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Knowledge and Preventive Attitudes of the Harmful Effects of Carbon Monoxide Among Mechanics in Shinkafi Community Zamfara State Nigeria

Jafaru, Yahaya*
Department of Nursing Science, College of Health Sciences, Federal University Birnin kebbi, Kebbi State Nigeria

Abstract
There are frequent mass casualty reports in the Nigerian mass media on Carbon Monoxide (CO) poisoning from electrical power generators. This indicates that it is a serious health risk, and deserving the attention of public health professionals (McDonald, Shields, & Frattaroli, 2010; Blumenthal 2001). CO is a common industrial hazard resulting from the incomplete burning of natural gas and any other material containing carbon such as gasoline, kerosene, oil, propane, coal, or wood. Forges, blast furnaces and coke ovens produce CO, but one of the most common sources of exposure in the workplace is the internal combustion engine.

The study design was descriptive cross sectional design that investigated the knowledge and preventive attitude of mechanics on harmful effects of carbon monoxide. Systematic sampling was used in selecting 116 respondents out of 165 mechanics in Shinkafi town, and 18 items semi structured questionnaire was used in data collection. Data collected were analysed in tables using frequencies and percentages. Chi square statistical tool was used in testing the research hypotheses using SPSS version 21.

The result of the study shows that mechanics have very poor knowledge of carbon monoxide; majority of the mechanics (79.3%) did not know that carbon monoxide can enter their blood. However most of the respondents (63.8%) received some information on carbon monoxide. The result also reveals that 75.9% of the respondents mentioned breathlessness as a sign of carbon monoxide harmful effects, 59.5% mentioned visual problem and only 0.9% mentioned muscle ache and loss of consciousness respectively. Majority of the respondents (89.7%) did not receive any training on carbon monoxide prevention, and prevention measures were poor among them. Hypotheses testing show that there was no significant difference in knowledge of carbon monoxide and preventive measures between different variables of the respondents such as age, educational level and years of experience.

It is therefore concluded that most of the mechanics were having little knowledge of carbon monoxide harmful effects and preventive measures. Preventive measures were not sufficient at garages and mechanics need to be educated on the harmful effects of carbon monoxide and how to prevent self from being affected. It is also recommended that government should provide proper places that are proper to be used as garages, enacts policies that control the mechanics garages and provide regular garages inspection system.
Key words: knowledge, prevention, attitude, mechanics, carbon monoxide, harmful effects

1. Introduction

There are frequent mass casualty reports in the Nigerian mass media on Carbon Monoxide (CO) poisoning from electrical power generators. This indicates that it is a serious health risk, and deserving the attention of public health professionals (McDonald, Shields, & Frattaroli, 2010; Blumenthal 2001). In the United States (US) and other parts of the world CO is noted as the leading cause of poisoning mortality and may be responsible for more than half of all fatal poisonings worldwide. It is the most common type of fatal air poisoning in many countries. It combines with haemoglobin to produce carboxyl haemoglobin (COHb), which is ineffective for delivering oxygen to bodily tissues (Goldfrank, Flomenbaum, Lewin, Howland, Hoffman, & Nelson, 2002; Omaye 2002).

According US Department of Labour Occupational Safety and Health Administration (2002); CO is a poisonous, colourless, odourless, and tasteless gas. Although it has no detectable odour, CO is often mixed with other gases that do have an odour. So, you can inhale carbon monoxide right along with gases that you can smell and not even know that CO is present. CO is a common industrial hazard resulting from the incomplete burning of natural gas and any other material containing carbon such as gasoline, kerosene, oil, propane, coal, or wood. Forges, blast furnaces and coke ovens produce CO, but one of the most common sources of exposure in the workplace is the internal combustion engine.

CO easily binds itself to the haemoglobin molecule. It has an affinity for haemoglobin 200 times that of oxygen. Once bound, receptor sites on the haemoglobin can no longer transport oxygen to the peripheral tissues. The result is hypoxia at the cellular level, and ultimately, metabolic acidosis. Hyperbaric oxygen increases the PaO_2, which promotes increased oxygen uptake on parts of the haemoglobin molecule which has not yet been bound by CO (Bledsoe, Porter, & Shade 2008).

Carbon monoxide is a temporary atmospheric pollutant in some urban areas, chiefly from the exhaust of internal combustion engines (including vehicles, portable and back-up generators, lawn mowers, power washers, etc.), it also comes from incomplete combustion of various other fuels (Hisashi, Sugawara, Sudos, Aoki & Nakasawa 2009). Occupational exposures in industries or settings with CO production represent some of the highest individual exposures observed in field monitoring studies. Such occupations include vehicle driving, maintenance, parking and traffic controls. Constant commuting by automobiles and the spending of long hours out of doors results in increased exposure to ambient levels. (Whincup, Papacosta, Lennon, & Harnes 2006, Fidan and Cumrin, 2007). The combined effect of increased atmospheric temperature, as experienced in the tropics, and CO can impair exercise performance and make daily chores like driving, climbing of stairs and long walks, a great task. Furthermore, a significant decrease in psychomotor performance has been shown with heat and CO co-condition (Walker, Ackland, & Dawson 2001).

According to Centre for Disease Control and Prevention (CDC 1999); Hundreds of people performing many different tasks have been poisoned because small gasoline-powered engines and tools produced hazardous concentrations of CO even in relatively open buildings. It is a lethal poison that is produced when fuels such as gasoline are burned. It is one of many chemicals found in engine exhaust and can rapidly accumulate even in areas that might appear to be well ventilated. Because CO is colourless, tasteless, odourless, and non-irritating, it can overcome the exposed person without warning. It produces weakness and confusion, depriving the person of the ability to seek safety. CO poisons primarily by tightly binding to haemoglobin in the blood (forming carboxyl haemoglobin), replacing oxygen, and reducing the oxygen-carrying capacity of the blood. It may also poison by binding to tissues and cells of the human body and interfering with their normal function. Persons with pre-existing heart disease are at increased risk. Recognizing early warning signs of CO poisoning is sometimes difficult because early symptoms of CO exposure (headache, dizziness, and nausea) are nonspecific and may be mistaken for symptoms of other illnesses such as colds, flu, or food poisoning. Confusion and weakness can inhibit a person's ability to escape the hazardous environment.

At lower levels of exposure, CO causes mild effects that are often mistaken for the flu. They include fatigue, dizziness, irregular breathing, disorientation, cherry red lips, nausea, headache, paleness, and coughing. The effects of CO exposure can vary greatly from person to person depending on age, overall health condition, the concentration of the gas and length of exposure. Because it is impossible to see, taste or smell the toxic fumes, CO can kill one before one is aware of its existence (Li, Hsu, & Moore 2009).

The severity of symptoms of CO exposure is influenced by three main factors: (1) the concentration of CO in the environment; (2) how long the exposure lasts, and (3) work-load and breathing rate. In general, assuming that users of gasoline-powered engines are engaged in at least a moderate level of activity, exposure to CO concentrations of 80 to100 parts per million (ppm) for 1 to 2 hours can result in decreased exercise tolerance and, in persons who are at risk, may bring on chest pain and cause irregular heartbeat (EPA 1991a). Symptoms associated with CO exposure concentrations of 100 to 200 ppm include headache, nausea, and mental impairment. More serious central nervous system effects, coma, and death are associated with CO exposure concentrations of 700 ppm or greater for an hour or more (Ilano and Raffin 1990). Symptoms of nervous system effects include staggering, confusion, changes in personality, and muscle aches. These symptoms may continue to occur for several days to several weeks after the exposure stops and the poisoned person has apparently recovered (CDC 1999).

According to the research findings by Jide, Tokunbo, Federick, & Theodore (2014) respondents demonstrated poor recognition of the signs and symptoms of carbon monoxide poisoning. While headaches were the most commonly reported carbon monoxide-associated symptom, only one respondent was aware that carbon monoxide poisoning could cause death. More than half (approximately 55%) of the respondents could not identify any symptoms of carbon monoxide poisoning. In their study in Nigeria, Ntaji, Okolo, Bamidele, & Nwagu (2011) reported poor knowledge of the features of carbon monoxide poisoning among preclinical medical students studied. In another study by Pach, Ogonowska, & Targos (2010), similar result was found in a studied university student population. The result indicated inadequate knowledge of carbon monoxide poisoning, even by the young student population. This research work is on the knowledge and preventive attitude of mechanics on the harmful effects of carbon monoxide in Shinkafi community.

1.1 Statement of the problem

A lot of mechanics are exposed for several hours to the poisonous chemical substance of CO in a daily basis. This makes them predisposed to the harmful effect of the gas, and it is observed that most of them are not applying any protective measures. Mechanics are among the widely exposed people to the CO and a lot of the people are running into the work without knowing the effects of the gas exposure or applying any protective measures. CO is silently affecting those exposed to it and making deadly and devastating effects on their health without knowing. There are frequent mass casualty reports in the Nigerian mass media CO poisoning from electrical power generators. This indicates that it is a serious health risk that needs to be investigated.

1.2 Significant of the study

The study is pertinent in educating the mechanics on the harmful effects of the CO; thus making them to carry out preventive measures. This will in turn reduce the devastating diseases caused by carbon monoxide which mostly went unnoticed. Policy makers will use the findings of the research for enacting laws and policies to reduce exposure to the gas. It will also be helpful to health personnel in educating the people and be conscious in asking the patients on the exposure to carbon monoxide during history taking.

1.3 Research objectives
The main objective of the research was to find out the knowledge and preventive attitudes of mechanics on the harmful effects of carbon monoxide.

1.4 Specific objectives
1. To assess mechanics knowledge of carbon monoxide harmful effect
2. To examine the mechanics knowledge of carbon monoxide prevention measures
3. To determine the preventive measures use by the mechanics
4. To educate the mechanics on the preventive measures of carbon monoxide exposure
5. To give recommendations

1.5 Research questions
1. Are mechanics knowledgeable on carbon monoxide harmful effect?
2. Do mechanics aware of preventive measures of carbon monoxide exposure?
3. Do mechanics carry out effective preventive measures of carbon monoxide poisoning?

1.6 Research hypotheses
1. There is no significant difference in the use of preventive measures between mechanics' levels of education
2. There is no significant difference in the use of preventive measures between mechanics' years of experience
3. Age will not have any effect on the mechanics use of preventive measures
4. There is no significant difference in the knowledge of carbon monoxide harmful effects between mechanics' levels of education
5. There is no significant difference in the knowledge of carbon monoxide harmful effects between mechanics' years of experience
6. Age will not have any effect on mechanics knowledge of carbon monoxide harmful effects

2. People at risk
You may be exposed to harmful levels of CO in boiler rooms, breweries, warehouses, petroleum refineries, pulp and paper production, and steel production; around docks, blast furnaces, or coke ovens; or in one of the following occupations:
- Welder
- Garage mechanic
- Fire fighter
- Carbon-black maker
- Organic chemical synthesizer
- Metal oxide reducer
- Long shore worker
- Diesel engine operator
- Forklift operator
- Marine terminal worker
- Toll booth or tunnel attendant
- Customs inspector
- Police officer
- Taxi driver

(U.S. Department of Labour Occupational Safety and Health Administration 2002)

2.1 Occupational exposure limits
The recommended limits of CO concentration in the workplace differ from country to country. In the USA, the level proposed by National institute for occupational safety and health (NIOSH 2004), is 35 ppm for an eight-hour workday and 200 ppm for 15 minutes, which is the maximum level. For Occupational Safety and Health Administration, OSHA 1991) the permitted concentration is 50 ppm for an eight-hour workday (EH-64, 1999). In Canada they follow the limits recommended by NIOSH. In Brazil, law NR-7 (1998) establishes the

parameters for biological control of the exposure to some chemical agents, and the CO concentration limit is 39 ppm per eight-hour workday. Besides the existence of these regulations, CO concentrations found in the workplace can exceed the permitted limits. For example, in a study by Goudreau (1992), 46% of the car mechanics in Montreal (Canada) exceeded the dose limit of CO concentration, which is 35 ppm. In another study by the Ministry of Labour, FUNDACENTRO, the CO concentrations present in shopping mall and commercial building parking lots in Rio de Janeiro exceed the dose limit of CO concentration, which is 39 ppm (Fonseca 2003).

2.2 Preventive measures of CO poisoning

Prevention of CO poisoning has been considered a priority for preventive action for many years, as it is one of the main causes of unintentional poisoning, often resulting in permanent neurological damage or death. Those involved in the prevention include:

• Health, consumer and labour authorities and ministries have a role in primary prevention, reducing hazards in the home, workplace and public areas.

• Social insurance organizations can promote awareness through public health campaigns, dissemination of leaflets, and general health education.

• Gas and coal manufacturers and suppliers are responsible for safe supply, and in some countries are involved in information and education programmes.

• General physicians in the community, and hospital emergency physicians, have a role in secondary prevention, early recognition of common symptoms of poisoning and initiation of appropriate treatment. For example, a poisons centre in France found that nearly 30% of carbon monoxide poisonings were initially overlooked and misdiagnosed and, as a result, inadequately treated on the first visit to the hospital or general practitioner.

• Environmental health officers and emergency physicians in hospitals need to identify the source of the carbon monoxide and provide adequate technical advice about, for example, repair or replacement of appliances.

• Poison centres have a role in surveillance of CO poisonings, recording cases and incidents, statistical analysis; alerting appropriate authorities; and raising awareness among physicians, health officers, teachers and other education professionals, schools, heating engineers, manufacturers of gas burning appliances, and the general public. Prevention of recurrence of poisoning requires urgent coordinated action on the part of several different individuals to avoid immediate or delayed re-intoxication that may even result in death. Raising awareness in the community is undertaken through three important methods for information dissemination:

1. Education programmes adapted to address local needs and priorities, using printed and broadcast media, booklets, posters, and video cassettes.

2. Product information and advice given to consumers when they buy new appliances (e.g. including clear warnings).

3. Through the primary and secondary school curriculum, and through undergraduate, postgraduate and professional education and training programmes:

— Students should be taught about the mechanism of combustion, how CO is produced, how poisoning occurs, and about safe behaviour. These topics can be included in the curriculum for physics and biology (World Health Organization WHO 2004).

3. Study design

The study design was descriptive cross sectional design that investigated the knowledge and preventive attitude of mechanics on harmful effects of carbon monoxide.

3.1 Population of the study and sampling

The study involved the entire mechanics of Shinkafi town. This includes power generator mechanics, car mechanics and motorcycle mechanics. Systematic sampling was used in selecting the sample of the study. Sampling frame of all the mechanics of Shinkafi town totalling 165 mechanics was used, and 116 mechanics were selected for the research using systematic sampling.

3.2 Sample size determination

The sample size was calculated using the Cochran's equation for sample proportion, at 95% confidence, 5% level of precision, and the estimate proportion of an attribute present in the population of the study is assumed to be 50%. The total target population was 165.

$$t^2pq$$

$$n_{o=}$$

d^2

t= selected alpha level in each tail
(p)(q)= estimate of variance. Maximum possible proportion is 0.5
1- Maximum possible proportion produces maximum possible sample size.
d= acceptable margin of error for proportion being estimated = 0.05 (Bartlett, Kotrlik, & Higgins 2001).

$t^2 = 1.96^2$ p= 0.5 q= 0.5 d= 0.05

$$\text{Thus } n_o = \frac{1.96^2 x0.5x0.5}{0.05x0.05} = 384$$

Cochran's correction formula was used in calculating the final sample, since the sample size exceeds the target population.

$$n_1 = \frac{n_o}{1 + n_o / \text{population}}$$

$$n_1 = \frac{384}{1 + 384 / 165} = 116$$

Therefore the sample size of this research was 116

3.3 Method of data collection

Data was collected using 18 items semi-structured questionnaire, administered to the respondents to answer. Interview was conducted using the questionnaire for the respondents that could not understand English language. Three research aids were trained and involved in data collection.

3.4 Validity and reliability

Face and content validity was used in validating the research instrument by giving the instrument to at least three experienced people in the research subject. Test-retest reliability was used in ascertaining the reliability of the questionnaire, and it was found to the reality of 6.8.

3.5 Ethical consideration

The respondents were voluntarily involved in the research, and information provided was treated as confidential. After collection of the data explanations were given on the harmful effects of CO, sings of carbon monoxide harmful effects and preventive measures against carbon monoxide harmful effects.

3.6 Method of data analysis

Data was analysed using descriptive statistic in tables indicating percentages and frequencies; and inferential statistic using Chi square statistical tool using SPSS version 21.

4. Result

Table 1. Demographic data N=116

VARIBLE	FREQUENCY	PERENTAGE
AGE RANGE		
10-19	31	26.7
20-29	35	30.2
30-39	34	29.3
40 and above	16	13.8
LEVEL OF EDUCATION		
Primary Education	10	8.6
Secondary Education	51	44.0
Tertiary Education	33	28.4
Non-formal Education	22	19.0
MARITAL STATUS		
Married	71	61.2
Single	45	38.8
YEARS OF EXPERIENCE		
1-10 years	63	54.3
11-20 years	29	25.0
21-30 years	13	11.2
31 and above years	8	6.9
Non response	3	2.6

Table 1 shows a demographic data of the respondents, which reveals that 26.7% of the respondents were 10-19 years old and only 13.8% were found to be at the age of 40 or above. Most of the respondents (44.0%) were at the level of secondary education, while 28.4% were at the level of tertiary education. However majority (61.2%) of the respondents were found to be married and 54.3% have working experience of between 1-10 years.

Table 2. Knowledge of carbonmonoxide N=116

VARIABLE	FREQUENCY	PERCENTAGE
Do you know that engine smoke contains harmful chemical?		
Yes	63	54.3
No	53	45.7
What is the name of harmful chemical in the engine smoke?		
Correct	27	23.3
Wrong	89	76.7
Does the engine smoke enter your blood?		
Yes	23	19.8
No	92	79.3
Non response	1	0.9
Does it affect important organs like brain, heart, kidney etc?		
Yes	34	29.3
No	82	70.7
Do you think you are at risk of engine smoke harmful effects?		
Yes	90	77.6
No	26	22.4

From table 2, the result shows a very high lack of knowledge of CO among the respondents. This is clear in that 79.3% did not know that CO can enter their blood, and only 23.3% could state the name of the chemical correctly. Moreover 45.7% of the respondents did not know that engine smoke contains harmful chemical.

Table 3. Information on carbon monoxide N=116

VARIABLE	FREQUENCY	PERCENTAGE
Do you receive information on harmful effect of engine smoke?		
Yes	74	63.8
No	41	35.3
Non response	1	0.9
SOURCES OF INFORMATION		
News paper	3	2.6
Hospital	75	64.7
Television	12	10.5
Radio	47	40.5
Neighbors	4	3.4
Friends	59	50.9
School	53	45.7
Internet	18	15.5
Social media	10	8.6
Others	4	3.4
None	20	17.2

Table 3 indicates that majority of the respondents (63.8%) received some information on CO, while 35.3% did not. However 64.7% of the respondents received information on CO from hospital, 50.9% from friends, with only 2.6% from news paper and 8.6% from social media.

Table 4. knwledge of sign of engine smoke harmful effects N=116

VARIABLE	FREQUENCY	PERCENTAGE
Headache	45	38.8
Fatigue	4	3.4
Dizziness	48	41.4
light-headedness	48	41.4
Breathlessness	88	75.9
Visual problems	69	59.5
Nausea/Vomiting	15	12.9
Muscles ache	1	0.9
Weakness	3	2.6
Loss of consciousness	1	0.9

Table 4 shows the knowledge of signs of CO harmful effects among the respondents. It indicates that 75.9% of the respondents mentioned breathlessness as a sign of CO harmful effects, 59.5% mentioned visual problem and only 0.9% mentioned muscle ache and loss of consciousness respectively.

Table 5. Preventive measures against carbon monoxide harmful effects N=116

VARIABLE	FREQUENCY	PERCENTAGES
For how many hours do you work per day?		
1-3 hour	5	1.7
4-6 hour	36	31.0
7-9 hour	54	46.6
10-12 hour	19	16.4
Non response	5	4.3
Do you receive any training on prevention against the engine smoke?		
Yes	7	6.0
No	104	89.7
Non response	5	4.3
What is the nature of your working place		
Close space	11	9.5
Open space	45	42.2
Semi open space	43	37.1
Highly ventilated area	8	6.9
Non response	5	4.3
What are the preventive measures you take against engine smoke harmful effects?		
Notice hazard warning labels of machine manufacturers	2	1.7
Provide effective ventilation system at work place	22	19.0
Use of face mask	76	65.5
Alert to ventilation problem	21	18.1
Recognise the symptoms and signs of over exposure	9	7.8
Report promptly complaints of dizziness, drowsiness and nausea etc	2	1.7
Leave a polluted area once you suspect carbon monoxide exposure is high	58	50.0
Use of self contained breathing apparatus	1	0.9

In table 5, it is shown that most of the respondents 46.6% work between 7-9 hours per day and 89.7% did not receive any training on CO preventive measures. 42.2% of the respondents work at open space, and 37.1% at semi open space, however 9.5% work at closed space. The table also indicates that 65.5% of the respondents used face mask as a preventive measure to CO poisoning, 50.0% leaves a polluted area once they suspect CO exposure is high. However only 19.0% of the respondents Provide effective ventilation system at work place and 1.7% report promptly complaints of dizziness, drowsiness and nausea etc as preventive measures. It is also shown from the table that only 0.9% of the respondents use self contained breathing apparatus as a preventive measure.

4.1 Hypotheses testing

Table 6. Hypotheses testing

	P-Value	Significant level	df
Hypothesis I	0.548	0.05	21
Hypothesis II	0.926	0.05	39
Hypothesis III	0.900	0.05	21
Hypothesis IV	0.308	0.05	39
Hypothesis V	0.369	0.05	21
Hypothesis VI	0.840	0.05	39

Null hypothesis I: There is no significant difference in the use of preventive measures between mechanics' levels of education. The P-value is 0.548 at 0.05 level of significance, P>0.05, which shows that there is no significant difference in the use of preventive measures between mechanics' levels of education.
Null hypothesis II: There is no significant difference in the use of preventive measures between mechanics' years of experience. The P-Value is 0.926 at 0.05 level of significance, P>0.05, which shows that there is no significant difference in the use of preventive measures between mechanics' years of experience.
Null hypothesis III: Age will not have any effect on mechanics use of preventive measures. The P-value is 0.900 T 0.05 level of significance, P>0.05, therefore age has no effect on the mechanics use of preventive measures.
Null hypothesis IV: There is no significant difference in the knowledge of carbon monoxide harmful effects between mechanics' levels of education. The P-value is 0.308 at 0.05 level of significance, P>0.05, therefore there is no significant difference in the knowledge of carbon monoxide harmful effects between mechanics' levels of education.
Null hypothesis V: There is no significant difference in the knowledge of carbon monoxide harmful effects between mechanics' years of experience. The P-value is 0.369 at 0.05, P>0.05, the data is therefore in conformity with the null hypothesis.
Null hypothesis VI: Age will not have any effect on mechanics knowledge of carbon monoxide harmful effects. The P-value is 0.840 at 0.05, P>0.05, therefore age has no effect on mechanics knowledge of carbon monoxide harmful effects.

5. Discussion of findings

The result of this research shows lack of knowledge of CO among the mechanics is very high. This is evident in that 79.3% did not know that CO can enter their blood, and only 23.3% could state the name of CO correctly. It is also clear from the data that 45.7% of the respondents did not know engine smoke contains harmful chemical, which can be dangerous considering the detrimental effects of the chemical. In their study in Nigeria, Ntaji, Okolo, Bamidele, & Nwagu (2011) also reported poor knowledge of the features of CO poisoning among preclinical medical students studied. Majority of the respondents (63.8%) received some information on CO, while 35.3% did not. From the data hospital is major source of information on CO as 64.7% of the respondents received information on CO from hospital, followed by friends with 50.9%, and only 2.6% from news paper and 8.6% from social media. This shows that hospital is performing a key role in disseminating information on CO harmful effects. But the data shows a very low usage of news paper and social media by the respondents.
The result of the study indicates that most of the respondents (75.9%) mentioned breathlessness as a sign of CO harmful effects. This is contrary to the study by Jide, Tokunbo, Federick, & Theodore (2014) in which headache is the most commonly reported CO associated symptoms. Also in conformity with the same authors that found only one respondent was aware that CO poisoning could cause death, in this research only 0.9% mentioned muscle ache and loss of consciousness respectively.
From the findings of the research it is shown that most of the respondents (46.6%) work between 7-9 hours per day and 89.7% did not receive any training on CO preventive measures. It therefore indicates that the mechanics are highly at risk of CO poisoning due to long time exposure and lack of training on preventive measures. Though majority (42.2%) of the respondents work at open space, the percentages of the respondents that work at semi open space (37.1%) and closed space (9.5%) are frightening. However the result shows that most of the respondents (65.5%) are knowledgeable on using face mask as a preventive measure to CO poisoning, 50.0% leaves a polluted area once they suspect CO exposure is high. But the respondents were not providing effective ventilation system at work place and not promptly reporting dizziness, drowsiness, and nausea etc. as preventive measures. This is evident from the data in which only 19.0% of the respondents Provide effective ventilation system at work place and 1.7% report promptly complaints of dizziness, drowsiness and nausea etc as preventive measures. The research shows a very poor use of self contained breathing apparatus for prevention, as only 0.9% of the respondents said to be using it.

5.1 Conclusion

From the findings of this research it is concluded that most of the mechanics have little knowledge on CO harmful effects; poor knowledge of CO poisoning preventive measures; and lack of adequate preventive measures at their working place. Most of the mechanics were not aware that the smoke they inhale contains a chemical substance that is highly detrimental to their health. As a result there were no enough preventive measures provided at most of the garages, and considerable numbers of garages were having poor ventilation. Therefore the mechanics need to be enlightened on the harmful effects of CO and preventive measures against CO harmful effects.

5.2 Recommendations

Health education programme should be provided to educate mechanics on harmful effects of CO and preventive measures against it.

Policy makers should provide well ventilated and right places for the mechanics to use as garages; as well as policies that prescribed the standards for the mechanics garages.

Inspection of the garages should be done periodically to make sure that standards are maintained at garages.

Mechanics unions and policy makers should help the mechanics in getting the equipments used as preventive materials against CO harmful effects.

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