KNOWLEDGE AND PERCEPTION OF THE PUBLIC AND PUMP ATTENDANTS ON THE SITING OF FUEL STATIONS IN THE TAMALE METROPOLIS

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Abstract

Tamale is a fast growing city which is currently witnessing an increase in the number of fuel stations that are sited close to public places especially stores, hospitals, and other commercial areas. The main aim of the study was to examine the knowledge and perceptions of pump attendants and the general public on the siting of fuel stations in the Tamale Metropolis. Stratified random sampling was used to select 25 fuel pump attendants, and 100 public respondents. Data was collected through field observation and questionnaire was used to elicit information on the knowledge level and perception of respondents. A Chi-square test was used for hypotheses testing (H1). The study found that many of the pump attendants were very knowledgeable on safety and health, and organisational requirement at the fuel stations. Knowledge of pump attendants on safety and health showed little relationship with knowledge on organisational requirements (p = 0.024). Most public respondents stated that fuel stations are sited inappropriately within the Metropolis. The study also revealed that profit was the major factor that influenced fuel station siting. Also, respondents attested that air pollution and respiratory problems were the major environmental and health effects associated with fuel stations. Based on the findings of the study, there is the need for intense public education on the menace associated with the siting and operation of fuel stations in order to prevent and manage likely risks and disasters from occurring in the same or greater magnitude as the twin disaster on 3rd June 2015.

Keywords: Knowledge, Perception, Pump Attendants, Fuel station, Tamale

Introduction

The expression "fuel station" (commonly used in Ghana) is understood differently in different countries. A fuel station also referred to as petrol station, filling station, gas station or petroleum outlet is defined by Ayodele (2011) as any land, building or equipment used for the sale or dispensing of petrol or oil for motor vehicles. Most fuel stations sell petrol and diesel. Some additionally retail liquefied petroleum gas (LPG), natural gas, hydrogen, biodiesel, kerosene, or butane whilst some offer services such as a mart and lube bay to their primary business (Hamid et al., 2009). There are forty fuel stations within Tamale Metropolis (Tamale Metropolitan Assembly, 2016). These fuel stations are sited close to public places especially stores, hospitals, banks and other commercial areas. However, increase in population and industrialisation coupled with the quest for easy movement has led to the need for machines and vehicles that require energy to power them in recent times. Chinambu (2012) acknowledged that, petroleum is one of the main drivers of industrial activities. Besides industrial activities, the transport sector is the major consumer of fuel. Also, Light (2004) stressed that retail gasoline is one of the most analyzed products in the world, especially in the United States of America because of people's reliance on cars. According to the Health and Safety Authority (2016), loading and offloading of fuel by fuel tankers could cause temporal traffic jam and leakages which are harmful to human health and the environment. The storage of fuel may also pose several risks such as fire explosion, environmental damage, and health effects when handled by

individuals. Again, the Environmental Protection Agency (2015) stressed that, air and water quality issues may include volatile organic compounds (VOCs) from offloading and dispensing as well as possible pollution of underground water. Studies conducted by Mshelia et al. (2015) revealed that air pollution is the most severe danger perceived by residents in Africa. Narrowing it to our part of the world (Ghana), Mshelia et al. (2015) stated that in locating petrol filling stations, it is important to take some precautionary measures like siting them at a distance of about 100 metres from buildings and places of public assembly such as markets, hospitals and schools and areas of high traffic congestion and residential buildings.

Problem Statement

Tamale is a fast growing city which is currently witnessing an increase in the number of fuel stations that are sited close to public places especially stores, hospitals, banks and other commercial areas. This coupled with the flood prone nature of most areas in the metropolis could result in leakages and spills from these fuel stations mixing with water during floods, presenting a great risk as in the case of 3rd June 2015 disaster which resulted in the loss of precious lives and properties worth millions of Ghana cedis. Concerns and complaints have been raised by residents rejecting the possible siting of fuel stations in their areas (EPA, 2016). The number of fuel stations are increasing very fast, and a number of these fuel stations are sited close to public places, many communities in Tamale are flood prone, there is therefore the likelihood of a recurrence of the 3rd June 2015 disaster of Accra or even a worse version of it. Also, there is limited information and research on fuel stations in Tamale Metropolis which has called for the urgent need for this research, to examine the knowledge and perception of pump attendants and the general public on the siting of fuel stations in the Tamale Metropolis.

Materials and Methods
Study area

The research was carried out in the Tamale metropolis because it is currently witnessing an increase in the number of fuel stations due to high demand of fuel. However, these fuel stations are sited close to residential areas.

Tamale Metropolis is one of the 26 districts in the Northern region of Ghana (Ghana Statistical Service, 2010). It is located in the central part of the region and shares boundaries with the Sagnerigu district to the west and north, Mion District to the east, East Gonja to the south and Central Gonja to the south-west. Tamale is the capital city of the Northern Region of Ghana and lies between latitude 9º16 and 9º34 N and longitudes 0º36 and 0º57 W. Tamale Metropolis has a population of 233,252 representing 9.4% of the region's population (GSS, 2010).

Source of Data

Both primary and secondary data were used during the research. The methodology used for collecting primary data included interview, questionnaire and field observation. The secondary data was the information taken from the Tamale Metropolitan Assembly on the number of fuel stations and their locations in Tamale Metropolis as well as information taken from manuals, journals and articles.

Sample Size, Sampling Technique and Data Collection

A preliminary survey was undertaken on the 5th of November, 2016, which revealed that there were 40 fuel stations sited in the Tamale metropolis. Out of these 25 were selected which is about 62.5% of the total number of fuel stations in the Metropolis. The sampling was done using stratified random sampling procedures thus the Metropolis was divided into strata from which the fuel stations were now selected. This was done to obtain a representative number of fuel stations for the Metropolis. The same method was used to select the 100 respondents (public) living close to these selected 25 fuel stations. In each of the selected fuel stations, four (4) public respondents were randomly selected. Copies of a questionnaire were administered to the public who constituted the respondents and 25 fuel pump attendants were interviewed. Personal observation was made to assess safety measures and the environmental conditions of the fuel stations such as proper management of spills and presence of warning signage. Secondary data was obtained from the Tamale Metropolitan Assembly, Environmental Protection Agency and Ghana Statistical Service.

The sampling technique used for the selection of the respondents was the stratified random sampling technique. The fuel stations were divided into three (3) zones namely Tamale central, Tamale north and Tamale south. The fuel stations and the public were

selected randomly from each zone. An interview guide, observation guide and a questionnaire were used to obtain information from the field during the research.

The data collection started from January, 2017 and ended in February, 2017. The pump attendants and public respondents' participation was based on their willingness to respond to the questions during the collection of data. Personal interview was used to obtain in-depth information from the pump attendants and an open ended questionnaire was used to enhance flexibility in response and also get detailed information from the respondents.

Data Analysis

The administered questionnaire was examined to check completeness, accuracy and consistency of responses in order to detect and eliminate errors. The Statistical Package for Social Sciences (SPSS v.

20.0) and Microsoft office Excel (2013) were used to process the qualitative data. Pearson Chi-square test was employed for statistical analysis to determine significant difference of selected variables.

Results and Discussion

Demographic characteristics

The demographic characteristics of pump attendants (respondents) of the 25 fuel stations visited in the Tamale Metropolis are shown in Table 4.1. The survey revealed that 44% of pump attendants have their ages ranging from 22 to 26 years, 24% between 27 to 31 years, 20% between 18 to 21 years and 12% were 32 years and above (Table 4.1). In terms of gender, 60% of pump attendants were male whilst 40% were female (Table 4.1). In terms of education, 84% of pump attendants had attained senior high school education, 8% have attained tertiary education and 8% have attained other form of education (Bible school) (Table 4.1).

Table 4.1: Demographic characteristics of pump attendants

Variable	Characteristics	Frequency (N=25)	Percentage (%)
Age	18-21 years	5	20
	22-26 years	11	44
	27-31 years	6	24
	32 years and above	3	12
Gender	Male	15	60
	Female	10	40
Educational level	Senior High	21	84
	Tertiary	2	8
	Others (Bible school)	2	8

Source: Field survey (2017)

The results showed that many of the pump attendants interviewed were male and this implies that males are usually the most preferred labour force in this area. Possibly, this could also be as a result of the physical demands of the work and the long working hours including nocturnal shifts at the fuel stations. With regards to education, majority of the pump attendants have had senior high school education. This corroborates the findings of a similar study conducted by Afolabi, et al., (2011) in Nigeria and that of Ansah & Mintah (2012) in the Central and Western regions of Ghana who disclosed that predominantly, attendants are the young bachelors with Senior High School education. The results also showed that all pump attendants interviewed were

trained. This is an indication that all pump attendants interviewed were educated, trained and responsible and this was very important because it indicated that pump attendants were able to understand, reflect and provide objective responses.

The demographic characteristics of respondents (public) living close to the fuel stations visited during the research are shown in Table 4.2. The study revealed that 16% of respondents have their ages ranging from 18 to 24 years, 31% between 25 to 30 years, and 53% were 31 years and above (Table 4.2). Also, 52% of respondents were male whilst 48% were female (Table 4.2). In terms of education, 7% of respondents had attained no education, 2% had primary school education, 12% had Junior High

school education, 36% Senior high school education, 36% tertiary education and 7% had other form of education (Table 4.2).

Table 4.2: Demographic characteristics of Public respondents

Variable	Characteristics	Frequency (N=100)	Percentage (%)
Age	18-24 years	16	16
	25-30 years	31	31
	31 years and above	53	53
Gender	Male	52	52
	Female	48	48
Educational level	No education	7	7
	Primary	2	2
	Junior High	12	12
	Senior High	36	36
	Tertiary	36	36
	Others	7	7

Source: Field survey (2017)

The results also showed that many of the respondents (public) were male. With regards to education, majority of the respondents had senior high school and first degree certificates. This was reflected in many respondents stating that they were knowledgeable in the impacts of the siting of fuel stations. The demographic characteristics highlight that many of the respondents were educated and responsible and this was very important because it indicated that the respondents were able to understand, reflect, articulate and provide objective responses.

Knowledge Level of Pump Attendants on Safety and Health

The knowledge level of pump attendants on safety and health are shown in Table 4.3. Out of the twenty-five (25) pump attendants interviewed, 80% were knowledgeable in the use of fire extinguishers whilst 8% had little knowledge on the use of fire extinguishers and 12% were not knowledgeable in the use of fire extinguishers. (Table 4.3). The results further showed that only 64% of pump attendants were knowledgeable on the importance of fire assembly points at the fuel stations. Also, 20% had little knowledge and 16% had no knowledge on the fire assembly points (Table 4.3).

Also, all the pump attendants (100%) had knowledge on the importance of protective clothing, dispensing of fuel and importance of a canopy at the fuel stations (Table 4.3). On the other hand, 84% of pump attendants were knowledgeable on the importance of fire action plan whilst 8% had little knowledge and 8% were not knowledgeable (Table 4.3). Furthermore, 96% of pump attendants were very knowledgeable on the importance of first aid whilst 4% were not knowledgeable. Similarly, 96% had knowledge on fuel spills management whilst 4% had little knowledge on fuel spills management (Table 4.3).

Table 4.3: Knowledge level of pump attendants on safety and health

Safety and Health Variables	Very Knowledgeable	Little Knowledge	Not Knowledgeable	Total
Use of fire extinguisher	20 (80%)	2 (8%)	3 (12%)	25 (100%)
Management of fuel spills	24 (96%)	1 (4%)	0	25 (100%)
Dispensing of fuel	25 (100%)	0	0	25 (100%)
Importance of first aid at fuel stations	24 (96%)	0	1 (4%)	25 (100%)
Importance of protective clothing's	25 (100%)	0	0	25 (100%)

	Very Knowledgeable	Little knowledge	Not knowledgeable	Total
Importance of fire assembly point	16 (64%)	5 (20%)	4 (16%)	25 (100%)
Importance of the canopy	25 (100%)	0	0	25 (100%)
Importance of the warning signs	23 (92%)	1 (4%)	1 (4%)	25 (100%)
Importance of the fire action plan	21 (84%)	2 (8%)	2 (8%)	25 (100%)
Importance of the exit (in and out)	24 (96%)	1 (4%)	0	25 (100%)

Source: Field survey (2017)

Many of the pump attendants were very knowledgeable in terms of proper management of fuel spills, proper fuel dispensing and the importance of canopy, protective clothing, warning signage, fire action plan, entrance and exit and first aid at the fuel stations. The procedure they gave for proper management of fuel spills was that, first pour sea sand on the spills, sweep and dispose by burying it in the ground to avoid fire outbreak because of its flammability. TankSmart Mod.6 (2017) mentioned that appropriate measures like turning off leaking equipment should be taken when a spill occurs to prevent further fuel flow and absorbent materials should be used to soak up spilled fuel. They explained that the warning signage are very important because it helps create awareness of customers to ensure safety and prevent unforeseen fire incidents at the fuel stations.

On the other hand, the results indicated that most of the pump attendants did not have adequate understanding of the relevance of fire assembly points at fuel stations. On the aspect of familiarity with the use of fire extinguishers, it was realised that only a few were identified to have no knowledge on how to use fire extinguishers to fight fire in any incidence of fire outbreak at the fuel station. This indicates that the 25 pump attendants interviewed have high level of knowledge in terms of health and safety measures at the fuel stations but have little knowledge on the relevance of fire assembly points at the fuel station. This finding disagrees with that of Afolabi et.al. (2011) who emphasised that, there is inadequate knowledge on safety practices in filling stations.

Knowledge Level on the Regulatory Bodies by the Pump Attendants

The knowledge level of pump attendants on the regulatory bodies for fuel station operations are shown in Table 4.4. Out of the 25 pump attendants interviewed, 28% were knowledgeable on EPA requirements at the fuel stations, 32% had little knowledge on the EPA requirements and 40% had no knowledge (Table 4.4). The results further showed that 80% of pump attendants were knowledgeable on Ghana Standards Authority requirements, 4% had little knowledge and 16% had no knowledge. However, 88% of pump attendants were knowledgeable on Ghana National Fire Service requirements, 4% had little knowledge and 8% had no knowledge on their requirements (Table 4.4). The study also showed that 96% of pump attendants were knowledgeable on National Petroleum Authority requirements, none had little knowledge and 4% had no knowledge (Table 4.4).

Table 4.4: Knowledge level on the regulatory bodies by the pump attendants

Regulatory Bodies	Requirements	Very Knowledgeable	Little knowledge	Not knowledgeable	Total
NPA	Checks fuel quality and quantity	24 (96%)	0	1 (4%)	25 (100%)
EPA	Monitoring and issuing of permit	7 (28%)	8 (32%)	10 (40%)	25 (100%)
GSA	Checks fuel quality and reliability	20 (80%)	1 (4%)	4 (16%)	25 (100%)
GNFS	Inspects fire extinguishers at the fuel stations	22 (88%)	1 (4%)	2 (8%)	25 (100%)

Source: Field survey (2017)

The study revealed that almost all the pump attendants were very knowledgeable about the parameters required from the fuel stations. They affirmed that the parameters required by the National Petroleum Authority (NPA). (2016) include checking fuel quality and quantity using a 10-Litre measuring can to ensure that the product is good for sale and the customer is not cheated. In doing so, the National Petroleum Authority (NPA) normally collaborates with the Ghana Standards Authority (GSA). (2016). The parameters of Ghana Standards Authority (GSA) were given as; using standards to ensure that products and services are safe, reliable and are of good quality. Also, they change stickers on the fuel pumps. This conforms to the laid down regulations of National Petroleum Authority (NPA) (2016) which states that, they jointly launch the 10-Litre measuring can with the Ghana Standards Authority (GSA) as an instrument to assist consumers ascertain the right volume of fuel being dispensed by the pump.

The parameters of Ghana National Fire Service (GNFS) were given as inspecting fire extinguishers to ensure that they are renewed and active for firefighting in case of any fire outbreak. This is in line with the requirements of Ghana National Fire Service (GNFS) (2017) which states that GNFS is the main regulatory body to ensure that fire extinguishers are replaced regularly to conform to expiry dates. However, most of the respondents were not knowledgeable in terms of Environmental Protection Agency (EPA) requirements but only a few were fully aware and knowledgeable of them as a body responsible for issuance of permits. The Environmental Protection Agency (EPA) (2016) states that they are responsible for inspection and monitoring as well as issuance of permits at fuel service stations. Conclusively, the above information shows that pump attendants interviewed have high level of knowledge on the requirements of NPA, GSA and GNFS but have low knowledge on EPA requirements.

Public Perception on Closeness of Fuel Station to Residents

It was indicated by most respondents (86%) that it is inappropriate to site fuel stations close to residential areas or public places whilst 14% of respondents thought otherwise.

Those who specified that it is inappropriate to site fuel stations close to public places gave three reasons namely; fire explosion, environmental pollution and health effects.

This finding is consistent with that of Health and Safety Authority (HSA) (2016) who disclosed that, the storage of fuel may pose several risks which may include fire explosion, environmental damage, and health effects when handled by individuals. However, those who mentioned fire explosion said, fuel stations produce highly flammable products which can easily cause explosions when it comes into contact with naked flames or heat, hence this can lead to loss of lives and properties as in the case of the 3rd June 2015 disaster in Accra. Further, those who mentioned environmental pollution said, fuel stations are one of the major sources of pollution to surface and groundwater, air, soil and human health. Again, they highlighted that fuel stations produce harmful materials which affect air quality, water quality and soil quality. They stressed that leakages from fuel stations pollute surface, underground water bodies and soil leading to loss of biodiversity of ecosystems and soil fertility. Also, they emphasised that fuel stations cause noise pollution as a result of vehicle movement at the stations which is a nuisance to the public and residents. This corroborates the findings of Isabel et al. (2010), who disclosed that petrol filling stations cause environmental impacts such as soil, water and air contamination as well as fire explosions hence must be located 100 metres away from public and residential buildings. Furthermore, those who mentioned health effects indicated that fuel stations produce products which are very harmful to humans. They stressed that during offloading and dispensing of fuel, harmful vapour is introduced into the atmosphere, which when inhaled by residents could cause lung cancer and heart pains. This supports the findings of Mshelia et.al. (2015), who noted in a related study that respiratory disorders are the major health effect suffered by both workers and residents living close to filling stations.

Those who indicated that it is appropriate to site fuel stations close to public places gave accessibility as a reason. They stressed that when fuel stations are located close to public places, it helps customers to get easy access to the fuel station by travelling short distances to buy fuel. Though Alagbe & Njoku (2015) mentioned in their work that in as far as filling

stations should be located where they can be easily accessible, the concern had been that there has been over-provision within one geographical area as well as indiscriminate locations within towns or cities.

Public Perception on Factors that Influence the Siting of Fuel Stations
The factors indicated by respondents for the siting of fuel stations in the metropolis are shown in figure

4.1. The study revealed that profit was identified by most respondents as the major factor that influences the siting of fuel stations in the Tamale Metropolis which recorded 35.4% as the highest (Figure 4.1). Accessibility, competition and job creation recorded 21.2%, 19.5% and 18.6% respectively (Figure 4.1). Also, nature of land was stated by respondents as the least factor which recorded 5.3% (Figure 4.1).
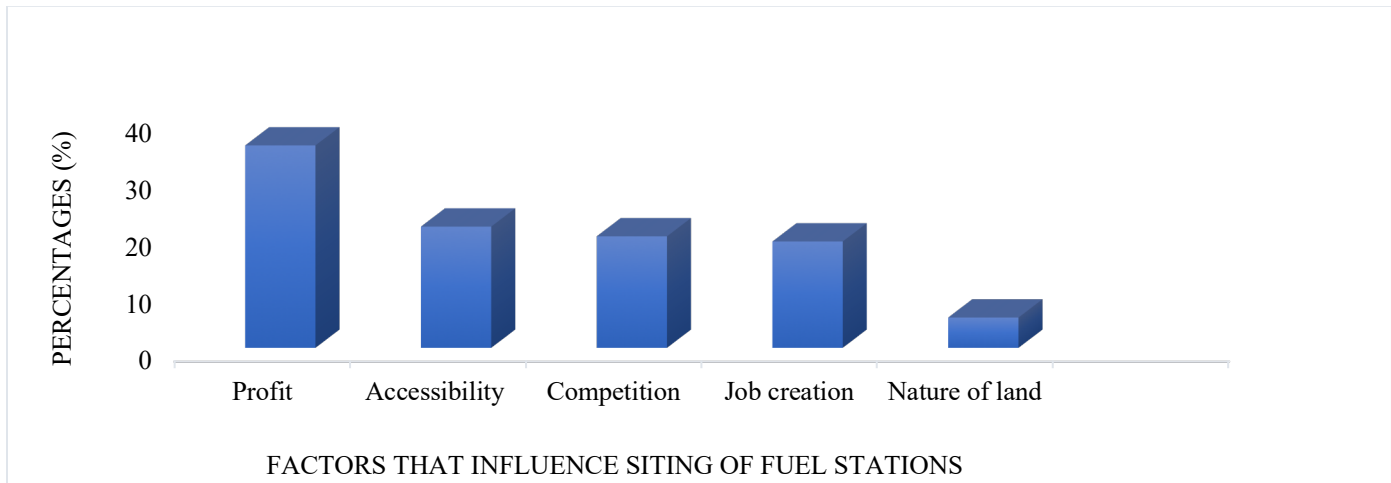
Figure 4.1: factors that influence the siting of fuel stations in the Tamale Metropolis
Source: Field survey (2017)

The survey revealed that, siting of fuel stations in the Tamale Metropolis are influenced by five main factors. Two of these are deemed as the major factors that influence fuel stations siting in the Tamale Metropolis. The two major factors stated by respondents were profit and accessibility. According to the respondents, an entrepreneur's choice of location is normally determined by points of maximising sales and profits. In most developed economies, locational choices are influenced by the price differentials and competitiveness between the fuel stations. This has been echoed by Chan et al. (2004) and Light (2004) who give evidence of price differentials and competitiveness that affect fuel stations locations.
The work of O'Sullivan (2005) emphasised that filling station operators always have a location preference with the hope of maximising sales and profits. Hence, they will choose to locate their business at a central place where they feel it will

attract a lot of motorists for refuelling and as a result, maximise their income. Also, Lonnie & Mike (2002) emphasised that the location selected will depend on the demand factors such as elasticity of product demand, location of competitors, proximity to customers, relative competitiveness of the industry, extent of market area either regional, national, international and importance of direct contact with customers.

Public Perception on Health and Environmental Effect Associated with Fuel Stations
Respiratory problems were specified by most respondents as the major health challenge associated with fuel stations representing 69.4%, skin rashes recorded 22.3% and neurological disorder was specified as the minor effect from fuel stations representing 8.3% (Table 4.6). The results also showed that, air pollution was specified by most respondents as another major environmental

challenge associated with fuel stations representing 36.2% (Table 4.6). Water pollution, soil pollution, noise pollution, fire outbreak recorded 18.8%, 17.4%, 11.6% and 8.7% respectively (Table 4.6).

Flooding was stated by respondents as the least environmental challenge associated with fuel stations representing 7.3% (Table 4.6).

Table 4.6: Health and environmental effects associated with fuel stations

Variables	Challenges	Frequency	Percent
Health effect	Respiratory problem	84	69.4
	Skin rashes	27	22.3
	Neurological disorder	10	8.3
	Total	**121**	**100**
Environmental effect	Air pollution	75	36.2
	Water pollution	39	18.8
	Soil pollution	36	17.4
	Noise pollution	24	11.6
	Fire outbreak	18	8.7
	Flooding	15	7.3
	Total	**207**	**100**

Source: Field survey (2017)

Respiratory problems were stated by most respondents as a major challenge confronting workers and residents living closer to the fuel stations. The next problem was skin rashes whilst neurological disorder was indicated by respondents as the least health challenge. This finding is consistent with that of Mshelia et.al. (2015) who disclosed that, respiratory disorders are the most dominant health problem affecting both the workers and some of the residents as a result of the inhalation of fuel contaminated air. Other health issues like skin and sight problems alongside other health complications could also arise. These could escalate and lead to narcotic effects like headache, nausea, dizziness and mental disorders.

However, the respondents specified that air pollution, water pollution, soil pollution, noise pollution, fire outbreak and flooding were the environmental problems suffered from fuel stations.

Hypotheses Testing Using Chi-Square Test

In statistical terms, since the p-value (p = 0.358) is greater than the significance level (0.05), the null hypothesis that, educational level and knowledge level of pump attendants are independent of each other cannot be rejected. Thus as identified in this current study educational level and knowledge level of pump attendants are independent of each other with no significant relationship between educational level and knowledge of pump attendants on health and safety measures (Table 4.8). Statistically, there was significant difference (p = 0.024) between knowledge of pump attendants on health, safety and organisational requirements in the respondent's responses hence the null hypothesis cannot be accepted (Table 4.8). Similarly, there was significant difference (p = 0.003) in the responses between length of stay of respondents and their perceptions on location of fuel stations in the Tamale Metropolis hence the null hypothesis cannot be accepted (Table 4.8)

Table 4.7 Hypotheses Testing Using Chi-Square Test

Hypotheses	Pump Attendants and Public Respondents		
	X^2-value	p-value	df
H_0: Education level of pump attendants influence their knowledge level on health and safety measures at the fuel stations.	11.000[a]	0.358	10
H_0: Knowledge of pump attendants on safety, health and organisational requirement are statistically dependent.	47.103[a]	0.024	30
H_0: Length of stay of respondents influence their perception on location of fuel stations in Tamale Metropolis.	29.958[a]	0.003	12

Source: Field survey (2017)

Statistically, there was no significant difference (p = 0.358) between educational level and knowledge of pump attendants on health and safety measures in terms of respondents' responses. The results imply that high or low level of education is independent of the knowledge on health and safety at the fuel stations. Therefore, it can be anticipated that there is no association between the level of education of pump attendants and their knowledge on health and safety at the fuel stations in the Metropolis. This finding disagrees with that of Gyekye & Salminen (2005) who revealed that, level of education influences workers' awareness on health and safety in a workplace.

Also, there was significant difference (p = 0.024) between knowledge of pump attendants on health, safety and organisational requirements in the respondents' responses. This denotes that the knowledge level of pump attendants on health and safety has an association with their knowledge on organisational requirement. Hence, there was a relationship between knowledge in health, safety and organisational requirement.

Similarly, there was significant difference (p = 0.003) in the responses between length of stay of respondents and their perceptions on location of fuel stations in the Tamale Metropolis. This implies that the period spent by individuals in an area influences their perception on the siting of fuel stations. Hence, the longer the stay of individuals in an area places them in the position to give objective responses on the siting of fuel stations. Therefore, it can be held that there was a relationship between the length of stay of individuals and their perception of an activity.

Conclusion

The present study sought to examine the knowledge and perceptions of fuel pump attendants and the general public on the siting of fuel stations in the Tamale Metropolis. The study revealed that majority of the pump attendants had high knowledge on safety and health measures at the fuel stations. This was reflected in many of the pump attendants showing high level of knowledge and hence gave the importance of canopy, protective clothing, warning signage, fire action plan, entrance and exit and first aid among others at the fuel stations. This was confirmed by two fuel station managers in the Metropolis.

This study revealed that, it is inappropriate to site fuel stations close to residential areas or public places as indicated by most respondents, however a few think otherwise. It was stated by most respondents that profit is the major factor that influences the siting of fuel stations in the Tamale Metropolis. Also, it was specified by respondents that respiratory

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problems and air pollution are the major health and environmental effects associated with fuel stations. The findings of this study will contribute significantly to policies aimed at preventing avoidable explosions at fuel stations. It will also enlighten the public on the status of fuel stations on the emergency response preparedness on fuel stations.

Based on the above findings, the following are some recommendations to surmount the menace associated with these fuel stations.

The respondents can be educated on the menace through sensitisation, seminars, visual demonstration of past disasters related to fuel stations, radio and newspapers. In order to change the perception of the public, fuel stations should be sited away from residential and public places. Also, there should be education on the importance of fuel stations to the public. There should be enforcement of the guiding principles and planning standards regarding the siting of fuel stations and regular monitoring of activities at fuel stations must be ensured by the appropriate agencies.

However, operations of fuel stations should be controlled effectively by ensuring that nozzles are properly inserted before dispensing the fuel and spills should be managed effectively by pump attendants. There should be regular checks on storage tanks to prevent leakages to groundwater and other places to minimise its effect on the environment. Safety kits such as nose masks, safety boots and clothing among others should be provided to workers to minimise its effect on their health. Fuel stations should be sited in accordance with the planning standards and principle to reduce its effect on human health.

Acknowledgement

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