



Perception of Workers Regarding Lead Pollution in Petrol Stations at Atfih Center in El-Giza Governorate

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Abstract

Background: Workers in petrol stations are often at the forefront of exposure to environmental hazards, including lead pollution. Their perception of lead pollution is shaped by a combination of personal experiences, workplace education, and awareness of health risks. Many workers recognize the presence of lead in fuels and its potential to harm their health, particularly through inhalation of fumes or direct skin contact. **Aim:** This study aimed to assess perception of workers regarding lead pollution in petrol stations. **Research design:** A cross sectional descriptive research design was used to conduct the study. **Setting:** Petrol stations in Atfih center, El- Giza governorate, Egypt. **Sample:** Convenient sample equal about 100 workers. **Tools of data collection:** Two tools included four parts, **1st part:** Demographic characteristics, **2nd part:** Medical history, **3rd part:** Worker's knowledge assessment questionnaire, **4th part:** Attitude of workers regarding lead pollution, and **2nd tool:** Observational checklist of workers' practice regarding prevention of hazards from lead pollution. **Results:** 64.0 % of the studied worker aged from 35 to less 45 years. While, 56.6 % of them suffer from asthma and 85.0 % of studied worker suffer from respiratory diseases. There was highly statistically significant relation between studied worker's total knowledge, total attitude and total practices and all items of demographic characteristics **Conclusion:** Less than one third of the studied workers had average total knowledge, and less than half of them had positive attitude. While, less than half of them had a satisfactory level in total practices regarding prevention of occupational hazards from lead pollution. There a relation between workers' knowledge, attitude and practices towards prevention of hazards from lead pollution. **Recommendations:** Provide health education program for workers about prevention of occupational hazards from lead pollution to improve their condition.

Keywords: Atfih Center, El-Giza Governorate, Lead Pollution, Petrol Stations and Workers.

Introduction:

Gas stations are busy places with lots of vehicle and pedestrian traffic. They also store and dispense large amounts of hazardous substances, especially flammable substances such as petrol, diesel and Liquefied Petroleum Gas (LPG). That's why it's very important to have good systems and processes in place for making sure workers stay healthy and safe. Service stations produce and release a high potential risk to the environment, the health of station attendants and the general public is posed by volatile organic compounds, which are a mixture of benzene, toluene, ethylbenzene, and xylenes. These chemical hazards, known as toxic vapors, are released during loading, storage, oil spills and exhaust fumes from customers' cars that enter the workplace (Goda et al., 2023)

Lead is an element of risk for the environment and human health and has harmful effects that may exceed those of other inorganic toxicants. Lead has a widespread application in general industry including lead-based paint, battery manufacture and reclamation, radiator repair, leaded gasoline, pottery and ceramics. Leaded gasoline contains tetraethyl lead and, to some extent, tetramethyl lead which are used as "anti-knock" additives to gasoline. Lead exposure in gasoline station occurs from lead fumes generated during filling cars, from cars emissions and from contaminated hands, food, water and clothing (Al-Sormy & Banafa, 2023).

The Institute for Health Metrics and Evaluation (IHME) estimates that more than 1.5 million deaths globally were attributed to lead exposure in 2021, primarily due to cardiovascular effects. Additionally, lead exposure was estimated to



account for more than 33 million years lost to Disability-Adjusted Life Years (DALYs) worldwide in 2021. Lead pollution in Egypt is the main source of air pollution as it represents, more than 75.0 % of total pollution in Egypt (*Sultana et al., 2024*).

Workers should have knowledge and positive attitude that heavy exposure to lead may cause serious adverse health issues especially among those who are exposed to it on a daily basis. Petrol contains significant amounts of monocyclic aromatic hydrocarbons as Benzene, Toluene, and Xylenes (BTX). There are many harmful effects seen after exposure to certain chemicals present in gasoline mixture such as benzene, lead, and oxygenates, breathing small amount of these compounds can lead to nose and throat irritation, headaches, dizziness, nausea, vomiting, confusion and breathing difficulties. It may affect skin and cause rash, redness and swelling (*Rahhal, 2022*).

Practices of workers in petrol station should be improved because workers at gas stations are exposed to volatile aromatic hydrocarbons in the atmosphere of gas stations, as well as organic and inorganic substances found in gasoline. Benzene is a solvent that causes chromosomal abnormalities, blood poisoning, asthma attacks, lung dysfunction, central nervous system suppression and carcinogenesis. Ethylbenzene vapors can cause acute respiratory effects such as sore throat and respiratory irritation. Personal Protective Equipment (PPE) is an important safety measure which should be common practice among petrol station attendants to safeguard inhaling the fumes of the volatile liquids (*Ameen & Abdulla, 2023*).

Lead (Pb) is a heavy metal that is toxic at very low exposure levels and has acute and chronic effects on human health. Pb exposure can lead to many health effects because of its extensive accumulation in the brain and spinal cord tissues, teeth, bones, skin, and mucosa. The toxic effects of Pb are seen in the hematopoietic, neurological, renal, gastrointestinal, cardiovascular, and reproductive systems, the first two being the most frequently and several affected (*Obeng & Gyasi, 2022*).

Although the toxicity of lead has been known for thousands of years, lead remains one of the most common environmental hazards for humane. There are many sources of lead exposure, as soil contaminated from years of leaded gasoline use, lead dust accidentally brought home from parents' workplaces and hobby areas, lead in plumbing, and some imported products and traditional remedies. Elevated levels of blood lead occurring during the first years of life. Exposure to lead among workers in our country is in the field of work, and that the most work sites in which lead has accumulated are industrial areas, especially works that are used in oil products, all these places are polluted with lead and increase in the percentage of lead among workers, this to be public health problem (*Al-Dosky et al., 2023*).

Lead poisoning occurs without regard to race, ethnic origin, income or social status. No region is without lead problems. Most workers with lead poisoning do not know they have it. Although United States (USA) and the European Union have banned lead as an additive to consumer fuel for road-going vehicles, lead continues to be used in petrol in many countries in the Middle East including Iraq (*Adedayo et al., 2023*). Petrol station workers are constantly in contact with leaded benzene and gasoline during their daily lives. Lead in the workplace comes from emissions in the form of fine particles that are inhaled and absorbed through the lungs, by ingestion, and through dermal exposure. Recent research has demonstrated that clinical or subclinical toxic effects can occur below the limit of 50 µg/dl in the whole blood (*Raj & Das, 2023*).

Occupational and environmental health nursing is the specialty practice that focuses on the promotion, prevention, and restoration of health within the context of a safe and healthy environment. It includes the prevention of adverse health effects from occupational and environmental hazards. It provides for and delivers occupational and environmental health and safety services to workers, workers populations, and community groups. Community health nursing play an important role in recognizing the signs and symptoms of lead pollution, explain causes of lead pollution, and advocating for preventive measures to reduce risk (*Khalafalla et al., 2023*).

Significance of the study

According to the study done in Iran, benzene and ethylene oxide are common carcinogens in the workplace. The estimated incidence of leukemia in the general population is reported to be 8.5 and 6.1 cases per 100,000 populations for males and females, respectively. More than two million workers are exposed to benzene each year and result in malignant and nonmalignant disorders worldwide. The United States National Cancer Institute in collaborated with the Chinese Academy of Preventive Medicine studied that worker exposed to benzene developed lympho-hematopoietic malignancies in China. In Great Britain from (1990–1993) years, 29.800 people were exposed to benzene carcinogen agent (*Getu et al., 2020*).

Lead pollution in Egypt is the main source of air pollution as it represents more than 75% of total pollution in Egypt. Diesel fuel burning is responsible for 18% of the total lead pollution in Egypt. In 2019, the Institute for Health Metrics



and Evaluation (IHME) recorded more than 902,000 deaths and 21.7 million Disability Adjusted Life Years (DALYs) worldwide due to lead exposure. The cement factories and foundries copper are responsible for the other ratio of lead pollution. Each year, an estimated 1 million people die from lead poisoning. Millions more, many of them children, are exposed to low levels of lead causing lifelong health problems, including anemia, hypertension, immunotoxicity and toxicity to the reproductive organs (*Sabola et al., 2023*).

Exposure to low levels of lead can result in serious and irreversible health and behavioral problems. While the high lead level can cause serious long-term health problems and harm almost every part of the body, especially the brain, reproductive organs and nervous systems of unborn children much more easily than those of adults (*Rizk et al., 2022*). So, therefore, it was important to assess perception of workers regarding lead pollution in petrol stations at Atfih center in El-Giza governorate.

Aim of the study

This study aimed to assess the perception of workers regarding lead pollution in petrol stations at Atfih center in El-Giza governorate, Egypt through the following:

- 1- Assessing the level of workers' knowledge regarding lead pollution.
- 2- Appraising the workers' attitude regarding lead pollution.
- 3- Assessing the workers' practices regarding lead pollution.
- 4- Assessing the relation between knowledge, attitude and practice regarding lead pollution.

Research questions:

- 1- What is the level of workers' knowledge regarding lead pollution?
- 2- What are the workers' attitude regarding lead pollution?
- 3- What are the workers' practices regarding the prevention of lead pollution?
- 4- What is the relation between knowledge, attitude and practice of the workers in petrol station regarding lead pollution?

Subjects & Methods

Research design:

A cross-sectional descriptive research design was applied to conduct the study.

Setting:

This study was conducted at petrol stations in Atfih center, El-GIZA governorate, Egypt. Atfih center contains 10 petrol stations. Every station consists of about two pumps for gasoline and two pumps for benzene, manager room, bath room and may contain supermarket, every petrol station included about 10 workers. Data collection was done two days per week Tuesday from 9 am- 2 pm and Saturday from 8 pm-11 pm.

Sampling:

Convenient sample was used in this study.

Sample size

The study targets 100 workers from 10 petrol stations, with each station employing 10 workers. The sample size consists of all 100 workers who have been employed at petrol stations for at least six months.

Tools for data collection:

Tools developed by investigator after reviewing national and international related articles and literature. Data for this study was collected by using two tools include:

Tool (I): A structured interviewing questionnaire: It consisted of four parts as following:

Part (I): Demographic characteristics of workers it consisted of 9 items as age, sex, marital status, number of family member, place of residence.

Part (II): Medical history: It divided into 2 sub-items:

1st -Past medical history for workers it consisted of 8 closed-end questions as suffering from chronic disease, if the answer is yes, take medications for a specific disease, if the answer is yes, suffering from respiratory disease, if the answer is yes, are you sleep without any problem of breathing.

2nd -Current health status for workers it consisted of 14 closed-end questions as suffer from a dry and persistent cough, suffer from chest tightness or pain, experience crackling, dry sounds in your lungs when you inhale, suffer from an increased amount of sputum.

Part (III): Worker's knowledge assessment regarding hazards of lead pollution it consisted of 12 closed ended questions as the meaning of lead pollution (It is a condition when the body is exposed to an excessive amount of lead on a

continuous basis, whether through breathing, ingestion or absorption through the skin), the most important risks resulting from lead contamination.

Scoring system:

Each statement was assigned score according to worker's knowledge were: complete correct was scored 2 grades, incomplete correct was scored 1 grade and wrong or don't know was scored 0. Total score were 24 grades from 12 questions. The total scores each item summed up and then converted into percent score as the following:

- Good knowledge ($\geq 75\%$) = ≥ 18 grades.
- Average knowledge ($50 < 75\%$) = $12 < 18$ grades.
- Poor knowledge ($< 50\%$) = < 12 grades.

Part (IV): Attitude of workers regarding lead pollution it consisted of 17 closed ended questions as are feel that were exposed to any type of lead contamination at the gas station, believes that workers at the gas station are exposed to the risk of lead contamination, think that lead contamination affects the health of and family, believes that all employees at gas stations receive training on the danger of pollution lead and how to prevent it.

Scoring system: the total score of workers 17 questions workers' attitude about lead pollution classified into two levels: The answers scored as 2 points for agree answer, 1 point for neutral and zero point to disagree answer. The total score of workers 34 points for attitude about lead pollution classified into two levels:

- **Negative attitude $< 60\%$ (< 20 points).**
- **Positive attitude $\geq 60\%$ (≥ 20 points).**

Tool (2): Observational checklist of workers' practice regarding prevention of occupational hazards from lead pollution consisted of 2 sub items as:

A- Workers' practices regarding clothing practices it consisted of 12 closed ended questions as wears gloves when working, wears protective clothing when working, wears safety glasses when working, wears a mask/respiratory protection when working.

B- Workers' practices regarding hand washing it consisted of 8 closed ended questions as place the soap on the palms of the hands, and distribute it to both hands, rub the hands well by rubbing the palms, rub the back of the left hand with the palm of the right hand, interlacing the fingers.

Scoring system:

Each statement was assigned score according to workers' practices were "Done" were scored 1 and zero for "Not done". Total score were 20 grades for 20 items. The scores of items summed up and then converted into percentage score **as the following:**

- (> 60) was considered satisfactory = > 12 grades.
- (≤ 60) was considered unsatisfactory = ≤ 12 grades.

Validity:

Revision of the tools for clarity, relevance, comprehensiveness, understanding and applicability was tested through a panel of five experts all of them from Faculty of Nursing from Community Health Department Faculty of Nursing Helwan University to measure the content validity of the tools.

Reliability:

The study tools were tested by the pilot subject's reliability for calculating Cronbach's Alpha which was 0.82 for the worker's knowledge about hazards of lead pollution, and 0.95 for the studied attitude of workers regarding lead pollution and 0.890 for the studied observational checklist of workers' practices regarding prevention of occupational hazards from lead pollution.

Ethical considerations:

An official permission to conduct the proposed study obtained from the Scientific Research Ethics Committee. Participation in the study is voluntary and subjects given complete full information about the study and their role before signing the informed consent. The ethical considerations included explaining the purpose and nature of the study, stating the possibility to withdraw at any time, confidentiality of the information where it not be accessed by any other party without taking permission of the participants. Ethics, values, culture and beliefs respected.

Preparatory phase:

It includes reviewing of related literature and theoretical knowledge of various aspect of the study using articles, internet and magazines to develop tools for data collection.

**Pilot study:**

A pilot study has been conducted on 10 % of the studied sample which equal 10 workers under study to assess the feasibility of the study as well as clarity and objectivity of the tools, no modification done and those workers were included in the actual study sample.

Field work:

- After receiving the initial acceptance from workers in petrol station, the investigator initially introduced himself to all participants to explain the aim of the study and to obtain their approval. workers were assured that data collection would be absolutely confidential. Each subject interviewed individually by the investigator to explain the study purpose.
- Data collected within 6 months from beginning February to the end of July 2024 two days per week Tuesday from 9 am- 2 pm and Saturday from 8pm-11pm, till the needed sample completed, informed consent obtained from workers then the investigator explained the purpose of the study to assess knowledge, attitude and practices of workers regarding prevention of lead pollution. Study collected through structure face to face interview and the entire tool filled by the investigator.
- The investigator utilizes two tool was need 30-40 minutes and the investigator collected about two to three questionnaires form per day, total number of workers equal 100 workers.
- The investigator taken 4-5 workers every two days each week consists about 16-17 workers per month, total number of workers equal 100 workers.

III- Administrative Item:

Approval to carry out this study was obtained from Dean of Faculty of nursing, Helwan University and official permission was obtained from the owners of the petrol stations to allow their workers to participate in the study.

IV- Statistical Item:

Upon completion of data collection, data was computed and analyzed using Statistical Package for the Social Science (SPSS), version 24 for analysis. The P value will be set at 0.05. Descriptive statistics tests as numbers, percentage, mean \pm standard deviation (\pm SD), was used to describe the results. Appropriate inferential statistics such as "F" test or "t" test was used as well. Chi square test (X^2) was used to calculate difference between qualitative variables.

Degrees of Significance of the results were:

- Non-Significant (NS) if $p > 0.05$.
- Significant (S) if $p < 0.05$.
- High Significant (HS) if $p < 0.01$.

RESULTS

Table (1): Frequency Distribution of the Studied Workers according to their Demographic Characteristics (n=100).

Demographic Characteristics	No.	%
Sex		
Male	100	100.0
Age (Years)		
25<35	10	10.0
35<45	64	64.0
45<55	5	5.00
≥ 55	21	21.0
Mean \pm SD	46.4 \pm 1.8 years	
Marital status		
Single	28	28.0
Married	67	67.0
Divorced	5	5.0
Number of family members		
≤ 4 members	75	75.0

≥5 members	21	21.0
≥6 members	4	4.0
Mean ± SD 4.4 ± 2.3 workers		
Educational level		
Not read and not write	22	22.0
Read and write	20	20.0
Basic education	27	27.0
Secondary school or diploma	31	31.0
Monthly income		
Sufficient and saved	30	30.0
Sufficient for basic needs	60	60.0
Not satisfy basic needs	10	10.0
Years of experience working in petrol stations		
< 1 year	12	12.0
1 - < 5 years	13	13.0
5 - < 10 years	60	60.0
≥ 10 years	15	15.0
Mean ± SD 7.4 ± 1.7 years		
Shift work in petrol stations		
12 hours	100	100.0

Table (1): Shows that, 100.0 % of studied worker's sex was male. Also, the mean age of studied workers were 46.4 ± 1.8 years, and 67.0 % of the studied worker's marital status were married. Moreover, 31.0 % of the studied worker's educational levels were secondary school or diploma. Additionally, 60.0 % of the studied worker's monthly income was sufficient for basic needs.

Table (2): Frequency Distribution of Studied Worker's Past & Current Medical History (n=100).

Item	No.	%
Past Medical History		
Do you suffer from any chronic diseases?		
Yes	30	30.0
No	70	70.0
- If the answer is yes, what is it (No=30)		
Diabetes	5	16.7
Heart disease	8	26.7
Asthma	17	56.6
Do you take some medications for a specific disease?		
Yes	30	30.0
No	70	70.0
- If the answer is yes, what is it: (No=30)		
Fortamet	5	16.7
Levodopa	8	26.7
Benralizumab (Fasenra)	17	56.6
Do you suffer from respiratory diseases?		
Yes	85	85.0
No	15	15.0
If the answer is yes, what is it: (No=85)		
Allergies	60	70.6

Bronchitis	25	29.4
Do you generally sleep without bouts of shortness of breath?		
Yes	15	15.0
No	85	85.0
Current Medical History		
Suffer from a dry and persistent cough		
Yes	5	5.0
Sometimes	28	28.0
No	67	67.0
Suffer from tightness or pain in the chest		
Yes	75	75.0
Sometimes	21	21.0
No	4	4.0
Suffer from skin ulcers		
Yes	25	25.0
Sometimes	8	8.0
No	67	67.0

Table (2): Demonstrates that, 70.0 % of studied worker hadn't suffered from chronic diseases, 56.6 % of them suffer from asthma. Moreover, 85.0 % of studied worker suffer from respiratory diseases, 75.0 % of them suffer from tightness or pain in the chest. While, 25.0 % of studied worker suffer from skin ulcers

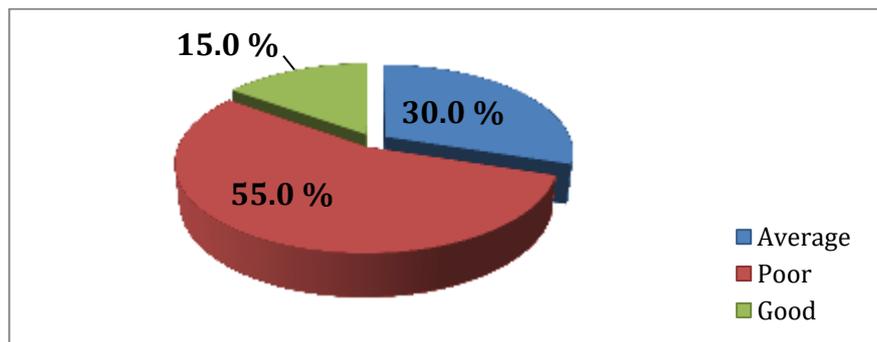


Figure (1): Percentage Distribution of the Studied Worker's Knowledge regarding Lead Pollution (n= 100).

Fig (1): Shows that, 55.0 % of the studied worker had poor knowledge regarding lead pollution. Also, 30.0 % of the studied worker had average knowledge regarding lead pollution. While, 15.0 % of the studied worker had good knowledge regarding lead pollution.

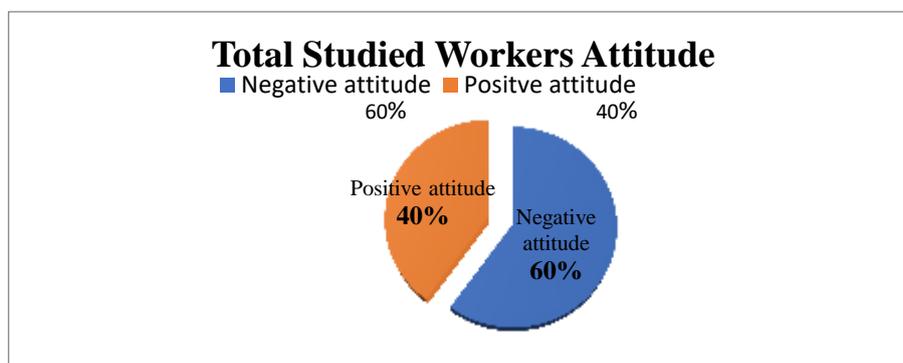


Figure (2): Percentage Distribution of Workers' Attitude regarding Lead Pollution (n=100)

Fig (2): Illustrates that, 60.0 % of the studied workers had negative attitude regarding lead pollution and 40.0 % of them had positive attitude regarding lead pollution.



Figure (3): Percentage Distribution of the Studied Worker’s Total Practices regarding Prevention of Lead Pollution (n=100).

Fig (3): Shows that, 45 % of the studied worker had a satisfactory level in total practices regarding prevention of lead pollution. While 55 % of them had unsatisfactory total practices regarding the prevention of lead pollution.

Table (3): Relation between Studied Worker’s Demographic Characteristics and their Total Knowledge (n=100).

Demographic characteristics	Total Knowledge						X ²	P – value
	Poor (55)		Average (30)		Good (15)			
	No.	%	No.	%	No.	%		
Sex								
Male	55	100.0	30	100.0	15	100.0	10.210	.000**
Age (year)								
25<35	10	18.2	0	0.0	0	0.0	11.391	.000*
35<45	45	81.8	19	63.3	0	0.0		
45<55	0	0.0	2	6.7	3	20.0		
≥55	0	0.0	9	30.0	12	80.0		
Marital status								
Single	28	50.9	0	0.0	0	0.0	15.558	.001**
Married	27	49.1	30	100.0	10	66.7		
Divorced	0	0.0	0	0.0	5	33.3		
Number of family members								
≤4 members	50	90.9	20	75.0	5	33.3	16.274	.000**
≥5 members	1	1.8	10	25.0	10	66.7		
≥6 members	4	7.3	0	0.0	0	0.0		
Educational Level								
Not read or write	20	36.4	0	0.0	2	13.3	17.239	.000**
Read or write	20	36.4	0	0.0	0	0.0		
Basic education	15	27.2	2	6.7	10	66.7		
Secondary school or diploma	0	0.0	28	93.7	3	20.0		
Monthly income								
Sufficient and saved	15	27.2	0	0.0	15	100.0		

Sufficient for basic needs	40	72.8	20	75.0	0	0.0	16.274	.000**
Not satisfy basic needs	0	0.0	10	25.0	0	0.0		
Years of experience working in petrol stations								
< 1 year	0	0.0	12	40.0	0	0.0	18.199	.000**
1 - < 5 years	0	0.0	13	43.3	0	0.0		
5 - < 10 years	55	100.0	5	16.7	0	0.0		
≥ 10 years	0	0.0	0	0.0	15	100.0		
Shift work in petrol stations								
12 hours	55	100.0	30	100.0	15	100.0	16.365	.001**
Place of residence								
Rural	27	49.1	30	100.0	15	100.0	10.210	.000**
Urban	28	50.9	0	0.0	0	0.0		

****Highly statistically significant <0.001**

Table (3): Shows that, there were highly statistically significant relation between studied worker's total knowledge and all items of demographic characteristics, where (P = < .0001).

Table (4): Relation between Studied Worker's Demographic Characteristics and their Total Practices (n=100).

Demographic characteristics	Total Practices				X ²	P – value
	Unsatisfactory (55)		Satisfactory (45)			
	No.	%	No.	%		
Sex						
Male	55	100.0	45	100.0	11.021	.000**
Age (year)						
25<35	10	18.2	0	0.0	13.225	.000*
35<45	45	81.8	19	42.2		
45<55	0	0.0	5	11.1		
≥55	0	0.0	21	46.7		
Marital status						
Single	28	50.9	0	0.0	19.225	.001**
Married	27	49.1	40	88.9		
Divorced	0	0.0	5	11.1		
Number of family members						
≤4 members	50	90.9	25	55.6	18.225	.001**
≥5 members	1	1.8	20	44.4		
≥6 members	4	7.3	0	0.0		
Educational Level						
Not read or write	20	36.4	2	4.4	17.102	.000**
Read or write	20	36.4	12	26.7		
Basic education	15	27.2	0	0.0		
Secondary school or diploma	0	0.0	31	68.9		
Monthly income						
Sufficient and saved	15	27.2	15	33.3	20.214	.000**
Sufficient for basic needs	40	72.8	20	44.4		
Not satisfy basic needs	0	0.0	10	22.3		
Years of experience working in petrol stations						

< 1 year	0	0.0	12	26.7	19.220	.000**
1 - < 5 years	0	0.0	13	28.9		
5 - < 10 years	55	100.0	5	11.1		
≥ 10 years	0	0.0	15	33.3		
Shift work in petrol stations						
12 hours	55	100.0	45	100.0	17.553	.001**
Place of residence						
Rural	27	49.1	45	100.0	11.021	.000**
Urban	28	50.9	0	0.0		

****Highly statistically significant <0.001**

Table (4): Shows that, there were highly statistically significant relation between studied worker’s total reported practices and all items of demographic characteristics, where (P = < .0001).

Table (5): Relation between Studied Worker’s Demographic Characteristics and their Total Attitude (n=100).

Demographic characteristics	Total Attitude				X ²	P – value
	Negative (60)		Positive (40)			
	No.	%	No.	%		
Sex						
Male	60	100.0	40	100.0	12.334	.000**
Age (year)						
25<35	0	0.0	10	25.0	15.001	.000*
35<45	60	100.0	4	10.0		
45<55	0	0.0	5	12.5		
≥55	0	0.0	21	52.5		
Marital status						
Single	0	0.0	28	70.0	19.266	.001**
Married	60	100.0	7	17.5		
Divorced	0	0.0	5	12.5		
Number of family members						
≤4 members	60	100.0	15	37.5	18.447	.001**
≥5 members	0	0.0	21	52.5		
≥6 members	0	0.0	4	10.0		
Educational Level						
Not read or write	20	33.3	2	5.0	17.885	.000**
Read or write	20	33.3	0	0.0		
Basic education	20	33.4	7	17.5		
Secondary school or diploma	0.0	0.0	31	77.5		
Monthly income						
Sufficient and saved	0	0.0	30	75.0	20.774	.000**
Sufficient for basic needs	60	100.0	0	0.0		
Not satisfy basic needs	0	0.0	10	25.0		
Years of experience working in petrol stations						
< 1 year	0.0	0.0	12	30.0	19.774	.000**
1 - < 5 years	0.0	0.0	13	32.5		
5 - < 10 years	60	100.0	0	0.0		

≥ 10 years	0.0	0.0	15	37.5		
Shift work in petrol stations						
12 hours	60	100.0	40	100.0	18.002	.001**
Place of residence						
Rural	32	53.3	40	100.0	12.001	.000**
Urban	28	46.7	0	0.0		

**Highly statistically significant <0.001

Table (5): Shows that, there were highly statistically significant relation between studied worker’s total attitude and all items of demographic characteristics, where (P = < .0001).

Table (6): Correlation between Studied Worker’s Total Knowledge, total Attitude and Total practices (n= 100).

Total knowledge and Total Attitude	Changes of scores of total knowledge and Total practice			
	Total knowledge		Total practices	
	r	P	R	P
Total knowledge	-----	----	0.168	0.094
Total Attitude	0.588	0.000	0.662	0.000

Table (6): Illustrates that, there was strong positive correlation between total knowledge, total attitude and total practices.

Discussion

Lead is a naturally occurring toxic metal found in the Earth’s crust. Its widespread use has caused extensive environmental contamination, human exposure and significant public health problems globally. Important sources of environmental contamination include mining, smelting, manufacturing and recycling activities, and lead use in a range of products. Lead exposure can have serious consequences for the health of children. Exposure to very high levels of lead can severely damage the brain and central nervous system causing coma, convulsions and even death. Children who survive severe lead poisoning may be left with permanent intellectual disability and behavioral disorders (*Raj & Das, 2023*).

Workers in petrol stations often exhibit varying perceptions of lead pollution based on their knowledge, exposure levels, and workplace safety measures. Many recognize the potential health risks associated with lead exposure, as respiratory issues, neurological impairments, and long-term systemic toxicity. However, a lack of formal education or training on occupational hazards often leads to underestimating the severity of lead pollution. Workers may express concerns about poor air quality and direct contact with leaded substances, but protective measures, such as using Personal Protective Equipment (PPE) or undergoing regular health checks, are frequently neglected. This is often due to a lack of awareness or inadequate enforcement of safety protocols (*Zhang et al., 2021*).

Regarding to demographic characteristics of the studied workers. The present study findings related that mean age of the studied workers were 46.4 ± 1.8 years (Table 1). This result is similar to a study conducted by *Zouine et al., (2024)* who conducted a study in Morocco about “Does higher education lead to lower environmental pollution? New evidence from MENA countries using econometric panel data”. They found that, the mean age of workers were 45.4 ± 1.9 years.

Concerning the level of education of studied workers, the current study result revealed that, less than one third of the studied workers had secondary school or diploma. This result in the same line with *Zhou et al., (2023)* who carried out a study conducted in Nigeria about " Synergistic remediation of lead pollution by biochar combined with phosphate solubilizing bacteria ", they found that 31.9 % of the studied workers had secondary school or diploma. **From the investigator point of view,** many roles in lead pollution, especially entry-level and manual labor positions, may not require advanced educational qualifications. Secondary education might be sufficient for the skills needed for these jobs, such as operating machinery, performing physical labor, and adhering to safety protocols.

Regarding the studied workers’ sex, the current study revealed that, the total of studied workers were males. This finding was in accordance with *Bakr et al., (2023)* who conducted a study in Egypt about "Lead (Pb) and cadmium (Cd)



blood levels and potential hematological health risk among inhabitants of the claimed hazardous region around Qaroun Lake in Egypt" they clarified that, 100.0 % of studied samples were males. **From the investigator point of view**, petrol station work often involves long hours, physically demanding tasks, exposure to hazardous substances like fuels and chemicals, and safety risks. These factors may dissuade women from pursuing such jobs, particularly in regions where workplace safety for women is a concern.

Concerning the marital status of studied workers, the current study result revealed that, more than two thirds of studied workers were married. This result in the same line with **Morshdy et al., (2021)** who carried out a study conducted in Egypt about "Lead and cadmium content in Nile tilapia (*Oreochromis niloticus*) from Egypt: a study for their molecular biomarkers", they found that 69.4 % of studied sample had married. From the investigator point of view, many workers seek companionship and emotional support as their age. Marriage can provide a stable and enduring relationship that fulfills these needs.

Regarding the monthly income of studied workers, the present study indicated that less than two thirds of studied workers were sufficient for basic needs. These results agree with **Awadalla et al., (2020)** who conducted a study in Egypt, studied about " Correlation between blood levels of cadmium and lead and the expression of microRNA-21 in Egyptian bladder cancer patients", they found that, 62.1 % of the studied sample monthly income were sufficient for basic needs. **From the investigator point of view**, petrol station jobs often involve manual labor or customer service, which may be categorized as low-paying positions. Employers in such industries may offer wages that are only marginally above minimum wage. The cost of living, including housing, food, transportation, and healthcare, may have increased disproportionately compared to the wages provided to workers. This disparity makes it difficult for workers to meet their basic needs.

Concerning the place of residence of studied workers, the current study result revealed that, more than two thirds of studied workers were live in rural area (Figure 1). This result in the same line with **Elshobary et al., (2020)** who carried out a study conducted in Egypt about " Algal community and pollution indicators for the assessment of water quality of Ismailia canal, Egypt ", they clarified that 72.5 % of studied sample had live in rural area. **From the investigator point of view**, many petrol stations are located along highways or in areas that serve rural and semi-urban communities. Workers from nearby rural areas may find it convenient to commute or relocate closer to their workplace.

Concerning suffers from any chronic diseases that more than two thirds of studied workers weren't suffers from chronic diseases (Table 2). This result in the same line with **Rizk et al., (2022)** who carried out a study conducted in Egypt about "Comprehensive environmental assessment of heavy metal contamination of surface water, sediments and Nile Tilapia in Lake Nasser, Egypt", they found that, 74.1 % of studied sample hadn't suffers from chronic diseases. **From the investigator point of view**, the bodies of younger individuals are typically more resilient and better equipped to repair damage and fight off illnesses. Their immune systems are generally more robust, reducing the likelihood of developing chronic conditions.

Regarding that majority of studied workers suffer from respiratory diseases. This result in the same line with **Mahmoud et al., (2024)** who carried out a study conducted in Egypt about " Functional surface homogenization of nanobiochar with cation exchanger for improved removal performance of methylene blue and lead pollutants ", they clarified that, 83.6 % of studied sample had suffer from respiratory diseases. **From the investigator point of view**, workers are regularly exposed to harmful substances such as benzene, toluene, xylene, and other volatile organic compounds (VOCs) present in petrol and diesel. Prolonged inhalation of these fumes can irritate the respiratory tract and lead to chronic respiratory diseases.

Regarding studied workers' total knowledge, the current study revealed that, more than half of them had poor knowledge, and more than quarter had average knowledge (Figure 2), this result disagrees with **Alhaj, (2020)** who conducted a study in Yemen about "Occupational Lead Exposure among Petrol Station Workers in Sana'a City, Yemen: Awareness and Self-Reported Symptoms", they found that, 62.0 % of the studied sample had good total knowledge. Also, 31.0 % had poor knowledge. **From the investigators point of view**, employers or safety officers may not emphasize the reproductive risks associated with lead exposure during training or workplace communication.

Regarding studied workers' attitude regarding lead pollution, the current study revealed that, less than two thirds of them had negative attitude regarding lead pollution (Figure 3), this result disagrees with **Asefaw et al., (2020)** who conducted a study in Ethiopia about "Assessment of liver and renal function tests among gasoline exposed gas station workers in Mekelle city, Tigray region, Northern Ethiopia", they found that, 62.0 % of the studied sample had negative attitude regarding lead pollution. **From the investigators point of view**, if the workplace does not emphasize the dangers of lead pollution or enforce strict safety measures, workers may adopt a similar indifferent attitude.

Regarding studied workers' total practices, the current study revealed that, more than half of them had unsatisfactory level in total practices, while more less half of them had satisfactory total practices (Figure 4), this result agrees with **Anigilaje et al., (2024)** who conducted a study in Nigeria about "Exposure to benzene, toluene, ethylbenzene, and xylene (BTEX) at Nigeria's petrol stations: a review of current status, challenges and future directions", they found that, 43.0 % of the studied sample had satisfactory level in total practices. Also, 58.0 % had unsatisfactory total practices. **From the investigator point of view**, workers may not have received comprehensive or effective training on essential practices, such as hygiene, use of personal protective equipment (PPE), and handling equipment safely.

Regarding to relation between studied worker's demographic characteristics and their total knowledge, the current study revealed a highly statistically significant between studied workers' age, educational levels occupation and their total knowledge scores (Table 8). This result agrees with the study done by **Yin et al., (2023)** who conducted a study in England about "Occupational fatigue and health of gas station workers", they found that, a statistically significant relation between studied samples' age, level of education and occupation, and their total knowledge scores. **From the investigator point of view**, high work pressure and tight deadlines can lead workers to cut corners or skip important safety and procedural steps to meet production targets. Poor communication within the organization can lead to misunderstandings or lack of awareness about proper practices. Workers may not receive clear and consistent information on what is expected.

Concerning to relation between studied worker's demographic characteristics and their total attitude, the current study revealed a highly statistically significant between studied workers' age, educational levels occupation and their total attitude scores (Table 9). This result agrees with the study done by **Pattama Polyong & Thetkathuek, (2023)** who conducted a study in Thailand about "Comparison of Prevalence and Associated Factors of Multi-system Health Symptoms Among Workers in the Gas Station Area, Thailand", they found that, a statistically significant relation between studied samples' age, level of education and occupation, and their total attitude scores. **From the investigator point of view**, have a more positive or proactive attitude toward adopting safety measures if they are more recently educated or exposed to modern training programs. Alternatively, younger workers may lack experience and perceive workplace risks as less severe.

Concerning to relation between studied worker's demographic characteristics and their total practices, the current study revealed a highly statistically significant between studied workers' age, educational levels occupation and their total practices scores (Table 10). This result agrees with the study done by **Abdulameer & Hussein, (2023)** who conducted a study in Baghdad about "Study of some hematological and biochemical parameters among petrol stations workers in Baghdad city", they found that, a statistically significant relation between studied samples' age, level of education and occupation, and their total reported practices scores. **From the investigator point of view**, workers who have not experienced accidents or witnessed their consequences may become complacent and underestimate the risks associated with their tasks, leading to practices. Develop and deliver regular training sessions that emphasize the importance of best practices and safety protocols. Include practical demonstrations and hands-on training.

Concerning to correlation between studied worker's total knowledge, total practices and total attitude, the current study revealed there was strong positive correlation between total knowledge, total practices and total attitude (Table 11). This result agrees with the study done by **Mshelia et al., (2023)** who conducted a study in Nigeria about "Environmental risk perceptions of residential and commercial neighborhoods of petrol stations in Maiduguri Metropolis, Nigeria", they found that, a there was strong positive correlation between total knowledge, total practices and total attitude. **From the investigator point of view**, workers with higher knowledge levels are more likely to engage in safe and effective practices. Understanding risks and the importance of prevention enables workers to implement proper measures, such as using protective equipment or maintaining hygiene.

Conclusion

Based on the results of the present study and research questions the following conclusion includes:

Less than one third of the studied workers had average total knowledge, and less than half of them had positive attitude. While, less than half of the studied worker had a satisfactory level in total practices regarding prevention of lead pollution. There a relation between workers' knowledge, attitude and practices towards prevention of lead pollution.

Recommendations

In the light of the result of this study, the following recommendations were suggested:

1. Develop and implement a health education program targeting workers to enhance their awareness and knowledge about the prevention of lead pollution and its impact on their health.
2. Design educational booklets specifically for workers, focusing on preventive measures against lead pollution and strategies to minimize its complications.



3. Create informative posters and banners highlighting preventive practices against lead pollution and methods to reduce its complications. These materials should be displayed prominently at petrol stations in Atfih Center, El-Giza Governorate, Egypt, under the supervision of occupational health nurses, to improve workers' knowledge and practices.
4. Conduct further research involving a larger sample size and diverse settings to enhance the generalizability of findings.

References:

- Abdulameer, A. H., & Hussein, S. Z. (2023).** Study of some hematological and biochemical parameters among petrol stations workers in Baghdad city.
- Adedayo, O. J., Adekunle, E. D., & Alex, O. T. (2023).** Knowledge of Occupational Hazards and Safety Practices among Petrol Station Workers in Ibadan Metropolis, Oyo State, Nigeria. *Journal of Materials Science Research and Reviews*, 6(4), 858-870.
- Al-Dosky, A. H., Al-Ogaili, S. S., & Hussein, J. H. (2023).** Occupational Workers Exposure To Lead Compared To A Previous Study Conducted In 2010 In Dohuk Citykurdistan, Iraq. *Russian Law Journal*, 11(5), 1478-1484.
- Alhaj, A. (2020).** Occupational Lead Exposure among Petrol Station Workers in Sana'a City, Yemen: Awareness and Self-Reported Symptoms. *Zagazig University Medical Journal*, 26(5), 795-805.
- Al-Sormy, A. A. Y. A., & Banafa, A. M. (2023).** Associations of Exposure to Lead with Hematological Change among Petrol Station Workers in Sana'a City-Yemen. *Sana'a University Journal of Medicine and Health Sciences*, 17(2).
- Ameen M, Abdulla S (2023).** Prevalence of respiratory disorders among Petrol Pump workers: A cross-sectional descriptive study. *Journal of Medical. Chemical Sciences*. 2023; 6(9): 2164-2176)
- Anigilaje, E. A., Nasir, Z. A., & Walton, C. (2024).** Exposure to benzene, toluene, ethylbenzene, and xylene (BTEX) at Nigeria's petrol stations: a review of current status, challenges and future directions. *Frontiers in Public Health*, 12, 1295758.
- Asefaw, T., Wolde, M., Edao, A., Tsegaye, A., Teklu, G., Tesfay, F., & Gebremariam, G. (2020).** Assessment of liver and renal function tests among gasoline exposed gas station workers in Mekelle city, Tigray region, Northern Ethiopia. *PLoS one*, 15(10), e0239716.
- Awadalla, A., Mortada, W. I., Abol-Enein, H., & Shokeir, A. A. (2020).** Correlation between blood levels of cadmium and lead and the expression of microRNA-21 in Egyptian bladder cancer patients. *Heliyon*, 6(12).
- Bakr, S., Sayed, M. A., Salem, K. M., Morsi, E. M., Masoud, M., & Ezzat, E. M. (2023).** Lead (Pb) and cadmium (Cd) blood levels and potential hematological health risk among inhabitants of the claimed hazardous region around Qaroun Lake in Egypt. *BMC Public Health*, 23(1), 1071.
- Elshobary, M. E., Essa, D. I., Attiah, A. M., Salem, Z. E., & Qi, X. (2020).** Algal community and pollution indicators for the assessment of water quality of Ismailia canal, Egypt. *Stochastic Environmental Research and Risk Assessment*, 34, 1089-1103.
- Goda, S. M., Mohamed, A. A., & Khalaf, S. A. (2023).** Environmental Safety, Stress Levels and Gas Stations' Workers' Knowledge, Attitude and Practices Regarding Occupational Health Hazards. *Tanta Scientific Nursing Journal*, 31(4), 129-151.
- Khalafalla, M. M., Ahmad Babalghith, K. M., Jafar, M., Allehiyani, O. H., Karar, H., Bakri, M., & Salih, A. F. (2023).** Blood Lead Level and Biochemical Changes Among Gasoline Stations Workers Exposed to Benzene in Makkah City, Saudi Arabia. *Pol. J. Environ. Stud*, 32(2).
- Mahmoud, S. E. M., Ursueguia, D., Mahmoud, M. E., Abdel-Fattah, T. M., & Díaz, E. (2024).** Functional surface homogenization of nanobiochar with cation exchanger for improved removal performance of methylene blue and lead pollutants. *Biomass Conversion and Biorefinery*, 14(16), 19107-19127.
- Mshelia, A. M., Salihu, A. C., Ubachukwu, N. N., & Dibal, I. J. (2023).** Environmental risk perceptions of residential and commercial neighborhoods of petrol stations in Maiduguri Metropolis, Nigeria. *Geografia-Malaysian Journal of Society and Space*, 19(1), 32-45.
- Morshdy, A. E. M., Darwish, W. S., Hussein, M. A., Mohamed, M. A. A., & Hussein, M. M. (2021).** Lead and cadmium content in Nile tilapia (*Oreochromis niloticus*) from Egypt: a study for their molecular biomarkers. *Scientific African*, 12, e00794.
- Obeng- Gyasi, E. (2022).** Sources of lead exposure in West Africa. *Sci*, 4(3), 33.)
- Pattama Polyong, C., & Thetkathuek, A. (2023).** Comparison of Prevalence and Associated Factors of Multi-system Health Symptoms Among Workers in the Gas Station Area, Thailand.
- Rahhal, B. (2022).** The effect of occupational exposure to petrol on pulmonary function parameters: A cross-sectional study in Palestine. *Journal Mater. Environ. Sci*, 13(6), 732-738.)
- Raj, K., & Das, A. P. (2023).** Lead pollution: Impact on environment and human health and approach for a sustainable solution. *Environmental Chemistry and Ecotoxicology*, 5, 79-85.
- Rizk, R., Juzsakova, T., Ali, M. B., Rawash, M. A., Domokos, E., Hedfi, A., ... & Rédey, Á. (2022).** Comprehensive environmental assessment of heavy metal contamination of surface water, sediments and Nile Tilapia in Lake Nasser, Egypt. *Journal of King Saud University-Science*, 34(1), 101748.
- Sultana, J., Nunna, T. T., Hasan, S. S., Shoab, A. K., Wobil, P., Vandenant, M., ... & Rasheed, S. (2024).** Knowledge, attitude, and practices related to lead pollution among adolescents and caregivers of young children living near Used Lead Acid Battery (ULAB) recycling sites in Bangladesh: a cross-sectional study. *BMC Public Health*, 24(1), 2108.
- Yin, Y., Tan, X., & Fan, J. (2023).** Occupational fatigue and health of gas station workers: a review. *Work*, 76(2), 707-726.



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- Zhang, Y., Wu, C., Liu, H., Khan, M. R., Zhao, Z., He, G., ... & He, Q. (2021).** Label-free DNAzyme assays for dually amplified and one-pot detection of lead pollution. *Journal of Hazardous Materials*, 406, 124790.
- Zhou, Y., Zhao, X., Jiang, Y., Ding, C., Liu, J., & Zhu, C. (2023).** Synergistic remediation of lead pollution by biochar combined with phosphate solubilizing bacteria. *Science of The Total Environment*, 861, 160649.
- Zouine, M., El Adnani, M. J., & Salhi, S. E. (2024).** Does higher education lead to lower environmental pollution? New evidence from MENA countries using econometric panel data. *Transnational Corporations Review*, 16(4), 200077.