

Level of Awareness of Effects of Automotive Emissions Among Residents of Minna, Niger State

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Abstract: The study was designed to determine the level of awareness of effects of automotive emissions among residents of Minna, Niger State. Two research questions and two null hypotheses guided the study. A descriptive survey research design was adopted for the study. The targeted population for this study was 360 respondents consisting of 60 Health workers and 300 non-Health workers who were randomly selected using stratified sampling within Minna metropolis. A structured questionnaire containing 36 items was used for the study. Mean, standard deviation and t-test were used to analyse the data collected for the study. The null hypotheses were tested at 0.05 level of significance. The findings among others revealed that residents of Minna metropolis are aware that health challenges like headache, disordered central nervous system, eye irritation, allergies, lung diseases and even death as well as disruption of our ecological system can be caused by automobile emissions. It was discovered that these effects can be reduced if people are properly oriented using medium like social media platforms, television and radio set broadcasts, billboard advertisement and journal publications. Based on the findings, it was recommended among others that: more awareness on effects of automotive emission should be created by the ministry of health just as they do for diseases like malaria and HIV/AIDS. It was also recommended that Vehicle Inspection Office (VIO) should ensure that all vehicle plying our roads pass through emission test.

Keywords: Automotive emission, Awareness, Pollutants, Automotive engines, Air pollution.

Introduction

The global trend of urbanisation in the recent years has paved the way for higher levels of comfort and has raised the standard of living of various individual through the introduction of life easing innovations like transportation, communication, air conditioning, alternative power sources among others. The technological advancement led to the invention of various machines that are propelled by internal combustion engines, example of which are cars, buses, generators, among others. These were widely accepted without having the proper awareness of the advantages and disadvantages that accompanies these innovations because we feel possessing them is the definition of a successful personality as portrayed by the society. This has led to the people focusing mainly on the pros and neglecting the adverse effects. The drive to enjoy these facilities have thus caused an increase in the number of vehicles and other internal combustion engines used for everyday activities which on the other hand, is causing another set of problems like lack of space, reduction in natural resources and most importantly environmental pollution; a phenomenon which average individual have little or no knowledge of the resultant effect of the innovations they embrace aggravates.

The lack of awareness about pollution has launched us into lot of activities which are transmogrifying into series of health challenges and environmental degradation which has negative impact on the ecosystem. This calls for an urgent need for the people's awareness level to be increased to avoid further damage. Developed countries of the world already have massive transportation mechanism such as roads, railways, air ports, bus systems and so on yet many are still projecting future expansion of these means of transportation to accommodate the ever-growing population. This has led to the air in circulation been severely polluted in the villages, towns and cities where most of the world's population live. Population in an increasing number of areas are therefore regularly exposed to air pollution, levels above limits set by the World Health Organisation (WHO, 2002, Borzel, 2002; CEC, 2002, Atubi 2009a)

In Nigeria, the bulk of concentration in terms of what major causes of unsafe air is channelled to general industrial pollution and pollution in oil industries, with minimal attention accorded to the damage of pollution caused by mobile transportation sources (Faboye, 1997; lyoha, 2009; Magbabeola, 2001). The situation of increased pollution from mobile transportation source is on the increase in per capital vehicle ownership, thus

resulting to high congestion on Nigeria city road and increase in the concentration of pollutants in the air, consequently, increasing health risk on human population. The sources of air pollution may be natural or anthropogenic. Coppalle (2001), reported that fossil fuel combustion, particularly in automobiles discharge in form of exhaust emissions such as carbon monoxide, oxides of nitrogen, hydro-carbons, particulate matters and evaporative emissions has been identified as the largest contributor to air pollution in the world, except during cooler months when wood fires contribute significantly. According to Abdulkadir et.al (2014), transport which falls under the anthropogenic sources of pollution is a known source of many air pollutants. In Minna, like most metropolis in Nigeria, the use of old cars and busses has increased tremendously due to high cost of new vehicles. This situation has increased more danger to the environment in these areas.

According to Mathew (2014), control over urban air pollution caused by automotive emission turns out to be an enormous challenge due not only to the rising numbers of total vehicles but also the increased toxic risk of the growing numbers of diesel cars. The major causes of air pollution are the flue gases, emission from refineries and factories, etc., on one hand; and exhaust emissions from vehicles on the other hand. The diesel fumes are more carcinogenic. The risk of diesel fumes is enhanced by their ability to trigger a wide range of non-cancerous effect, including allergy, asthma and other respiratory problems. Much worse in inhalation, organic lead emitted from cars, gets easily absorbed in brain, liver, kidney and blood, which becomes cumulative poison leading to brain damage, muscular paralysis, convulsions and even death. For this reason, leaded petrol has been banned in developed countries. Though the word 'smog' was coined in the United States, photochemical smog due to vehicle emission is now turning many megalopolises both in developed and the developing world into virtual disaster areas as all of them are regularly plagued by automobile emission.

The burnt gases from internal combustion of engines is generally referred to as automotive emissions. The transport and industrial sectors contributed majorly to air pollution simply because vehicles and industrial plants are propelled by internal combustion engines. Vehicular emissions are of particular concerns, since these are ground level sources and hence have the maximum impact on the general population. This implies that air pollution will be higher in congested urban areas. (Shivaji, 2013)

Mathew (2014), defined air pollution as the disruption caused to the natural atmospheric environment by the introduction of certain chemical substances, gases or particulate matter, which cause discomfort and harm to structures and living organisms including plants, animals and humans. Air pollution has hence become a major concern in most of the countries of the world because it is responsible for causing respiratory diseases, cancers and serious other ailments. Besides the health effects, air pollution also contributes to high economic losses. Poor ambient air quality is a major concern, mostly in urban areas. The release of pollutant into the air is also responsible for serious phenomena such as acid rain and global warming. The substances causing air pollution are collectively known as air pollutants. They may be solid, liquid or gaseous in nature. Pollutants are classified as primary and secondary air pollutants. Primary pollutants are those which are emitted directly to atmosphere, whereas, secondary pollutants are formed through chemical reactions and various combinations of the primary pollutants. (Shivaji, 2013, Ojolo, Oke, Dinrifo & Eboda 2007, Kanyoke, 2004)

Studies conducted in Kaduna and Abuja metropolises show higher values of Carbon monoxide concentration in heavily congested areas: 1840ppm for Sambo Kaduna, 1780ppm for Stadium round-about, Kaduna, and 1530ppm for A.Y.A, Abuja, 1160ppm for Asokoro Abuja (Akpan & Ndoke, 1999). On a worrisome note at Minna, also Abdulkadir, Hassan, Abubakar, Abdulkarim, Olawale, Jane (2014) discovered that there is high concentration of pollutants in the three major towns of Chanchaga, Bosso and Lapai, which has been attributed to the number of registered automobiles in these areas. The oxides of Carbon have the highest concentration in all three towns investigated with Chanchaga having the highest level of concentration and Lapai with the lowest. When the average concentration in the three towns is compared with clean air, it was observed that the concentrations of the pollutants in Minna metropolis are outrageously high and therefore detrimental to human health, livestock and crops. Consequently, concerted efforts are needed to arouse awareness level among the consumers on how much adverse effect automotive emission has on plants, animals, human as well as the environment. The problem of this study therefore is to ascertain the level of knowledge the residents of Minna metropolis have on the harmful effects automotive emission which is a by product of modern technology they clamour for so has not just on human health, but that of other members of the

ecological cycle. With this being done, they will be able to effectively harness all the benefits associated with these modern technologies without causing too much damage to our ecological system which will leave it worse than it was before the advent of modern day technology if not, all our clamour for better and comfortable living will be grounded to halt at a speed much more faster than that of the light.

Objectives of the Study

The main purpose of this study is to determine the level of awareness of the effects of automotive emission among residents of Niger State. The study specifically seeks to:

1. To determine the level of awareness on effects automotive emissions among residents of Minna, Niger State.
2. To determine the techniques that should be employed for increasing the level of awareness among residents of Minna, Niger State.

Research Questions

The following questions were carefully thought out to guide the study

1. What is the level of awareness on effects automotive emissions among residents of Minna, Niger State?
2. What are the techniques that should be employed for increasing the level of awareness among residents of Minna, Niger State?

Research Hypotheses

Two null hypotheses were formulated for the study and tested at 0.05 level of significance:

Ho₁ There is no significant difference between the mean responses of Health workers and Residents on the effects of automotive emissions in Minna, Niger Sate.

Ho₂ There is no significant difference between the mean responses of Health workers and Residents on the techniques for increasing awareness on effects of automotive emissions in Minna, Niger Sate.

Research Methodology

The research design adopted for this study was a descriptive survey research design. In the view of Anyakaoha (2009), a descriptive survey employs the use of questionnaires, interviews and direct

observation to ascertain the opinions, attitudes, perception and preference of individuals under study. This study was carried out in Minna metropolis of Niger State. The targeted population for this study consists of 360 comprising of 60 Health workers and 300 Residents who were randomly selected using stratified sampling method. A structured questionnaire which containing 36 items was used to collect the needed data from the respondent. The questionnaire items were structured using five-point rating scale with response options of: Very Highly Aware (5), Highly Aware (4), Moderately Aware (3), Not Aware (2), Highly Not aware (1), and Strongly Agree (5), Agree (4), Undecided (3) Disagree (2) and Strongly Disagree (1) for the research questions. The instrument was validated by a Medical Doctor from the Federal Medical Hospital Ido Ekiti and a lecturer each in the Departments of Geography and Industrial and Technology Education, Federal University of Technology Minna. It was trial tested in Maikunkele village using a population of 10 health professionals and 30 residents and Cronbach Alpha value of 0.87 was obtained. The data was analysed using Mean and standard deviation. The two null hypotheses were tested at 0.05 level of significance.

Results

Table 1

Mean Responses of Respondents on level of awareness on effects of Automotive Emissions among Residents of Minna, Niger State

S/No	Items	x ₁	x ₂	x ₃	Remark
1.	Prolonged inhaling of soot can cause headache	4.22	4.08	4.15	Aware
2.	Prolonged inhaling of polluted air can cause weakness	4.35	4.63	4.49	Aware
3.	Inhaling carbon dioxide (CO ₂) can cause dizziness	3.70	4.70	4.20	Aware
4.	Inhaling carbon monoxide (CO) can result in fainting	3.85	4.47	4.16	Aware
5.	Confusion could result from disordered central nervous system	3.76	4.22	3.99	Aware
6.	Inhaling of fuel fumes can cause Nausea	4.29	4.62	4.45	Aware
7.	Polluted air can cause alteration in the immune system	4.02	3.92	3.97	Aware
8.	Asthma and allergies can be aggravated when sooth is inhaled	4.57	4.45	4.51	Aware
9.	Inhaling of particulate matters can cause coughing	4.39	4.67	4.53	Aware
10.	Central nervous system disorder resulting from inhaling lead toxins	3.84	4.88	4.36	Aware
11.	Choking effect of fumes can cause shortness of breath	4.42	4.47	4.45	Aware
12.	Increased respiratory infections can be caused when smoke is inhaled	4.17	4.30	4.23	Aware
13.	Change in lung function resulting from inhalation of sulphur oxides (SO ₂)	3.79	4.20	4.00	Aware
14.	Difficulty breathing resulting from inhaling groups of hydrocarbons	4.04	4.43	4.24	Aware
15.	Aggravation of respiratory diseases resulting from inhaling soot	4.23	4.28	4.26	Aware
16.	Smoke can cause eye irritation	4.46	4.58	4.52	Aware
17.	Polluted air can cause encephalopathy in children which results in lower IQ	3.73	4.12	3.93	Aware
18.	Prolonged inhaling of CO can lead to death	4.14	4.50	4.32	Aware
19.	Inhaling of particulate matter can cause heart and lung cancer	3.88	4.47	4.17	Aware
20.	Polluted air can cause hyperactivity and reduced ability to concentrate	4.05	3.97	4.01	Aware
21.	Polluted air can lead to exacerbation of cardiovascular disease	3.83	4.20	4.01	Aware
22.	Polluted air can damage aquatic eco- systems and other eco-systems	3.92	4.53	4.22	Aware
23.	Particulate matter deposit results in fog which reduces visibility	4.01	4.20	4.11	Aware
24.	Dirtyness of the environment can result from deposit of particulate matter	4.16	4.55	4.36	Aware
25.	Deposit of nitrogen oxides (NO _x) causes depletion of ozone layer	4.17	4.62	4.39	Aware
26.	Further oxidation of SO ₂ to form H ₂ SO ₄ can cause acid rain	3.82	4.37	4.10	Aware

Key: \bar{x}_1 = Mean of Residents, \bar{x}_2 = Mean of Health workers, \bar{x}_3 = Average Mean
 The result presented in Table 1 showed that the respondents are aware that all the 26 items presented are effects of automotive emission.

Table 2
 Mean Response of Respondents on Techniques to be employed for increasing the level of Awareness among Residents of Minna, Niger State

S/No	Items	\bar{x}_1	\bar{x}_2	\bar{x}_3	Remark
1.	Media publicity on television or radio on effects of automotive emissions	4.51	4.58	4.55	Agree
2.	Increased journal, article publication on effects of automotive emissions	4.13	4.35	4.24	Agree
3.	Public rallies on effects of automotive emissions	4.26	4.40	4.33	Agree
4.	Public lectures on effects of automotive emissions	4.28	4.57	4.42	Agree
5.	Posters and flyers on effects of automotive emissions	4.22	4.63	4.43	Agree
6.	Use of stickers on effects of automotive emissions	4.10	4.55	4.32	Agree
7.	Town hall meetings on effects of automotive emissions	4.18	4.52	4.35	Agree
8.	Door to door campaign on effects of automotive emissions	4.01	4.22	4.12	Agree
9.	Social media campaign on effects of automotive emissions	4.19	4.48	4.34	Agree
10.	Bill board advertisements on effects of automotive emissions	4.18	4.43	4.31	Agree

The result presented in Table 2 showed that the respondents agreed that the techniques outlined that should be employed to increase the level of awareness on auto emission among residents of Minna, Niger State.

Table 3
 t-test of the respondents on the level of awareness on effects of automotive emissions among residents of Minna, Niger State

S/No	Items	\bar{x}_1	\bar{x}_2	\bar{x}_3	Remarks
1.	Prolonged inhaling of soot can cause headache	0.84	0.87	0.28	NS
2.	Prolonged inhaling of polluted air can cause weakness	0.70	0.66	0.00	S
3.	Inhaling carbon dioxide (CO ₂) can cause dizziness	1.25	0.56	0.00	S
4.	Inhaling carbon monoxide (CO) can result in fainting	1.12	0.62	0.00	S
5.	Confusion could result from disordered central nervous system	0.89	0.61	0.00	S
6.	Inhaling of fuel fumes can cause Nausea	0.78	0.56	0.00	S
7.	Polluted air can cause alteration in the immune system	0.88	0.94	0.44	NS
8.	Asthma and allergies can be aggravated when soot is inhaled	0.73	0.59	0.16	NS
9.	Inhaling of particulate matters can cause coughing	0.75	0.51	0.00	S
10.	Central nervous system disorder resulting from inhaling lead toxins	0.91	5.31	0.13	NS
11.	Choking effect of fumes can cause shortness of breath	0.70	0.65	0.64	NS
12.	Increased respiratory infections can be caused when smoke is inhaled	0.90	0.62	0.16	NS
13.	Change in lung function resulting from inhalation of sulphur oxides (SO ₂)	0.87	0.78	0.00	S
14.	Difficulty breathing resulting from inhaling groups of hydrocarbons	0.83	0.79	0.00	S
15.	Aggravation of respiratory diseases resulting from inhaling soot	0.83	0.64	0.55	NS
16.	Smoke can cause eye irritation	0.68	0.81	0.29	NS
17.	Polluted air can cause encephalopathy in children which results in lower IQ	0.91	0.74	0.00	S
18.	Prolonged inhaling of CO can lead to death	1.06	0.75	0.00	S
19.	Inhaling of particulate matter can cause heart and lung cancer	0.94	0.96	0.00	S
20.	Polluted air can cause hyperactivity and reduced ability to concentrate	0.78	0.84	0.46	NS
21.	Polluted air caused to exacerbation of cardiovascular disease	0.80	0.97	0.01	S
22.	Polluted air can damage aquatic eco-systems and other eco-systems	1.01	0.83	0.00	S
23.	Particulate matter deposit results in fog which reduces visibility	0.83	0.73	0.08	NS
24.	Dirtyness of the environment can result from deposit of particulate matter	0.88	0.62	0.00	S
25.	Deposit of nitrogen oxides (NO _x) causes depletion of ozone layer	0.93	0.67	0.00	S
26.	Further oxidation of SO ₂ to form H ₂ SO ₄ can cause acid rain	1.09	0.82	0.00	S

Key: SD_1 = Standard deviation of Residents, SD_2 = Standard deviation of Health workers, p = probability value

The result in Table 3 shows that there is no significance difference in the mean response of both group of respondents for items 1,7,8,10,11,12,15,16,20 & 23 therefore the null hypotheses for these items were upheld while the null hypothesis for the remaining items were rejected because they fall below the value 0.05.

Table 4
 t-test of the respondents on the techniques that should be employed for increasing the level of awareness among residents of Minna, Niger State

S/No	Items	SD_1	SD_2	p	Remarks
1.	Media publicity on television or radio on effects of automotive emissions	0.40	0.67	0.73	NS
2.	Increased journal, article publication on effects of automotive emissions	0.92	0.90	0.98	NS
3.	Public rallies on effects of automotive emissions	0.95	0.95	0.97	NS
4.	Public lectures on effects of automotive emissions	0.73	0.79	0.91	S
5.	Posters and flyers on effects of automotive emissions	0.49	0.58	0.94	S
6.	Use of stickers on effects of automotive emissions	0.85	0.60	0.98	S
7.	Town hall meetings on effects of automotive emissions	0.85	0.75	0.98	S
8.	Door to door campaign on effects of automotive emissions	1.01	1.06	0.98	NS
9.	Social media campaign on effects of automotive emissions	1.00	0.93	0.95	S
10.	Bill board advertisements on effects of automotive emissions	0.92	0.97	0.98	S

The result in Table 4 shows that there is no significance difference in the mean response of both group of respondents for items 1,2,3, & 8 only therefore the null hypotheses for these items were upheld while the null hypothesis for the remaining items were rejected because they fall below the value 0.05.

Findings of the study

1. The residents of Minna metropolis are aware that health challenges like headache, disordered central nervous system, eye irritation, allergies, lung diseases and even death as well as disruption to our ecological system which gives rise to challenges like ozone layer depletion, acid rain, death of aquatic organisms and reduced visibility can be caused by harmful gases being released into the atmosphere by internal combustion engines.
2. Residents of Minna metropolis believed that although they are aware of these environmental and health effects, there is need for more awareness to be made via means like social media platforms, television and radio set broadcasts, billboard advertisement and journal or other paper publications in order to reach the unreached dwellers of Minna, Niger State.

3. There was significant difference in mean responses of Residents and Health workers on the health and environmental effects of automotive emissions for all items except for items 1,7,8,10,11,12,15,16,20 & 23.
4. There was significant difference in mean responses of Residents and Health workers on the strategies to be adopted for increasing level of awareness on effects of automotive emissions for all items except for items 1,2,3 & 8.

Discussion of Findings

The findings in Table 1 revealed that diseases that can be caused by prolonged inhalation of uncontrolled exhaust gases released into the atmosphere includes, headache, disordered central nervous system, eye irritation, allergies, respiratory diseases, asthma and eventual death if immediate and proper health measures are not taken to salvage the life of the victim. This is in line with an epidemiological survey which was carried out in the United States of America by Ackerman, Davies, Jefferson, Longhust, and Marquez (2002), where it was discovered that prolonged exposure to automobile emissions spanning ten years and above alters lungs function, reason for the prevalence of chronic bronchitis and asthma among tunnel officers and street cleaners exposed to concentrations higher than World Health Organisation (WHO) value. Enemari (2001) & Brook Franklin, Cascio, Hong, Howard, Lipsett, Luepker, Mittleman, Samet and Smith, (2004) also found out that constant exposure to oxides of carbon is very harmful to human health because carbon monoxide causes blood clotting when it reacts with haemoglobin, a phenomenon which truncates the supply of oxygen.

The results further revealed that it is not only human beings that suffers the pains of auto emissions, other living things in the ecological system like lower terrestrial animals, aquatic animal and arboreal animals are threatened because increase in commercial activities is directly proportional to increase in polluted air. The by product of this activities which involves the use of heavy duty machineries and vehicle results in depletion of ozone layer, formation of acid rain and dirty environment. Heavy commercial activities is a phenomenon which is common occurrence in urban centres (Glen Zelenka & Graham, 1996; Johnson, Jamriska, Morawska & Ferreira, 2002). This implies that those living in urban centres are more at risk.

The findings in Table 2 revealed that the residents of Minna, Niger State believe that all hope is not lost if the populace can be more enlightened for those still living in the darkness of what they are toiling with. Measures suggested through which this could be done includes, media publicity on radio and television sets, door to door campaigns, public lectures, social media publicity, public rallies as well as a special call on scholars to increase the number of articles which will sensitise the general public on the subject matter at hand. Sayers (2006) & International Federation of Red Cross and Red Crescent Societies (2011) opined that personal communication is only efficient in reaching limited people, they however suggested that printed materials - for example, billboards, brochures, comics, pamphlets, posters and resource books, audio-visual resources - for example, pre-recorded cassettes, videos, websites, media interviews, feature articles and announcements in newspapers, magazines, media interviews and news items on local radio and television as means through which the larger population can be reached.

A t-test significance was used to test hypothesis one on level of awareness on effects of automotive emissions among residents of Minna, Niger State. Table 3 had 10 items with a calculated sig. 2-tailed value greater than 0.05 and the remaining 16 items had a calculated sig. 2-tailed value less than 0.05. Therefore, the null hypothesis of no significant difference was upheld for the 10 items while it was rejected for the remaining 16 items. This may be due to the fact that an average individual believes that health related issues is majorly a matter of concern to Health workers and they are the set of individuals who should be abreast with all details as regards personal hygiene and general human wellbeing. This is evident from close observation of the means on the Table 1 which showed that the means of Health workers is higher than that of the Residents.

Table 4 revealed result on perception on methods of increasing awareness on effects of automotive emissions among residents of Minna, Niger State. 4 items had a calculated sig. 2-tailed value greater than 0.05 and the remaining 6 items had a calculated sig. 2-tailed value less than 0.05. Therefore, the null hypothesis of no significant difference was upheld for the 4 items while it was rejected for the remaining 6 items based on the decision rule that items with calculated value less than 0.05 will be rejected while those with value greater than 0.05 will be upheld. This could also be attributed to the level of exposure of Health workers which allows them to easily relate with and accept anything that will boost their knowledge base unlike the illiterate individual who may find it difficult to change.

Conclusion

Based on the findings of this study, it could be concluded that a large number of residents of Minna, Niger State are quite aware that diseases or health anomalies like central nervous system disorder, weakness, headache and death are associated with unsafe air which is a by-product of automotive emissions.

Recommendations

Based on the findings, the following recommendations were made:

1. The ministry of health should make it a point of duty to ensure that media campaign on effects of automotive emissions is given topmost priority as it is for other diseases like malaria, HIV/AIDS and others.
2. Regulatory bodies, most especially Vehicle Inspection Office (VIO) should ensure that all vehicle plying our roads pass emission test. Strict measure should also be taken against those who violate the rules governing auto emissions.
3. The notion that a body of knowledge belongs solely to a particular profession should be abolished especially matters that borders around health, finance, security and other. Everyone should therefore broaden their scope around the important spheres of life other than just being professionally grounded.
4. Attempt to increase level of awareness should be directed towards the generally acceptable means of information dissemination like media publicity on radio and television sets, public rallies, door to door campaign and publications so that it will be by target audience without any bias

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