are exposed to in their work environment could provide a more complete understanding of the respiratory risks faced by these workers.



CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Fuel pump attendants are aware of the potential respiratory risks associated with their occupation; yet, there is room for improvement regarding the awareness about the importance of personal protective equipment and the specific respiratory risks associated with different aspects of their work. The high prevalence of respiratory morbidities among fuel pump attendants highlights the need for employers and health officials to implement strategies to reduce the risk of respiratory morbidities among these workers. Work-related factors such as years of working experience, working hours, and monthly income were significantly associated with the prevalence of respiratory morbidities among fuel pump attendants. Employers should consider implementing policies to reduce working hours and ensure that workers have adequate breaks and rest periods, as well as providing financial assistance or subsidies to help workers afford necessary protective equipment and adopt safe work practices. Regular monitoring of respiratory health among fuel pump attendants is also necessary to identify potential issues and address them in a timely manner.

6.2 Recommendations

Based on the findings of this study, the following recommendations are proposed:

Public health Recommendations:

1. Increase awareness about the specific respiratory risks associated with different aspects of fuel pump work and the importance of personal protective equipment. It is important for fuel workers to be aware of the potential health risks associated with their work and to take necessary precautions to protect themselves, such as using personal protective equipment and following safety protocols.

2. Employers should also provide ongoing education and training to fuel workers to ensure that they are aware of the potential health impacts of their work and how to minimize their risk of respiratory morbidities.
3. Regularly monitor the respiratory health of fuel pump attendants to identify potential issues and address them in a timely manner.

Policy recommendations:

1. Implement policies to reduce working hours and ensure that fuel pump attendants have adequate breaks and rest periods.
2. Provide financial assistance or subsidies to help fuel pump attendants afford necessary protective equipment and adopt safe work practices.

Research recommendations

1. Further research is needed to better understand the specific risks faced by fuel pump attendants in their work environment, and to identify strategies for reducing the risk of respiratory morbidities among these workers.



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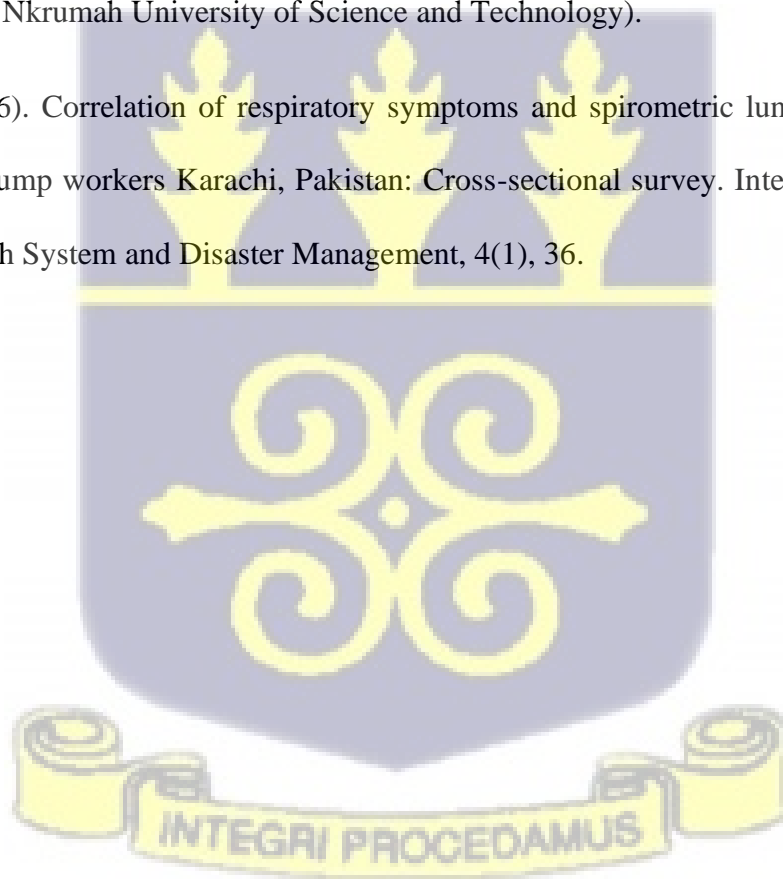
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APPENDIX I

PARTICIPANT INFORMATION SHEET

Dear Participant,

My name is DESMOND BONAPARTE; a student offering Masters of Public Health from the School of Public Health, University of Ghana.

I am carrying out research on “Prevalence, Awareness and Factors associated with Respiratory Morbidities among fuel pump attendants in the Greater Accra Region, Ghana” in pursuance of my master’s degree in Public Health.

Additionally, you will be asked questions related to your socio-demographic background, knowledge on respiratory morbidities in line with your occupation, recognized respiratory indications and symptoms, as well as work-related factors associated with respiratory illnesses. Ten minutes would be needed to do this. To the best of your ability, kindly provide a thoughtful and heartfelt response. Your provided information will be kept private and used solely for research purposes.

Potential Risks: While we still remain in the era of Covid-19, there would be a need to adhere to safety precautions. The spirometer spirettes would be singly wrapped and every participant would be offered a new spirette to be used to reduce the risk of infection of covid-19. The spirometer would also be disinfected with 70% alcohol rub prior to usage by every participant. The participants would also be provided with hand sanitizers prior to touching any of the devices and also afterwards. This would also ensure reduction of the transmission of the virus to the barest minimum. The participants will be informed about the general nature of the study and assured of the measures put in place to minimize the potential risk of transmission of infection during the study.

Benefits: Though you may not have any immediate or direct benefits from the study, your responses would be helpful in policy planning and formulation of recommendations to

appropriate authorities concerning the prevalence of respiratory morbidities and work-related factors associated with your line of work.

Costs: Participation in this study will not cost you any money. You will also not receive any money/incentives for participating in this research.

Compensation: You will not be compensated for your participation and loss of time

Declaration of Conflict of Interest: The researcher has no conflict of interest in this study.

Confidentiality: Your identity and name won't be recorded for this study. The information you are about to give will be coded, nonetheless, and will be kept in the strictest of confidence. You can be sure that the information you provide will be kept completely confidential. No one else will have access to the data, in whole or in part, but the researcher and the research supervisor. After six months, data files would be deleted or otherwise disposed of.

Voluntary participation/withdrawal: It is optional to participate. You are free to decide whether or not to participate in this study. You may also withdraw your consent at any moment without giving a reason and without suffering any repercussions.

Outcome and Feedback: Data gathered will help to improve policy formulation on work related factors associated with respiratory morbidities.

Feedback to participant: No feedback will be given to you as an individual but a report will be given to the various stakeholders involved in formulating policies on the prevalence of respiratory morbidities among fuel pump attendants.

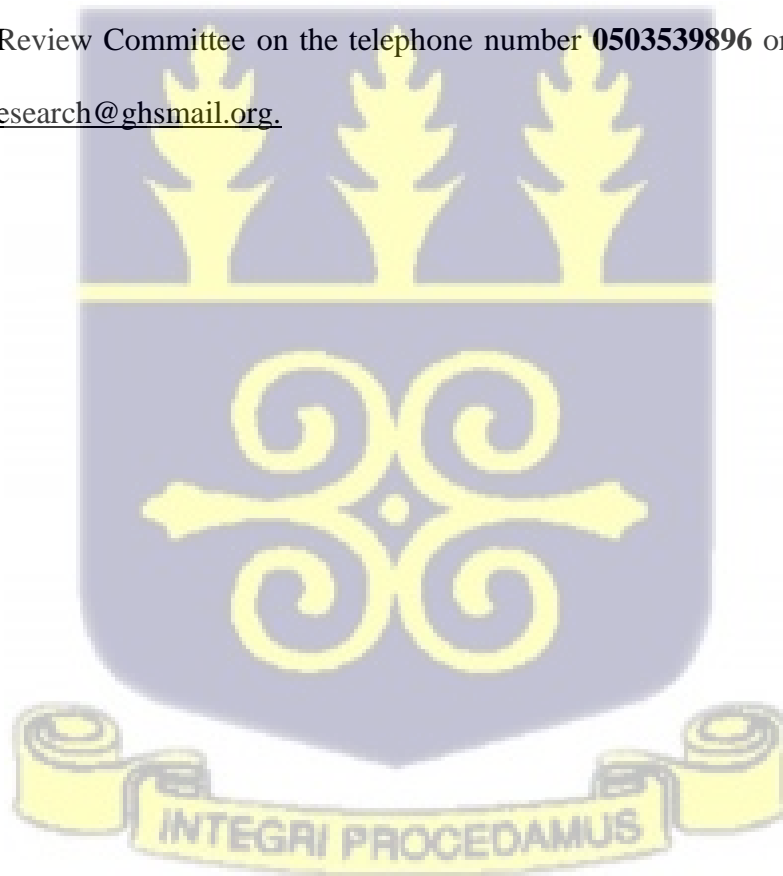
Funding information: The principal investigator is funding this study.

Sharing of participants Information/Data: I will hold onto the collected data and not give it to or share it with any other person(s) or organisation(s). It will only belong to me.

Storage of samples: After six months, data files would be deleted or otherwise disposed of. Before it is utilised for any other purpose, approval from the Ghana Health Service's Ethics Review Committee will be requested.

Provision of Information and Consent for participants: Prior to data collection, participants would be provided with an information sheet and an informed consent form. The details of the study would be explained thoroughly to participants and once participant is satisfied and all necessary clarifications addressed; the participant would be recruited and the sheets would be signed or thumb-printed by the participant.

For Further Clarification: If you have a concern about any aspect of this research, please contact **Desmond Bonaparte** at the School of Public Health, Legon or speak to me directly on telephone number 0541738592 and e-mail address desbon95@gmail.com or my supervisor, **Dr. Sylvia Akpene Takyi** on telephone number 0502626573. For further clarification on ethical issues please contact Madam Nana Abena Apatu, the administrator at the Ghana Health Service Ethics Review Committee on the telephone number **0503539896** or with the E-mail address ethics.research@ghsmail.org.



APPENDIX II

INFORMED CONSENT FORM

STUDY TITLE: PREVALENCE, AWARENESS AND FACTORS ASSOCIATED WITH RESPIRATORY MORBIDITIES AMONG FUEL PUMP ATTENDANTS IN THE GREATER ACCRA REGION, GHANA.

PARTICIPANTS' STATEMENT

I acknowledge that I have read or have had the purpose and contents of the Participants' Information Sheet read and all questions satisfactorily explained to me in a language I understand (English/Twi/Ga/Ewe/Dagbani). I fully understand the contents and any potential implications as well as my right to change my mind (i.e. withdraw from the research) even after I have signed this form.

I voluntarily agree to be part of this research.

Participants' Signature OR Thumb Print.....

Date:.....

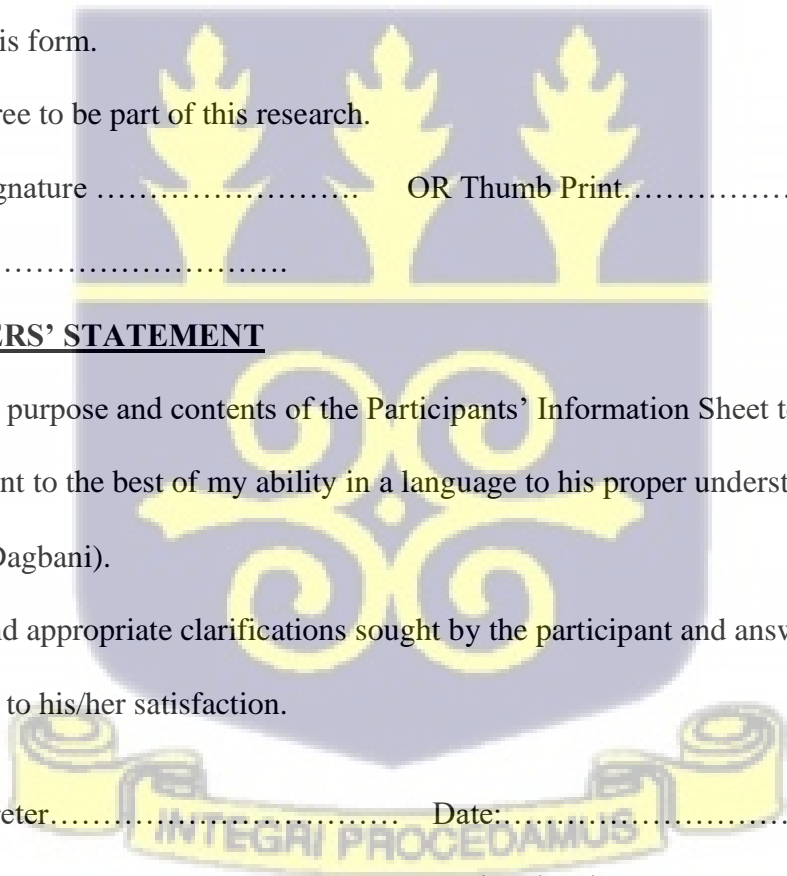
INTERPRETERS' STATEMENT

I interpreted the purpose and contents of the Participants' Information Sheet to the afore named participant to the best of my ability in a language to his proper understanding (English /Twi/Ga /Ewe/Dagbani).

All questions and appropriate clarifications sought by the participant and answers were also duly interpreted to his/her satisfaction.

Name of Interpreter..... Date:.....

Signature of Interpreter..... OR Thumb Print



STATEMENT OF WITNESS

I was present when the purpose and contents of the Participant Information Sheet was read and explained satisfactorily to the participant in a language he/she understood (English/Twi/Ga/Ewe/Dagbani).

I confirm that he/she was given the opportunity to ask questions/seek clarifications and the same were duly answered to his/her satisfaction before voluntarily agreeing to be part of the research.

Name:.....

Signature..... OR Thumb Print

Date:.....

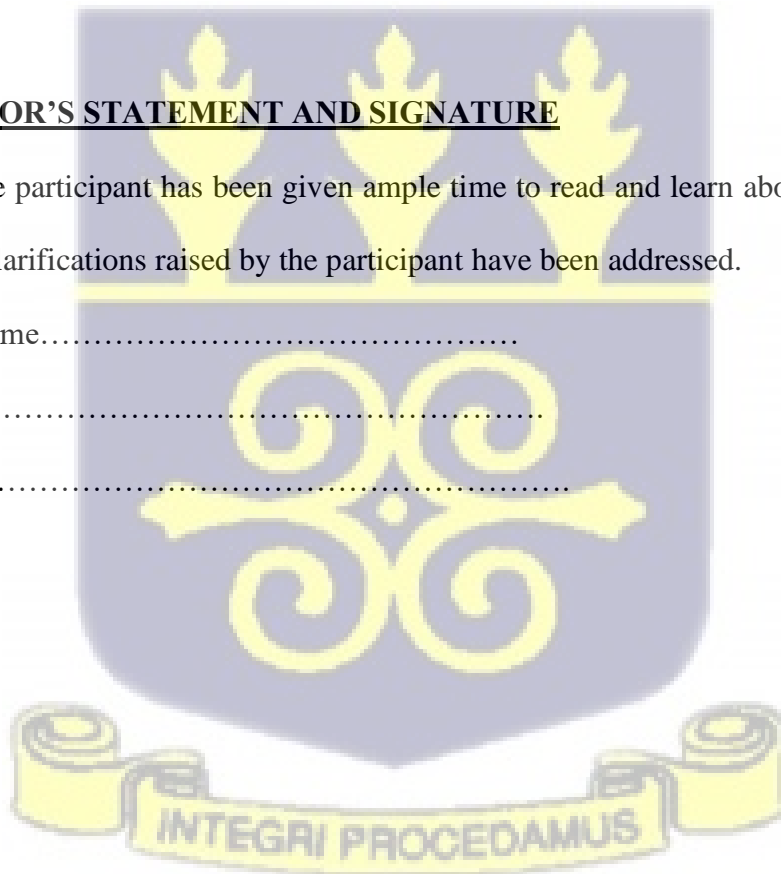
INVESTIGATOR'S STATEMENT AND SIGNATURE

I certify that the participant has been given ample time to read and learn about the study. All questions and clarifications raised by the participant have been addressed.

Researcher's name.....

Signature

Date.....



APPENDIX III

RESEARCH QUESTIONNAIRE

SECTION 1: SOCIO-DEMOGRAPHIC FACTORS

Q.NO	QUESTION	RESPONSES
1	Age completed (Years)
2	Please what is your gender?	<input type="checkbox"/> Male <input type="checkbox"/> Female
3	Level of education	<input type="checkbox"/> Primary <input type="checkbox"/> Secondary <input type="checkbox"/> Tertiary
4	Marital Status	<input type="checkbox"/> Single. <input type="checkbox"/> Married. <input type="checkbox"/> Divorce. <input type="checkbox"/> Separated
5	Income (Ghc)
6	Religion	<input type="checkbox"/> Christian <input type="checkbox"/> Muslim <input type="checkbox"/> Traditionalist. <input type="checkbox"/> Others

SECTION 2: SELF REPORTED-LIFESTYLE INFORMATION

Q.NO	QUESTION	RESPONSES
7	Have you ever smoked cigarettes?	<input type="checkbox"/> Yes <input type="checkbox"/> No (If Yes answer the next question, if No skip to question 8)
7a	Do you currently smoke?	<input type="checkbox"/> Yes <input type="checkbox"/> No (If Yes, skip to 7c; If No, answer the next question)

7b	How long ago did you stop smoking?	<input type="checkbox"/> <1year <input type="checkbox"/> 1-2 years <input type="checkbox"/> 2-3 years <input type="checkbox"/> >3years
7c	For how long have you been smoking/did you smoke?	<input type="checkbox"/> 1-5years <input type="checkbox"/> 6-10years <input type="checkbox"/> >10years
7d	How many sticks do you smoke/did you smoke per day?	<input type="checkbox"/> < 5 sticks <input type="checkbox"/> < 10 sticks <input type="checkbox"/> >10sticks
8	Have you ever taken alcohol?	<input type="checkbox"/> Yes <input type="checkbox"/> No (If No, end interview)
9	Do you currently take alcohol?	<input type="checkbox"/> Yes <input type="checkbox"/> No (If Yes, skip to 8c; If No, answer the next question)
10	How long ago did you stop taking alcohol?	<input type="checkbox"/> <1year <input type="checkbox"/> 1-2 years <input type="checkbox"/> 2-3 years <input type="checkbox"/> > 3years
12	For how long have you been taking alcohol/did you take alcohol?	<input type="checkbox"/> 1-5years <input type="checkbox"/> 6-10years <input type="checkbox"/> >10years
13	How much alcohol do/did you take per day?	<input type="checkbox"/> 1-3 units <input type="checkbox"/> 4-6 units <input type="checkbox"/> 7-10 units
14	Which type of alcohol do/did you usually take?	<input type="checkbox"/> Spirits <input type="checkbox"/> Bitters <input type="checkbox"/> Beers <input type="checkbox"/> Other

**SECTION 3 : KNOWLEDGE ON RESPIRATORY MORBIDITIES IN RELATION TO THEIR
OCCUPATION**

Q.NO	QUESTION	RESPONSES
15	Do you think the work you do can affect your health in any way?	<input type="checkbox"/> Yes <input type="checkbox"/> No
16	Do you think there is an adverse health effect of petroleum emissions on your respiratory system?	<input type="checkbox"/> Totally agree <input type="checkbox"/> Agree <input type="checkbox"/> Indifferent <input type="checkbox"/> Disagree <input type="checkbox"/> Totally disagree
17	Do you think continuous exposure to petroleum products is related to respiratory illnesses?	<input type="checkbox"/> Totally agree <input type="checkbox"/> Agree <input type="checkbox"/> Indifferent <input type="checkbox"/> Disagree <input type="checkbox"/> Totally disagree
18	Do you think the length of daily working hours in petroleum stations is related to respiratory diseases?	<input type="checkbox"/> Totally agree <input type="checkbox"/> Agree <input type="checkbox"/> Indifferent <input type="checkbox"/> Disagree <input type="checkbox"/> Totally disagree
19	Do you think it is important to use PPE's when working in the petroleum station?	<input type="checkbox"/> Totally agree <input type="checkbox"/> Agree <input type="checkbox"/> Indifferent <input type="checkbox"/> Disagree <input type="checkbox"/> Totally disagree

SECTION 4: SELF-REPORTED SYMPTOMS

Q.NO	QUESTION	RESPONSES
	COUGH	
20	Do you usually have a cough?	<input type="checkbox"/> Yes <input type="checkbox"/> No

21	When do you usually have a cough?	
22	Do you usually cough for four days or more per week?	<input type="checkbox"/> Yes <input type="checkbox"/> No
23	Do you usually cough for three consecutive months or more during the year?	<input type="checkbox"/> Yes <input type="checkbox"/> No
24	For how long have you had this cough?	
	SPUTUM	
25	Do you usually bring out any phlegm from your chest when you cough?	<input type="checkbox"/> Yes <input type="checkbox"/> No
26	When do you usually have cough with sputum?	<input type="checkbox"/> In the morning. <input type="checkbox"/> During the day <input type="checkbox"/> At night
27	Do you usually cough with sputum for four or more days in the week?	<input type="checkbox"/> Yes <input type="checkbox"/> No
28	Do you cough with sputum on most of the days for as much as three consecutive months or more in a year?	<input type="checkbox"/> Yes <input type="checkbox"/> No
	WHEEZING & CHEST TIGHTNESS	
29	Do you have wheeze/ whistling/ sound in your chest?	<input type="checkbox"/> Yes <input type="checkbox"/> No
30	When do you have wheeze/ whistling sound in your chest?	<input type="checkbox"/> In the morning. <input type="checkbox"/> During the day

		<input type="checkbox"/> At night
31	For how long has this wheezy sound persisted?	
32	Was is associated with chest tightness	<input type="checkbox"/> Yes <input type="checkbox"/> No
BREATHLESSNESS		
33	Are you troubled by shortness of breath when hurrying on level ground or walking up a slight hill?	<input type="checkbox"/> Yes <input type="checkbox"/> No
34	Have you had trouble of breathlessness while walking with a person of the same age?	<input type="checkbox"/> Yes <input type="checkbox"/> No
35	Do you have to stop for breath when walking at your own pace on the level ground?	<input type="checkbox"/> Yes <input type="checkbox"/> No
36	For how long have you been this short of breath?	

SECTION 5 : PAST RESPIRATORY ILLNESS

Q.NO	QUESTION	RESPONSES
37	Have you experienced any respiratory illness confirmed by physician before you started working as a fuel pump attendant?	<input type="checkbox"/> Yes <input type="checkbox"/> No

38	If yes, which of the following?	<input type="checkbox"/> Asthma <input type="checkbox"/> Tuberculosis <input type="checkbox"/> Chronic Bronchitis <input type="checkbox"/> Emphysema <input type="checkbox"/> Lung cancer Any other, please specify.....
----	---------------------------------	---

SECTION 6: OCCUPATIONAL AND EXPOSURE HISTORY OF RESPONDENTS

Q.NO	QUESTION	RESPONSES
39	For how long have you been working in this working area?	
40	For how many working hour per day have you been working in this working area?	
41	For how many working days per a week have you been working in this working area?	
42	Have you ever worked in similar working environment where there is petrol vapour or in dusty environment before?	<input type="checkbox"/> Yes <input type="checkbox"/> No
43	Where is cooking normally taking place in your home?	<input type="checkbox"/> inside the house. <input type="checkbox"/> outside the house <input type="checkbox"/> in open area. <input type="checkbox"/> in the kitchen

44	What type of energy source mostly do you use for food preparation?	<input type="checkbox"/> Charcoal <input type="checkbox"/> Firewood <input type="checkbox"/> Kerosese <input type="checkbox"/> Electricity <input type="checkbox"/> LPG Others.....
----	--	--

SECTION 7 : OCCUPATIONAL SAFETY AND PERSONAL PROTECTIVE EQUIPMENTS

Q.NO	QUESTION	RESPONSES
45	Has your work ever exposed you to any of the following hazards?	<input type="checkbox"/> Dust <input type="checkbox"/> Vapour <input type="checkbox"/> Irritating Gas or liquid <input type="checkbox"/> Fumes <input type="checkbox"/> No idea
46	Are you currently exposed to any of the above hazards please indicate in the above ?	<input type="checkbox"/> Yes <input type="checkbox"/> No
47	Do you use any personal protective equipment such as respiratory protector when you are working?	<input type="checkbox"/> Yes <input type="checkbox"/> No
48	Does the company provide you the personal protective equipment you use, such as the respiratory protector?	<input type="checkbox"/> Yes <input type="checkbox"/> No

49	Have you been trained on how to do your work in a healthy and safe environment?	[] Yes [] No
----	---	----------------

AUSCULTATORY FINDING

AIR ENTRY- [] Adequate [] Reduced

BREATH SOUNDS- [] Bronchial [] Vesicular

ADDED RESPIRATORY SOUND- [] Wheeze [] Crackles [] No added sounds

LUNG FUNCTION (PEAK EXPIRATORY FLOW RATE ESTIMATION)

PARAMETER	VALUE
HEIGHT	
GENDER	
RACE	
PREDICTED PEFR VALUE	
ACTUAL PEFR VALUE	
PEFR RELATIVE REDUCTION	[] <80% [] >80%



APPENDIX IV

TABLES OF RESULTS

Table A1: Sociodemographic Characteristics across the three Filling Stations

Characteristics	Glory		Allied		IBM	
	Freq.	%	Freq.	%	Freq.	%
Age						
>50	1	2.0				
18-35	32	64.0	37	50.0	11	64.7
36-50	17	34.0	37	50.0	6	35.3
Gender						
Female	12	24.0	7	9.5	1	5.9
Male	38	76.0	67	90.5	16	94.1
Education						
Primary	23	46.0	17	23.0	4	23.5
Secondary	27	54.0	57	77.0	13	76.5
Marital Status						
Divorce	2	4.0				
Married	14	28.0	18	24.3	4	23.5
Separated	1	2.0	2	2.7		
Single	33	66.0	54	73.0	13	76.5
Monthly Income(GHC)						
300-500	37	74.0	7	9.5		
600-1000	13	26.0	67	90.5	17	100.0
Religion						
Christian	40	80.0	61	82.4	17	100.0
Muslim	10	20.0	60	17.6		
Experience						
<1 year	3	6.0	6	8.2		
>7 years	8	16.0	22	29.7	4	23.5
1-3 years	20	40.0	15	20.3	4	23.5
4-7 years	19	38.0	31	41.9	9	52.9

Table A.2: Details of the self-reported lifestyle of participants

Characteristics (n=141)	Frequency	Percentage (%)
Alcoholic		
No	132	93.62
Yes	9	6.38
Smoker		
No	132	93.62
Yes	9	6.38

Table A.3: Distribution of work-related factors among study participants

Characteristics (n=141)	Frequency	Percentage (%)
Working hours		
>8hours	14	9.93
8-12 hours	27	19.15
>12 hours	100	70.92
Exposure to hazards		
No	8	5.67
Yes	133	94.33
Use of PPEs		
No	4	2.84
Yes	137	97.16
Type of PPEs used (n=137)		
Safety boots only	116	84.67
Nose masks and safety boots	19	13.87
Nose masks, safety boots, and hand gloves	2	1.46

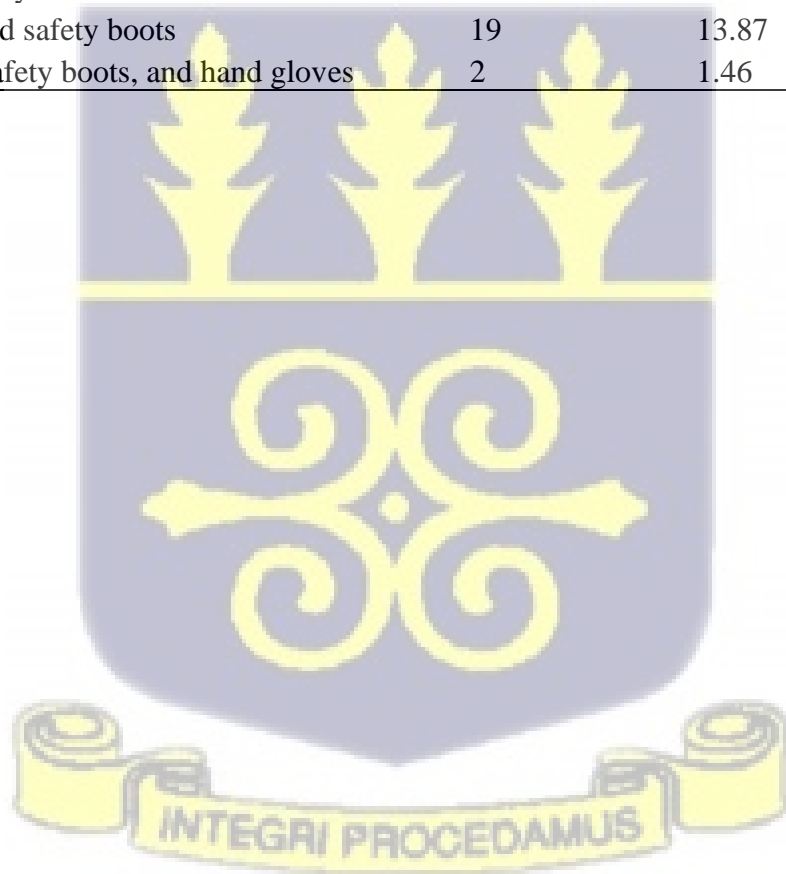


Table A.4: Level of Awareness of Respiratory Morbidities among Fuel Pump Workers for each of the Three Filling Stations

Question	Response	Glory		Allied		IBM	
		Freq.	%	Freq.	%	Freq.	%
Knowledge on the effect of their line of work on their health	Yes	47	94.0	70	94.6	17	100.0
Knowledge on any adverse effect of petroleum emissions on the respiratory system	Disagree	1	2.0	1	1.4		
	Indifferent	2	4.0	3	4.1		
	Agree	10	20.0	5	6.8	1	5.9
	Totally Agree	37	74.0	65	87.8	16	94.1
Knowledge on continuous exposure to petroleum products relation to respiratory illness	Disagree			2	2.7		
	Indifferent	4	8.0	2	2.7		
	Agree	6	12.0	6	8.1	1	5.9
	Totally Agree	40	80.0	64	86.5	16	94.1
Knowledge on length of daily working hours in relation to respiratory disease	Disagree	1	2.0	2	2.7		
	Indifferent	2	4.0	2	2.7		
	Agree	10	20.0	4	5.4	1	5.9
	Totally Agree	37	74.0	66	89.2	16	94.1
Knowledge on the importance of the use of PPE during their duty hours	Indifferent	1	2.0	3	4.1		
	Agree	13	26.0	8	10.8	1	5.9
	Totally Agree	36	72.0	63	85.1	16	94.1



Table A.5: Association between sociodemographic and lifestyle factors and prevalence of respiratory morbidities for all participants

Variables	Respiratory Morbidity Present no.(%)	Odds Ratio	Confidence Interval	p-value	Chi-Square Statistic (X ²)	p-value
Age					1.939	0.164
18-35(base)	25 (49.02)	1 (base)				
36-50	26 (50.98)	1.63	0.82 - 3.27	0.165		
Sex					9.0856	0.003
Female (base)	1 (1.96)	1 (base)				
Male	50 (98.04)	12.5	1.62 - 96.69	0.016		
Education					6.8421	0.009
Primary-Junior (base)	9 (17.65)	1 (base)				
Secondary	42 (82.35)	2.97	1.29 - 6.85	0.011		
Marital Status					2.9784	0.395
Single (base)	38 (74.51)	1 (base)				
Married	36 (25.49)	0.92	0.42 - 2.03	0.841		
Separated	0 (0.00)	1	0.91 - 1.13	0.992		
Divorced	0 (0.00)	1	0.94 - 1.26	0.998		
Monthly Income					20.3142	<0.001
¢ 300-500 (base)	4 (7.84)	1(base)				
¢ 600-1000	47 (92.16)	9.40	3.12 - 28.30	<0.001		
Religion					4.7654	0.029
Christian (base)	47 (92.16)	1 (base)				
Muslim	4 (7.84)	0.30	0.01 - 0.93	0.037		
Alcoholic					2.6148	0.106
No (base)	1 (1.96)	1 (base)				
Yes	50 (98.04)	0.21	0.02 - 1.69	0.141		
Smoker					2.6148	0.106
No (base)	1 (1.96)	1 (base)				
Yes	50 (98.04)	0.21	0.02 - 1.69	0.141		

Table A.6: Association between knowledge and awareness of respiratory morbidities and prevalence of respiratory morbidities.

Variables	Chi-Square Statistic (χ^2)	<i>p</i>-value
Do you think the work you do can affect your health in any way?		
No	0.1842	0.668
Yes		
Do you think there is an adverse health effect of petroleum emissions on your respiratory system?		
Disagree	3.6725	0.299
Indifferent		
Agree		
Totally agree		
Do you think continuous exposure to petroleum products is related to respiratory illnesses?		
Disagree	4.0537	0.256
Indifferent		
Agree		
Totally agree		
Do you think the length of daily working hours in petroleum stations is related to respiratory diseases?		
Disagree		
Indifferent	5.9898	0.112
Agree		
Totally agree		
Do you think it is important to use PPE's when working in the petroleum station?		
Disagree		
Indifferent	4.0302	0.133
Agree		
Totally agree		



Table A.7: Multivariate Analysis showing the Association between independent factors and respiratory morbidities among fuel pump attendants.

Variables	Odds Ratio	Confidence Interval	p-value
Sex			
Female (base)	1 (base)		
Male	13.85	0.80- 238.55	0.070
Education			
Primary (base)	1 (base)		
Secondary	1.68	0.52 - 5.49	0.388
Monthly Income			
¢ 300-500 (base)	1(base)		
¢ 600-1000	10.10	2.24 - 45.22	0.003
Religion			
Christian (base)	1 (base)		
Muslim	0.33	0.08 - 1.28	0.109
Years of Working			
≤ 3 years (base)	1 (base)		
>3-7 years	4.70	1.19 -18.61	0.027
>7 years	15.26	3.06 - 79.86	0.001
Working hours			
< 8 hours (base)	1 (base)		
8-12 hours	1.38	0.91 - 1.51	0.169
>12 hours	2.13	1.01 - 3.10	<0.001

Table A.8: Association between income level and working hours of participants studied

Monthly Income (GHC)	Working Hours			Fisher's exact (p-value)
	< 8 hours	8-12 hours	>12 hours	
300-500	1	5	38	0.018
600-1000	13	22	62	

APPENDIX V

GHANA HEALTH SERVICE REVIEW COMMITTEE, ETHICAL APPROVAL

GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

In case of reply the number and date of this Letter should be quoted.



Research & Development Division
Ghana Health Service
P. O. Box MB 190
Accra
Digital Address: GA-050-3303
Mob: +233-50-3539896
Tel: +233-302-681109
Email: ethics.research@ghs.gov.gh
18th October, 2022

My Ref. GHS/RDD/ERC/Admin/App 22/482
Your Ref. No.

Desmond Bonaparte
P. O. Box C. O. 2557, Tema

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol.

GHS-ERC Number	GHS-ERC: 059/09/22
Study Title	Awareness, Prevalence and Factors Associated with Respiratory Morbidities among Fuel Pump Attendants in the Greater Accra Region, Ghana
Approval Date	18 th October, 2022
Expiry Date	17 th October, 2023
GHS-ERC Decision	Approved

This approval requires the following from the Principal Investigator

- Submission of a yearly progress report of the study to the Ethics Review Committee (ERC)
- Renewal of ethical approval if the study lasts for more than 12 months,
- Reporting of all serious adverse events related to this study to the ERC within three days verbally and seven days in writing.
- Submission of a final report after completion of the study
- Informing ERC if study cannot be implemented or is discontinued and reasons why
- Informing the ERC and your sponsor (where applicable) before any publication of the research findings.

You are kindly advised to adhere to the national guidelines or protocols on the prevention of COVID -19

Please note that any modification of the study without ERC approval of the amendment is invalid.

The ERC may observe or cause to be observed procedures and records of the study during and after implementation.

Kindly quote the protocol identification number in all future correspondence in relation to this approved protocol

SIGNED.....
Dr. Naa-Korkor Allotey
(Ag. Head, Ethics & Research Management Department)

Cc: The Director, Research & Development Division, Ghana Health Service, Accra