

Global Journal of Advanced Engineering Technologies and Sciences
AWARENESS OF TRADERS AT LORRY STATIONS ABOUT THE
HEALTH HAZARDS OF AUTOMOBILE EMISSIONS: THE CASE OF
FEMALE TRADERS IN A LORRY STATION IN KUMASI, GHANA

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Abstract

The study assessed the awareness of female traders at a lorry station in Kumasi, Ghana about the adverse effects of automobile emissions on their health. A cross-sectional survey design with a semi-structured interview was used to collect data from all 48 traders who sell at the station. The results indicated that the traders believed all automobile emissions have a smell, are visible and blue in colour. The findings also showed that 47.9% of the traders knew automobile emissions cause irritation of the eyes, 43.7% felt the emissions cause coughing and 31.3% attributed nausea and vomiting to the inhalation of the emissions. It was concluded that the traders were aware of some of the adverse effects of automobile emissions. They were, however, not aware that the inhalation of the emissions could result in death. The study recommended that the local authority (Kumasi Metropolitan Assembly) should relocate either the lorry station or the female traders to save the latter from inhaling dangerous emissions. The Environmental Protection Agency should also embark on vigorous education of the general public on the adverse effects of automobile emissions.

Keywords: adverse effects, automobile emissions, Ghana, health, Kumasi, traders.

Introduction

Air pollution has been identified as one major source of death globally. The World Health Organisation [WHO] (n.d.) indicated that about 3.1 million people die premature deaths worldwide while 3.2 % suffer from various diseases as a result of air pollution.

Air pollution comes in two forms. One is indoor air pollution which is caused by smoking of tobacco in enclosed places, use of fuel operated cooking stoves in kitchens and the running of engines in garages attached to living rooms among others. The other form of air pollution is outdoor pollution. The main sources of this form of pollution include emissions from automobiles and stationary sources such as generators and industrial machines. Indeed, Goyal, Ghatge, Nema and Tamhane (2006) observed that: 'Air pollution has become a growing problem in megacities and large urban areas throughout the globe, and transportation is recognised as the major source of air pollution in many cities' (p.403). Automobile emissions, according to Hillier and Coombes (2004), are waste products, expelled into the atmosphere through the exhaust system, crankcase breather or an unsealed fuel supply system of the vehicle.

Modern vehicles are equipped with different types of devices to help control the emission of dangerous emissions such as un-burnt vaporised fuel (HC), partially burnt fuel known as carbon monoxide (CO) and nitrogen oxides (NO_x) which are all harmful to human beings, the environment and all other living organisms (Hiller, 1991). For example, a catalytic convertor is installed in the exhaust systems of some vehicles to help clean the stated emissions exiting through the tailpipe of the exhaust system while emissions from the crankcase which would otherwise have been discharged into the atmosphere to cause air pollution, are re-cycled back into the engine to be burnt. The escape of vaporised fuel through parts of the fuel system such as the carburettor, fuel injection unit and fuel filler cap to contaminate fresh air is prevented by an evaporative emission control system which collects and returns such fuel to the engine to be burnt with the normal air-fuel mixture (Hillier, 1991; George, n.d; 'Automobile Emissions', 1994). In spite of these 'interventions' put in place on motor vehicles to curb the emission of poisonous gases into the atmosphere, Caleb and Goble (2007) have stated that air pollution from automobile emissions in most urban areas is still at levels considered to be harmful to human life.

In Ghana, the motor vehicle is the main means of transport for conveying farm produce and other commodities to market centres for sale. The Kumasi Central Market Complex is one of the largest markets in West Africa where

people from neighbouring countries like Burkina Faso, Togo and Cote d'voire come to transact business. In spite of the large size of the market, it lacks enough space to house all traders, buyers as well as vehicles. As a result, some traders display their wares in open spaces which are also used by some driver unions as bus terminals popularly referred to as lorry stations. The Aboabo Lorry Station is one such terminal where female traders line up to sell various items in the midst of parked and running vehicles. Figure 1 shows a picture of the Aboabo Lorry Station with vehicles and traders doing business.



Fig. 1. Female traders displaying fish and other items for sale at the Aboabo Lorry Station

Most of the vehicles which operate at the lorry station are over-aged and poorly maintained. Additionally, they are not equipped with emission control devices and as a result, emit dangerous emissions into the environment. Some of the drivers whose vehicles do not have starter motors for self starting at times leave their engines running while waiting for passengers to board.

The traders occasionally heckle the drivers for running their vehicles over their wares but are consoled by the fact that the location of the station is strategic to them. In the first place, the station is right in the middle of where the traders do business and so when vehicles bring goods of the traders to the station, the traders would not have to incur additional cost in conveying the goods to a relatively safe place to sell. Secondly, the traders are happy with the location of the station because at the end of their day's business, they do not have to walk long distances to the lorry station to pick vehicles to their homes.

A number of studies including those of Balashanmugan, Nehrukumar, and Balasubramanian (2014), Hassan, Mohammed, Nasir, Okegbile and Otaba (2014), and Ojolo, Oke, Dinrifo and Eboda (2007), have been conducted to determine the adverse effects of vehicular emissions on human health. There, however, appears to be little or no recent study on whether people who are exposed to breathing in vehicular emissions know what these emissions are and the adverse effects the emissions have on their health especially in Ghana. The purpose of this study was therefore to find out whether female traders who sell at the Aboabo Lorry Station in Kumasi, Ghana know automobile emissions and the adverse effects of breathing in these emissions.

Literature Review

Many studies have alluded to the fact that automobile emissions in general are harmful to humans and the environment. For example, studies by Avid and Manish (cited in Hassan, Mohammed, Nasir, Okegbile & Otaba, 2014) showed that CO is a very dangerous gas because it does not give an inkling of indication that it has been inhaled into the human system. All it does when inhaled is to travel unnoticed to the blood stream and mix with hemoglobin to form carboxyhemoglobin (CoHb). The effect of this combination in the human body is that it decreases the supply of oxygen from the lungs to the brain and heart which can lead to health related problems. Bailey (n.d.) indicated that the degree of effect of CoHb in an individual depends upon its concentration in that individual. A concentration of 15% results in mild headache, 25% nausea and severe headache, 45% in unconsciousness and 50% in death.

Petrović and Trajković (2010) indicated that CO is a highly toxic gas that has no smell or taste. It is lighter than air and so insidious that even in small amounts can be very dangerous when inhaled. Petrović and Trajković also revealed that in the United States of America, CO is responsible for over 50% of all deaths resulting from poisoning. 'Dangers of exhaust fumes' (2013) have it that CO is so dangerous that 'when listing the dangers of exhaust fumes, death from CO poisoning falls at the top' (p.1).

Abbey (2015) reported that two lovers (man and woman) were found dead in a poorly ventilated single room in Accra, Ghana. The couple died as a result of breathing exhaust fumes from a generating set which they were operating in the room for fear of it being stolen if operated from outside. Abbey quoted an engineer who commented on the death of the couple as explaining that: 'A generating set should be used in an open space with good ventilation because the fumes contain emissions which are colourless, invisible and odourless' (p.60).

Dapatem (2015) also reported that a mother and child in Kumasi and a man and his female lover in Kukurantumi all in Ghana died as a result of inhaling exhaust fumes from a generator. Similar deaths have also been reported in Ebonyi and Anambra states in Nigeria where eleven people lost their lives as a result of inhaling fumes from generator sets ('Deaths from generator' 2012; 'An enlightenment campaign' n.d.).

Nimako (2015) asserted that short-term exposure to vehicle exhaust can cause irritation of the eyes and throat, fatigue and headache among others, while the long term effects may lead to chronic cough, excessive mucus production, chest tightness and impaired lung function.

Nitrogen Oxides (NO_x) is one other dangerous gas that is harmful to humans and the environment. It is generated when nitrogen in the air reacts with oxygen at a high temperature and pressure in the combustion chamber of the motor vehicle. When this gas is emitted into the atmosphere, it combines with water to form nitrous acid which causes lung disorders. NO_x in the atmosphere also combines with other exhaust gases to cause nose and eyes irritation, weaken the body's defences against respiratory infections such as pneumonia and influenza. High levels of exposure have been linked with increased hospital admissions due to respiratory problems, while long term exposure may affect lung function in sensitive people (Hillier, 1991; Rossman, 2009).

In the view of Phamornsuwana (n. d.) one devastating effect of NO_x is that it combines with sulphur dioxide to react with other chemicals to form either dry or wet deposition. Wet deposition refers to acid rain, fog and snow which affect visibility and damages crops, trees and river bodies. Oxides of nitrogen also combine with volatile organic compounds to form ozone which causes coughing, throat irritation, pain or discomfort in the chest when breathing and in extreme cases, death.

Diesel exhaust has also been found to create a number of health related problems for people who inhale it. This arises from the fact that the small particles in diesel exhaust fumes get settled in the lung tissue and causes respiratory ailments, asthma, headache, running nose, eyes and nausea. Diesel exhaust is known to contain methane and carbon and therefore contributes to global warming.

Studies have also shown that hydrocarbon emitted by automobiles combine with nitrogen oxide and sunlight to form ground level ozone which causes irritation of the eyes, nose, and throat and also damages the lungs (Sydbom, Blomberg, Parnia, Stenfors, Sandström & Dahlén, 2001; 'Cars exhausts gases' n.d.).

Materials And Methods

Research Design

The research design used for the study was a cross-sectional descriptive survey. The choice of the design was based on the fact that Osuala (1993) saw it as being appropriate for obtaining views of subjects about an on-going process. Additionally, the choice of survey method was informed by the views of Davis, Stokes-Hurby, Rover and Donovan (2002), and Anaekwe (2007) who indicated that results obtained from survey research can be generalized to be that of the population's.

Participants of the Study

A group of 48 female traders at the Aboabo Lorry Station was used for the study. This number represented the total number of traders who sell at the station.

Instrument

A semi-structured interview was used to collect data. The instrument was used to collect background information of the interviewees, their knowledge of the nature of automobile emissions, and the adverse effects the emissions had on their health.

Data Collection Procedure And Analysis

The interviewees were made aware of the purpose of the study and assured that any information they gave out would be treated confidentially to which they consented. The interviews were conducted in 'Twi', a local language generally spoken and understood by all those who ply their trades in the Kumasi Central Market. The interviews were held on a one-on-one basis and in the evenings after the female traders had closed for the day's business. This approach was necessary to ensure that the interviews were not disrupted by buyers or the interviewees losing their customers to other competitors as a result of the interview. The interview lasted two weeks. The data obtained were converted to percentages and reported accordingly.

Results And Discussion

Table 1 shows the background characteristics of participants of the study.

Table 1. Distribution of some characteristics of interviewees (N = 48)

Description	frequency	Percentage (%)
<i>Level of education</i>		
Vocational/technical school	2	4.2
Senior high school	3	6.3
Junior high school	5	20.8
Primary school	12	25.0
No formal education	26	54.2
<i>No of years participant had traded at the station</i>		
≤ 1 year	15	33.3
2-4 years	20	41.6
5-7 years	7	14.5
≥ 8 years	6	12.5

The background information of the interviewees shows that their educational level and the number of years they had been selling at the station, to a great extent appeared to influence their awareness of the nature and adverse effects of automobile emissions on human beings. Interviewees who had vocational/technical and senior high school education and had been doing business at the station for a period of at least five years, knew more about automobile emissions than those with lower educational qualifications and had not been selling at the station for at least five years. Additionally, traders who had also been doing business at the station for at least five years but with no formal education also had a better understanding of automobile emissions and their adverse effects on human beings than those with junior high and primary school education only.

The results in Table 2 are responses of the interviewees when they were requested to state all that they knew about the nature of automobile emissions. Five interviewees mentioned two characteristics; three listed three while twenty stated four. The least known characteristic had a frequency of 36 and the most known had 46. All the four aspects of automobile emissions as identified by the interviewees are shown in descending order in Table 2.

Table 2. Perceived nature of automobile emissions (N = 48).

Nature/characteristic of automobile emissions	Frequency	
	n	%
1. All automobile emissions are visible	46	95.9

2. All automobile emissions are gaseous	42	87.5
3. All automobile emissions are blue in colour	40	83.3
4. All automobile emissions have a smell	36	75.0

From Table 2, the results indicate that 46 (95.9%) interviewees were of the view that all automobile emissions were visible. This finding contradicts that of Abbey (2015) who noted that some exhaust emissions were not visible. This new finding may be attributable to the fact that since most of the vehicles which operate at the station are old and improperly maintained, they do not achieve complete combustion of their fuel/air mixtures; hence, they discharge 'smoky' emissions which are visible. Additionally, the results showed that 42 (87.5%) interviewees stated that all automobile emissions were gaseous in nature. A 33-year-old woman commented that:

We all here know that vehicular emissions are gaseous in nature. They are the burnt gases or smoke that comes out through the tail pipe of a vehicle into the atmosphere.

The result that automobile emissions are gaseous fall in line with the findings of Petrović and Trajković (2010); Abbey (2015); and Hillier, (1991) who have all indicated in their studies that automobile emissions are a combination of different gases.

The results also showed that 40 (83.3%) interviewees believed exhaust emissions were blue in colour. The interviewees, however, indicated that it was the vehicles which operated at the station that emitted blue smoke because they had seen black exhaust emissions being emitted by heavy duty diesel vehicles elsewhere. The interviewees further stated that black smoke was unpleasant and dangerous when inhaled because it could 'make the heart black' and affect its operation while blue emissions were pleasant and normal. This finding is twofold. In the first place, the result that black smoke from diesel vehicles is dangerous when inhaled agrees with the view of Vidal (2013) that exposure to diesel exhaust contributes to lung disease, heart attack and asthma among others. In the second case, the result that blue emissions discharged by some vehicles is pleasant and normal, is inconsistent with what is reported in 'exhaust color' (n.d.) which has it that gray/blue automobile emissions are indicative of oil being burnt alongside with fuel/air in engine cylinders and such emissions in the view of Hillier (1991) are harmful to humans.

Finally, the results in Table 2 show that 36 (75%) interviewees were of the view that all exhaust emissions had a smell. Two pregnant women from those who said vehicular emissions had a smell claimed that exhaust emissions from some vehicles had a pleasant smell and they at times went near the exhaust pipes of such vehicles to inhale the emissions just 'to feel fine.' A 47-year-old woman commented that: 'Anyone who cannot smell automobile emissions must have lost the sense of smell.' This finding contradicts that of Petrović and Trajković (2010) and Nimako (2015) who have found that some automobile emissions contain gases which are odourless but deadly when inhaled.

The results in Table 3 show responses the interviewees gave when they were asked to state the adverse effects of automobile emissions on humans. In all, six effects were mentioned. The least mentioned effect was stated by 15 (31.3%) interviewees and the most mentioned was by 23 (47.9%) interviewees. All the six mentioned effects are shown in descending order in Table 3.

Table 3. Perceived adverse effects of automobile emissions

Adverse effects	Frequency	
	n	%
1. Automobile emissions cause irritation of the eyes	23	47.9
2. Automobile emissions cause coughing	21	43.7
3. Automobile emissions cause irritation of the throat	20	41.6
4. Automobile emissions cause mucus production	18	37.5
5. Automobile emissions cause headache	16	33.3
6. Automobile emissions cause nausea and vomiting	15	31.3

From Table 3, 23 (47.9%) interviewees believed automobile emissions caused irritation of the eyes. Two of these interviewees lamented that the emissions from the vehicles at the lorry station cause them to involuntarily shed tears and this appeared to affect their vision. A 42-year-old fish monger expressed her frustrations about the emissions by stating that: *"I have developed 'weeping eyes' as a result of the smoke from the vehicles which enter my eyes on a daily basis."* This result is similar to findings by Nimako (2015) and Hillier (1991) that exposure to vehicle emissions causes irritation of the eyes and throat.

It is reported by Nimako (2015) and Phamornsuwana (n. d.) that short-term exposure to exhaust emissions causes coughing while long term exposure could result in chronic cough. The results of the study also show that 21 (43.7%) interviewees believed automobile emissions caused coughing. Coincidentally, two interviewees had to ask the author to hold on for them to cough and clear their throats just before responding to the interview. One interviewee intimated that: *'Since I started selling in this market, I have developed a cough which troubles me a lot.'*

As shown in Table 3, 20 (41.6%) interviewees indicated that automobile emissions caused them to develop irritating throats. Five of these interviewees complained the irritations were such that one had to occasionally clear one's throat in order to feel good. Eighteen interviewees (37.5%) who mentioned coughing as a consequence of inhaling automobile emissions also stated that automobile emissions caused irritation of their throats. To these interviewees, it was an unpleasant thing to sell at the station because of the emissions but then they had no alternative places to go to. One of them said in frustration:

I did not come to this station with an irritating throat. I know it's the exhaust emissions from these old vehicles which have visited this on me. How can one be breathing in these emissions every day and won't fall sick? If these emissions were good, why are the vehicles rejecting them from their systems into the atmosphere?

The next ranked item that was mentioned by 18 (37.5%) interviewees as an effect of automobile emissions was mucus production. Three interviewees stated that the emissions did not only cause mucus production, but it made them sneeze and had uncontrollable 'running noses.' This finding agrees with studies by Nimako (2015) who also found out that automobile emissions can result in mucus production.

Sixteen (33.3%) interviewees stated that automobile emissions caused headache. A 41-year old woman intimated that she had been experiencing an 'on and off' headache and believed it was attributable to the automobile emissions she inhaled anytime she came to the station to sell her wares. Studies by Abbey (2015) and Hassan et al. (2014) have also proven that when automobile emissions are inhaled they can cause headache.

The last item in Table 3 shows that 15 (31.3%) interviewees identified nausea and vomiting as effects of automobile emissions. This group of interviewees indicated that they had at one point or the other vomited as a result of the bad smell of exhaust emissions from vehicles in the station. Similar findings have been reported by Hassan, Mohammed, Nasir, Okegbe and Otaba (2014) that automobile emissions cause nausea and vomiting.

Conclusions And Recommendations

The study was to determine the awareness of female traders at the Aboabo Lorry Station in Kumasi, Ghana about their knowledge of the nature of automobile emissions and the adverse effects the emissions had on their health.

The study concluded that:

The traders were aware of some of the adverse effects of automobile emissions on their health.

- The traders were not aware that vaporised fuel is a form of vehicular emission and dangerous to human health.
- The traders were not aware that the inhalation of exhaust emissions could cause asthma, impaired lung function, pneumonia, influenza and even death as indicated by Rossmann (2009) and Petrović and Trajković (2010).
- The traders were not aware that vehicular emissions contain some dangerous gases that are colourless and invisible yet very dangerous when inhaled.

Based on the findings of the study, it is strongly recommended that the Kumasi Metropolitan Assembly which has administrative oversight of the Kumasi Central Market should either relocate the lorry station or the traders. A relocation of one party would save the traders from inhaling dangerous emissions. The Environmental Protection Agency should also embark on serious educational campaigns to educate the public on the adverse effects of automobile

emissions on human life and the environment. The Driver and Vehicle Licensing Authority which is responsible for inspecting the roadworthiness of vehicles before certifying them safe for road use should not certify vehicles that are not fitted with catalytic convertors and evaporative emission control systems.

References

1. Abbey, E.E. (2015, February 5). Lovers killed by exhaust fumes. Daily Graphic, pp.3, 60.
2. 'An enlightenment campaign may contain the spate of deaths' (n.d.). <http://www.thisdaylive.com/articles/generator-fumes-the-silent-killer/164647/>
3. Anaeke, M.C. (2007). *Basic research methods and statistics in education and social sciences*. Onitsha: Sophie Publicity and Printers Limited.
4. Automobile Emissions: An overview. (1994, August). Retrieved on 15 th May, 2015 from: <http://www.epa.gov/oms/consumer/05-autos.pdf>
5. Bailey, R. (n.d.). Carbon monoxide. Retrieved 15th May, 2015 from, http://biology.about.com/od/molecularbiology/a/carbon_monoxide.htm
6. Balashanmugam, P., Nehrukumar, V., & Balasubramanian, G. (2014, March). A survey on the effects of vehicle emissions on human health in Chidambaram town. *International Journal of Engineering Research and Development*, 10(3), 24-34.
7. Caleb, D., & Goble, R. (2007). The allure of technology: How France and California promoted Electric and hybrid vehicles to reduce urban air pollution. *Policy Science*. 40(1), 1-30.
8. Car exhaust-air pollutants (n.d.) Retrieved on 20th May, 2015, from <http://www.nutrained.com/environment/carsepa.htm>
9. Car exhaust emissions. (n.d.). Retrieved on 15th May, 2015 from, [http://safersolutions.org.au/a/15-a-Dangers_of_exhaust_fumes_\(2013,_April_15\).html](http://safersolutions.org.au/a/15-a-Dangers_of_exhaust_fumes_(2013,_April_15).html)
10. Dapatem, D.A. (2015, July 28). Generator fumes kill two at Duase. Daily Graphic, p.26.
11. Davis, N., Stokes-Hurby, H., Rover, B.K.C., & Donovan, C. (2002). *Research and Technology*. USA: McGraw-Hill Higher Education.
12. 'Deaths from generator fumes' (2012, August 1). Retrieved on 24th July, 2015 from, <http://www.thisdaylive.com/articles/deaths-from-generator-fumes/121264/>
13. 'Exhaust color diagnosis' (n.d.). Retrieved on 20th July 2015 from, <http://www.freeasestudyguides.com/exhaust-color.html>
14. George, P.E. (n.d.). How evaporative emission control systems work. Retrieved on 12th June, from, <http://auto.howstuffworks.com/evaporative-emission-control-system.htm>
15. Goyal, S.K., Ghatge, S.V., Nema, E., & Tamhane, S.M. (2006). Understanding urban vehicular pollution problem vis-a-vis urban air quality-Case study of a mega city (Delhi, India). *Environmental Monitoring and Assessment*, 119(1-3). 557-569.
16. Hassan, A.B., Mohammed, A., Nasir, A., Okegbile, O. J., & Otaba, J. O. (2014). Effect of automobile emissions pollution in Minna metropolis of Niger State. *International Journal of Engineering Science Innovation*, 3(3), 1-5.
17. Hillier, V.A.W. (1991). *Fundamentals of motor vehicle technology* (4th ed.). England: Stanley Thornes Ltd.
18. Hillier, V.A.W., & Coombes, P. (2004). *Fundamentals of motor vehicle technology*. United Kingdom: Nelson Tornos Ltd.
19. Nimako, K. (2015, March 16). Exhaust fumes: Daily dosage kills. Retrieved 6th May 2015 from, <http://flpkdr.com/InfoFiles/Exhaust%20Fumes%20Daily%20Dosage%20Kills%20Slowly.pdf>
20. Ojolo, S.J., Oke, S.A., Dinrifo, R.R., & Eboda, F.Y. (2007). A survey on the effects of vehicle emissions on human health in Nigeria. *Journal of rural and tropical human health* 6, 16-23.
21. Osuala, E.C. (1993). *Introduction to research methodology*. Onitsha: Africana-Fep Publishers Ltd.
22. Petrović, M., & Trajković, S. (2010). Air pollution as a cause of urban stress. A case study: Nemanjića boulevard, niš, Serbia nemanjića boulevard, niš, Serbia. *Architecture and civil*
23. *Engineering*, 8(4), 403-412. Retrieved on 11th May, 2015 from, <http://www.doiserbia.nb.rs/img/doi/0354-4605/2010/0354-46051004403P.pdf>
24. Phamornsuwana, S. (n. d.). Acid rain: Causes, effects, and solutions. Retrieved on 16th May, 2015 from, <http://site.google.com/site/acidrain1project/>
25. Rossman, R. E. (2009, August 8). The effects of vehicular emissions on human health. Retrieved on 23rd April, 2015 from, http://teachers.yale.edu/curriculum/search/viewer.php?id=initiative_08.07.09_.

26. Sydbom, A., Blomberg, A., Parnia, S., Stenfors, N., Sandström T., & Dahlén, S.E. (2001).
27. Health effects of diesel exhaust emissions. European Respiratory Journal, 17(4), 733-746. Retrieved on 16th May, 2015 from <http://www.ncbi.nlm.nih.gov/pubmed/11401072>
28. Vidal, J. (2013, January 27). Diesel fumes are more damaging to health than petrol engines. The Guardian. Retrieved on 14th May, 2015 from, <http://www.theguardian.com/uk/2013/jan/27/diesel-engine-fumes-worse-petrol>
29. WHO (n.d.). Exposure to air pollution: A major public health concern. Retrieved on 30th March, 2015 from, http://www.who.int/ipcs/features/air_pollution.pdf