Environmental Safety, Stress Levels and Gas Stations' Workers' Knowledge, Attitude and Practices Regarding Occupational Health Hazards

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Abstract

Background: Gas stations have an adverse influence on the environment and workers' health due to the chemicals and physical risks they contain. So, this study aimed to assess environmental safety, stress levels and gas stations' workers' knowledge, attitude and practices regarding occupational health hazards. **Subject and Method: Research Design:** A descriptive cross-sectional study design. **Setting:** All gas stations in Assiut City (11stations) that affiliated to Ministry of Petroleum, Egypt Gas Station Directory. **Subjects:** 140 gas stations' workers. **Tools of data collection:** Three tools were utilized; **Tool (1):** A structure interview questionnaire that consisted of five parts; workers' personal data, socio-demographic status assessment scale, knowledge of the occupational health risks associated with gas stations, workers' reported practices and workers' attitude toward occupational health hazards. **Tools (2):** Assessment of the gas stations' working environment. **Tools (3):** Assessment of workers' stress levels. **Results:** It was observed that 54.3% of the workers were from urban area, their mean age ranged from 19.0 to 57.0, 64.3% of them had good knowledge with significant effect with residence, times of work and daily working hours. Also, there was effect of working hours and attainting courses on their reported practices and working times& working hours on workers' stress level. **Conclusion:** Less than two-thirds of gas stations' workers had high level of knowledge and had positive attitude, more than half of them had unsatisfactory reported practices and approximately two-thirds experienced moderate level of stress. **Recommendations:** It would be beneficial to establish ongoing training programs for gas stations' workers about occupational health hazards.

Keywords: Environmental safety, Gas stations' workers, Occupational health hazards & Stress.

Introduction

Gas stations are crowded locations with a lot of passing traffic and pedestrian activity. Large volumes of dangerous and combustible materials, including gasoline, diesel, and liquefied petroleum gas, are also stored, and distributed by them [(1)]. 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, also known as toxic vapors, are released during loading, storage, oil spills and exhaust fumes from customers' cars that enter the workplace [(2)].

Many common hazardous materials can be found in the gas station environment. For example, benzene is a class 1 carcinogen and mutagen that can infect humans and animals through oral, dermal, and inhalation exposure [(3)]. It has been

estimated that humans who breathe in benzene are exposed to between 50 and 80 percent of it on average. In order to safeguard workers and preserve a healthy environment, gas station environmental risk assessment is currently very important[4].

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 [5]. Additionally, workers were subjected to a wide range of consequences related to occupational illnesses and injuries, such as bodily, chemical, biological, ergonomic, and psychological harm [6].

As a result that petroleum products release toxic volatile and flammable gases that can easily give off even at low temperatures, gas station workers are at risk of hazards like fire or explosions **[2]**. They had the risk of suffering from strained muscles or even back injuries. Overwork ruins workers' ability to cope with their surroundings, leading to emotional and stress-related changes like anxiety, irritability, and depression [6-9].

Approximately 0.07% of the world's workforce dies from occupational causes. Furthermore, it is reported that 5.3% of workers have illnesses related to their jobs, 37% have back pain, 16% have hearing loss and 13% have chronic obstructive pulmonary disease [10].

Workers at gas stations are regarded as a high-risk group because of their ongoing exposure at work, which may have a detrimental effect on their respiratory systems [11]. Safety is a major concern and a procedural issue in gas stations. Due to the nature of the work, this industry is regarded as high-risk. Workplace risks and hazards have the potential to cause fatalities, severe injuries, and long-term morbidity. It might also lead to decreased output, damage to large machinery, loss of materials and worsening of the environment [12].

The demands of the jobs at gas stations put workers' abilities and coping mechanisms over their heads, making them vulnerable to stress and other health issues. The focus is on limiting or reducing the exposure time of fuel station workers in warm-climate countries like Egypt because of a growing health concern [10].

Complete level of physical, mental and social well-being among workers across all professions is known as occupational health. A source of danger with the potential to inflict harm or injury is referred to as a hazard. Occupational hazards are risks to one's health and safety that are connected to particular professions. Despite efforts to lessen risks, these risks always exist in the workplace because of the nature of the work [13].

Through prevention, protection and proactive health interventions, occupational health nurses play a multifaceted role in influencing, improving, or maintaining a worker's daily workplace health, resulting in productive, healthy workers in a healthy workplace. Conversely, the main responsibilities of nurses are advocacy, assessment, case management, evaluation, marketing, policy

and procedure development, primary care, health promotion and the prevention of illness and injuries [14].

Significance of study:

There is a scarcity of documented data on safety practices and occupational health hazards awareness among Assiut City gas stations' workers that can be utilized for interventions aimed at controlling health hazards. In order to provide relevant data for health hazards control interferences, this research was conducted.

Aim of the study

To assess environmental safety, stress levels and gas stations' workers' knowledge, attitude and reported practices regarding occupational health hazards.

Research questions:

1. What are the levels of knowledge, attitude and reported practices regarding occupational health hazards among gas stations' workers in Assiut City?
2. Which level of stress was most prevalent among gas stations' workers in Assiut City?
3. What is the relation between gas stations' workers' socio-demographic characteristics and their occupational health hazards knowledge, attitude, reported practices and stress levels in Assiut City?
4. What are levels of safety in gas stations working environment in Assiut City?

Subjects and method

Research design:

Descriptive study design was followed.

Setting:

The current research included all the gas stations in Assiut City (11stations) that affiliated to Ministry of Petroleum; Egypt Gas Station Directory.

Subjects and sample size calculation:

Due to the small number of workers at gas stations, the study sample consisted of all workers at the eleven (11) Assiut City stations listed above who have been employed by the company for more than six months and who perform all services offered by the station. There were 183 workers in total who worked the morning and evening shifts at these stations; 28 workers declined to take part, and 15 workers had only recently started working (less than six months). Accordingly, the total number of studied subjects was 140 workers.

Tools of the study:

After reviewing of the current researches the present study included three tools were developed by the researchers to collect data classified as follows:

Tool (1): A structured interview questionnaire that the researchers developed in order to gather the required data which comprised of five parts;

Part (1): Assessment of personal information including six questions such as age, years of experience, role in the station, working hours and days, working shifts and attendance of training courses at the work place.

Part (2): Assessment of workers' socio-demographic status by using scale developed by El- Gilany et al., (2012) [15]. It includes: seven domain, educational and cultural for both (husband and wife), occupation, family, economic, family possessions, home sanitation and health care.

Scoring system: The socioeconomic status assessed using a scale comprised seven

domains with a maximum score of 84 and a higher score indicating better socioeconomic status. Socioeconomic scores were classified into four levels, scores < 42 (very low), 42< 63 (low), 63 < 71.4 (moderate) and 71.4 -84 (high social level).

Original Validity and reliability: The socioeconomic status scale is valid and reliable (r=0.93).

Part (3): The assessment of workers' knowledge regarding the health hazards associated with gas stations; that was developed by (Nneka et al., 2017, Hamad, 2018 and Nicholas et al., 2019) [16-18] and adopted by the researchers which comprised of 15 true/false and multiple-choice questions. The questions covered topics such as: The harmful effects of gas emissions on health, the continuous exposure to gas products, the effects of working long hours in gas stations on health, and the negative effects of gas products on the environment...etc.

Scoring system: One point was given to the correct answer and zero point for the incorrect and don't know. The total score of knowledge was 39 points which categorized as the following: Poor <50% (0-19 points) and good≥ 50% (20-39 points).

Part (4): Reported workers' practices of occupational health (ten items); this part developed by (Nneka et al., 2017 and Nicholas et al., 2019) [16,18]. Workers' commitment to workplace health and safety practices was evaluated using ten (10) done or not done statements, as: Using tobacco products, eating or drinking, cleaning one's hands in the event that petroleum products spill, using a cell phone and taking a shower after work…etc.

Scoring system: One point was given to done and zero for not done**.** The total reported practices were classified as follow; unsatisfactory practices 50% (0-5 points) and satisfactory practices more than 50% (6-10 points).

Part (5): The attitude of workers toward occupational health hazards was assessed in this section through the use of five statements based on three likert scale responses (agree, naturally, disagree). These statements included the use of personal protective equipment, such as wearing uniforms, informing customers about safety instructions and properly disposing of waste from gas stations. The answers received scores of 3, 2 and 1, respectively. **Total score** determined by summing up and converted into percent. Station workers' attitude measured positive if the score equal ≥ 60% and negative if the score equal< 60% (Nneka et al., 2017, Nicholas et al., 2019 and Sabry et al., 2022) [16, 18, 19].

Tools (II): Assessment of the environmental state of the gas stations through the use of an observational checklist with seven (7) parameters and yes/no questions to gauge the environment overall as: presence of tress around gas station, slippery floor, presence of hand washing sinks….etc.

Scoring system; the environment was considered safe if the score was ≥ 60% and unsafe if the score was <60% (Mohamed et al., 2014, Hamad, 2018 and ELsayed et al., 2018) [20, 17,1].

Tools (III): Perceived stress scale which developed by (Almadi et al., 2012 and Mohamed et al., 2014) [21,20] used to gauge workers' stress levels at gas stations. Developed in Arabic, it has been used in numerous studies. It had thirty-two items,

each of which periodically indicated its own stress level. Using a Likert scale, responses to stress were scored on a four-point scale from one (never) to four (always). The scoring system is divided into: No stress: From 32-64, moderate level of stress: From 65-95, sever level of stress: from 96-128.

Method:

The current research proceeded as the following:

Approval:

An official letter approval from the Dean of the Faculty of Nursing, Assiut University to the Ministry of Petroleum, Egypt Gas Station Directory; this letter included a permission to carry out the study and explained its aim and nature in the selected gas stations.

Ethical considerations:

The scientific research ethics committee of the faculty of nursing provided ethical approval prior to the commencement of the study. A formal consent from the directors in the chosen environment. The workers at gas stations gave their agreement to participate in the study after being informed of its goal. They are also guaranteed that the data will be kept private and used exclusively for research. The participants were made aware that their participation in the study is entirely voluntary and that they can end it whenever they choose.

Tools development:

Tools' validity:

Three professors of community health nursing at the Faculty of Nursing, Assiut University, verified and evaluated the translated Arabic tools, checking them for relevance, accuracy and completeness. The questionnaire's developments were finished in accordance with the necessary adjustments.

Tools' Reliability:

The value of Cronbach's alpha reliability test for the used tools was as the following: knowledge= 0.746, attitude= 0.674, reported practices= 0.740, work environment= 0.768 and stress level= 0.758.

Pilot study:

A pilot study was carried out to evaluate the tools' clarity and applicability on fourteen workers (10%) of the sample as a whole. Since the research tools were not modified, these workers number were included in the study.

Field work:

Following an examination of the relevant literature, the researchers developed a structured interview form. Information gathered between April 1st and end of July, 2023. The researchers gave an introduction, outlining the goal of the study and the key components of the questionnaire for gas stations' workers. Then, each worker was asked to give his informed oral consent to participate in the study, taking into account the availability at work during the interview to provide the required information. Four to five sheets were filled every day for two days per week. Each questionnaire typically took 25 to 30 minutes to complete, depending on the worker's response. An observational checklist was used to assess the working environment at the stations and this took an additional 10 minutes.

Statistical analysis:

Data entry and data analysis were done using SPSS version 22 (Statistical Package for Social Science). Data were presented as number, percentage, mean, and standard

deviation. Chi-square test was used to compare between qualitative variables. P-value considered statistically significant when $P < 0.05$.

Results

Table (1): Clarifies that the age of gas stations' workers ranged between 19.0-57.0, more than half of the studied workers were from urban area and had less than 5 years of experience (54.3% and 51.4%) respectively. In referral to educational level; less than half (47.8%) of them had secondary education, less than two thirds (62.9%) of them were interviewed during their evening shift, more than half (53.6%) of them worked for 8-10 hours/day & less than three quarters (72.9%) attended training courses.

Figure (1): Shows that slightly more than two fifths (42.9%) of the gas stations' workers were worked in fuel services.

Figure(2): Illustrates that occupational hazards was the most attending training course at the work place for more than two fifths (43.1%) of workers followed by one third (33.3%), slightly less than one fifth (19.6 %) for using working equipment, personal protective equipment respectively and less than fifth (17.6%) for actions in emergency situations.

Figure (3): Demonstrates that less than two thirds (64.3%) of gas stations' workers had good knowledge and more than one third (35.7%) of them had poor level of knowledge regarding occupational health hazards.

Figure (4): Reveals that less than two thirds (62.1%) of gas stations' workers had positive attitude toward occupational health hazards.

Figure (5): Clears that more than half (57.1%) of gas stations' workers had unsatisfactory reported practices about occupational health hazards.

Figure (6): Declares that less than two thirds (65.0%) of gas stations working environment was unsafe.

Figure (7): Highlights that about two thirds (66.4%) of gas stations' workers had moderate stress level and more than one quarter 32.2% of them had no stress.

Tables (2): Shows that total score of knowledge regarding occupational health hazards and stations workers socio-demographic characteristics, it was found that residence, times of work, daily working hours and workers' roles had significant effect on their knowledge with P-values= 0.030, 0.006, 0.002 and 0.003. While there weren't significant effect with age, years of experiences, educational level and social levels with p-values= 0.366, 0.830, 0.177 and 0.597 respectively.

Table (3): Clarifies that there were statistical significant relation between workers' residence, times of work and their roles in gas stations and total score of attitude toward occupational health hazards (P-values=.007,.040 & 0.003) respectively.

Table (4): Signifies the statistical significant effect of daily working hours and attending training courses at the work place on the total score of workers' practices about occupational health & safety (p-values= .043 &.016) respectively.

Tables (5): Refers to the statistically significant relation between the times of work and daily working hours at the work place and gas stations' workers' stress levels (p-values= 0. 006 and 0.001) respectively.

Table (1): Distribution of gas stations' workers regarding their socio-demographic characteristics and work data in Assiut City.

Socio-demographic characteristics	No. (140)	%
Age: (years)		
< 25	54	38.6
25 – 30	42	30.0
> 30	44	31.4
Mean ± SD (Range) 28.87 ± 9.01 (19.0-57.0)		
Residence:		
Rural	64	45.7
Urban	76	54.3
Years of experience:		
< 5 years	72	51.4
5 – 10 years	41	29.3
> 10 years	27	19.3
Educational level:		
Read & write	17	12.2
Primary	13	9.3
Preparatory	22	15.7
Secondary	67	47.8
University / Postgraduate	21	15
Social level:		
Very low	35	25.0
Low	43	30.7
Middle	42	30.0
High	20	14.3
Times of work:		
Morning shift	52	37.1
Evening shift	88	62.9
Daily working hours:		
< 8 hours	37	26.4
8 – 10 hours	75	53.6
> 10 hours	28	20.0
Attendance of training courses at work place		
Yes	102	72.9
No	38	27.1

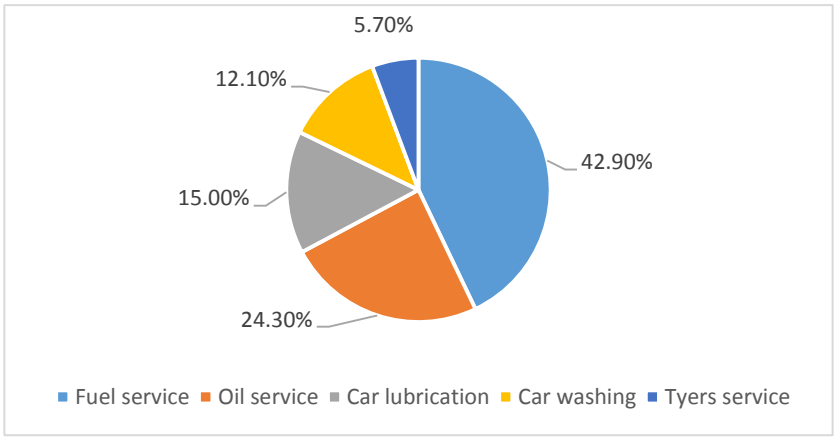

Figure (1): Distribution of the studied workers' roles at gas stations in Assiut City (n=140)

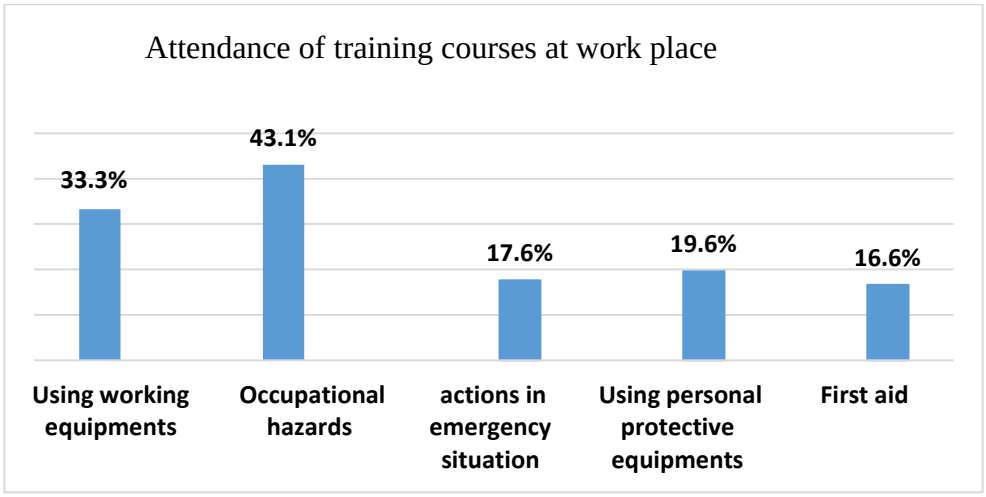

Figure (2): Distribution of the gas stations' workers who attended training courses regarding occupational safety and hazards in Assiut City (n=140)

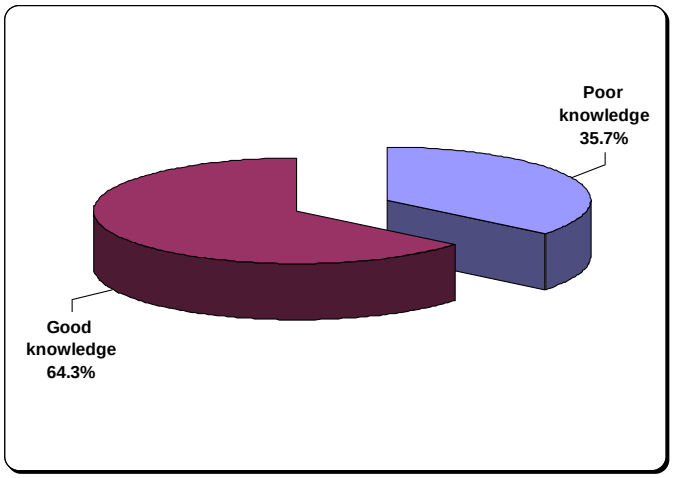

Figure (3): Total score of gas stations' workers' knowledge regarding occupational health hazards in Assiut City (n=140)

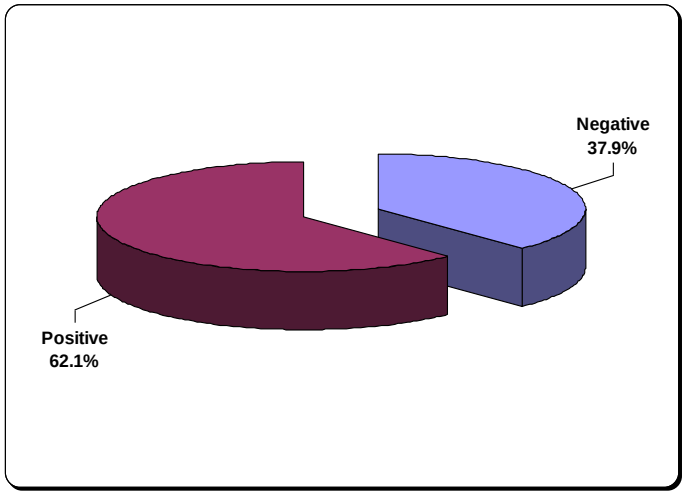

Figure (4): Total score of gas stations' workers' attitude toward occupational health hazards in Assiut City (n=140)

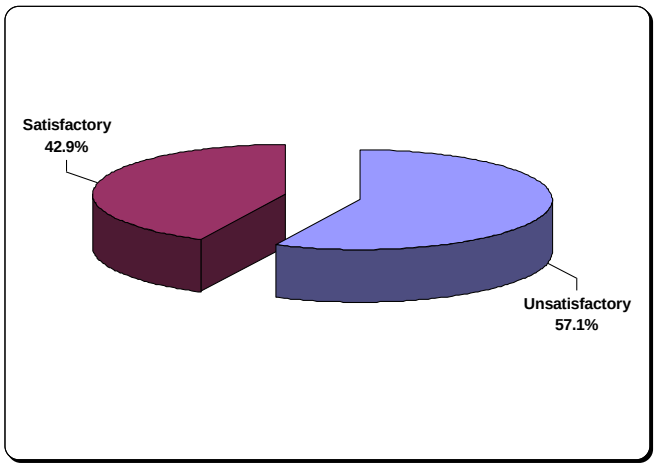

Figure (5): Total score of gas stations' workers' reported practices about occupational health hazards in Assiut City (n=140)

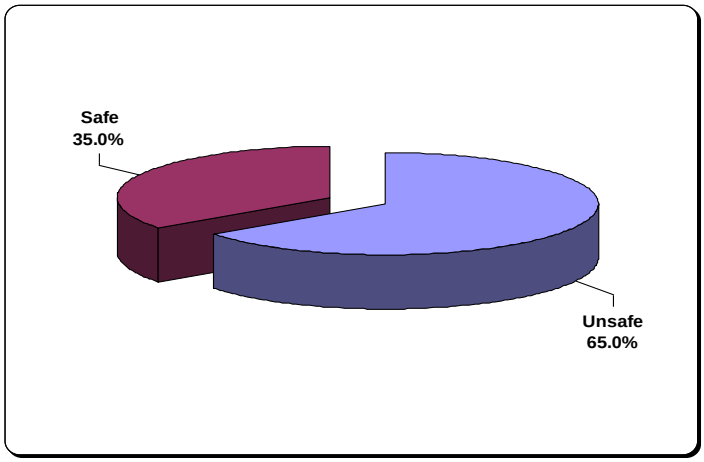

Figure (6): Total score of gas stations' environment assessment in Assiut City

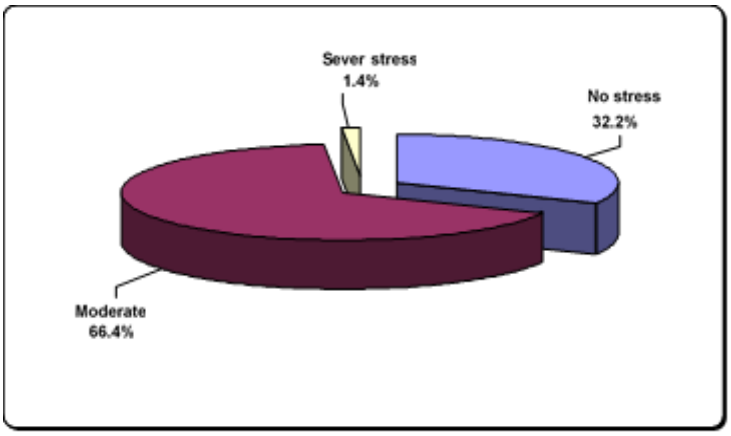

Figure (7): Stress levels among gas stations' workers in Assiut City (n=140)

Tables (2): Relation between total score of gas stations' workers' knowledge regarding occupational health hazards and their socio-demographic characteristics in Assiut City

Socio-demographic characteristics	Total score of knowledge (140)				P-value
	Poor knowledge		Good knowledge		
	No.	%	No.	%	
Age: (years)					0.366
< 25	19	35.2	35	64.8	
25 – 30	12	28.6	30	71.4	
> 30	19	43.2	25	56.8	
Residence:					0.030*
Rural	29	45.3	35	54.7	
Urban	21	27.6	55	72.4	
Years of experience:					0.830
< 5	25	34.7	47	65.3	
5 – 10	14	34.1	27	65.9	
> 10	11	40.7	16	59.3	
Educational level:					0.177
Illiterate/ Read & write	4	23.5	13	76.5	
Basic education	16	45.7	19	54.3	
Secondary/ Technical institute	20	29.9	47	70.1	
University/ Postgraduate	10	47.6	11	52.4	
Social levels:					0.597
Very low	15	42.9	20	57.1	
Low	15	34.9	28	65.1	
Middle	12	28.6	30	71.4	
High	8	40.0	12	60.0	
Times of work:					0.006*
Morning shift	11	21.2	41	78.8	
Evening shift	39	44.3	49	55.7	
Daily working hours:					0.002*
< 8	11	29.7	26	70.3	
8 – 10	21	28.0	54	72.0	
> 10	18	64.3	10	35.7	
Attending training courses at the work place:					0.070
Yes	41	40.2	61	59.8	
No	9	23.7	29	76.3	

Workers' roles in the gas stations:					
Fuel service	15	25.0	45	75.0	0.003*
Oil service	21	61.8	13	38.2	
Car lubrication	6	28.6	15	71.4	
Car washing/ Tyers service	8	32.0	17	68.0	

Chi-square test

Table (3): Relation between total score of gas stations' workers' attitude toward occupational health hazards and their socio demographic characteristics in Assiut City

Socio-demographic characteristics	Total score of workers' attitude (140)				P-value
	Negative		Positive		
	No.	%	No.	%	
Age: (years)					
< 25	25	46.3	29	53.7	0.200
25 – 30	12	28.6	30	71.4	
> 30	16	36.4	28	63.6	
Residence:					
Rural	32	50.0	32	50.0	0.007*
Urban	21	27.6	55	72.4	
Years of experience:					
< 5	31	43.1	41	56.9	0.161
5 – 10	16	39.0	25	61.0	
> 10	6	22.2	21	77.8	
Educational level:					
Illiterate/ Read & write	4	23.5	13	76.5	
Basic education	13	37.1	22	62.9	0.500
Secondary/ Technical institute	26	38.8	41	61.2	
University/ Postgraduate	10	47.6	11	52.4	
Social level:					
Very low	14	40.0	21	60.0	
Low	18	41.9	25	58.1	0.809
Middle	15	35.7	27	64.3	
High	6	30.0	14	70.0	
Time of work:					
Morning shift	14	26.9	38	73.1	0.040*
Evening shift	39	44.3	49	55.7	
Daily working hours:					
< 8	9	24.3	28	75.7	0.054
8 - 10	29	38.7	46	61.3	
> 10	15	53.6	13	46.4	
Attending training courses at the work place:					
Yes	39	38.2	63	61.8	0.880
No	14	36.8	24	63.2	
Workers' roles in the gas stations:					
Fuel service	17	28.3	43	71.7	
Oil service	20	58.8	14	41.2	0.003*
Car lubrication	11	52.4	10	47.6	
Car washing/ Tyers service	5	20.0	20	80.0	

Chi-square test

Table (4): Relation between total score of gas stations' workers' reported practices regarding occupational health hazards and their socio-demographic characteristics in Assiut City

Socio-demographic characteristics	Total score of workers' reported practices (140)				P-value
	Unsatisfactory		Satisfactory		
	No.	%	No.	%	
Age: (years)					
< 25	27	50.0	27	50.0	0.400
25 – 30	26	61.9	16	38.1	
> 30	27	61.4	17	38.6	
Residence:					
Rural	41	64.1	23	35.9	0.129
Urban	39	51.3	37	48.7	
Years of experience:					
< 5	38	52.8	34	47.2	0.395
5 – 10	27	65.9	14	34.1	
> 10	15	55.6	12	44.4	
Educational level:					
Illiterate/ Read & write	8	47.1	9	52.9	0.736
Basic education	19	54.3	16	45.7	
Secondary/ Technical institute	41	61.2	26	38.8	
University/ Postgraduate	12	57.1	9	42.9	
Social level:					
Very low	23	65.7	12	34.3	0.460
Low	23	53.5	20	46.5	
Middle	25	59.5	17	40.5	
High	9	45.0	11	55.0	
Times of work:					
Morning shift	28	53.8	24	46.2	0.545
Evening shift	52	59.1	36	40.9	
Daily working hours:					
< 8	16	43.2	21	56.8	0.043*
8 – 10	50	66.7	25	33.3	
> 10	14	50.0	14	50.0	
Attending training courses at the work place:					
Yes	52	51.0	50	49.0	0.016*
No	28	73.7	10	26.3	
Workers' roles in the gas stations:					
Fuel service	29	48.3	31	51.7	0.108
Oil service	22	64.7	12	35.3	
Car lubrication	16	76.2	5	23.8	
Car washing/ Tyers service	13	52.0	12	48.0	

Chi-square test

Tables (5): Relation between stress levels and gas stations' workers' socio-demographic characteristics in Assiut City

Socio-demographic characteristics	Stress levels (140)				P-value
	No stress		Moderate stress		
	No.	%	No.	%	
Age: (years)					
< 25	18	33.3	36	66.7	0.836
25 – 30	12	28.6	30	71.4	
> 30	15	34.1	29	65.9	
Residence:					
Rural	21	32.8	43	67.2	0.876
Urban	24	31.6	52	68.4	
Years of experience:					
< 5	24	33.3	48	66.7	0.144
5 – 10	9	22.0	32	78.0	
> 10	12	44.4	15	55.6	
Educational level:					
Read & write	6	35.3	11	64.7	0.121
Basic education	13	37.1	22	62.9	
Secondary	24	35.8	43	64.2	
University/ Postgraduate	2	9.5	19	90.5	
Social level:					
Very low	13	37.1	22	62.9	0.909
Low	13	30.2	30	69.8	
Middle	13	31.0	29	69.0	
High	6	30.0	14	70.0	
Times of work:					
Morning shift	24	46.2	28	53.8	0.006*
Evening shift	21	23.9	67	76.1	
Daily working hours:					
< 8	20	54.1	17	45.9	0.001*
8 – 10	15	20.0	60	80.0	
> 10	10	35.7	18	64.3	
Attending training courses at the work place:					
Yes	31	30.4	71	69.6	0.467
No	14	36.8	24	63.2	
Workers' roles in the gas stations:					
Fuel service	21	35.0	39	65.0	0.083
Oil service	9	26.5	25	73.5	
Car lubrication	3	14.3	18	85.7	
Car washing/ Tyers service	12	48.0	13	52.0	

Chi-square test

Discussion:

The unbalanced combination of worker skills and psychological agents at gas stations increases the risk of stress reactions, according to recent research. While most attention has been focused on chemical and physical risks, fuel station workers are also exposed to real psychological risks. Rising job expectations and customer interaction as a result of intense market competition amongst gasoline companies support an increase in worker responsibility. Furthermore, employees have to adapt to ever-changing work environments, which means they will bear more responsibility [6,22].

The current study aimed to assess environmental safety, stress levels and gas stations' workers' knowledge, attitude and reported practices regarding occupational health hazards.The present study examined the socio-demographic traits of gas stations' workers and found that the mean age was 28.87 ± 9.01 years old, less than two-fifths were under 25 and less than one-third were between 25 and 30 years old. These outcomes were backed by **Mohamed et al., (2018)** [23] who conducted study for assessment of knowledge, attitude, and practice of petroleum stations worker's towards adverse health effects of their activities in Khartoum State, Sudan and they found that 59.6% of workers were aged from 18< 36 and 23.2% between 36 ≥ 45 year. Additionally, these outcomes concurred with **ELsayed et al., (2018)** [1] who conducted study under title of occupational hazards among gas station workers in Egypt and they demonstrated that of the workers in the study, over one third (35.8%) were between the ages of 20 and 30. Moreover, **Alb´an-P´erez et al., (2017)** [22] who carried a study in Ecuador to investigate the psychosocial factors at work and occupational stress in gas station attendants and they reported that the mean age was of 30.05 years (SD= 8.31). Furthermore, these outcomes were inconsistent with **OE and QM, (2018)** [24] who conducted a study to assess the occupational hazards, health problems and safety practices of petrol station attendants in Nigeria and they noticed that the mean age of respondents was 24.3 ± 4.6 years.

In terms of workers' educational status, the current study discovered that slightly less than one fifth of workers had a university and post graduate degree and less than half of them completed secondary school. The fact that one quarter of the workers in the study belonged to a very low social class could help to explain these findings. These findings were at odds with **Alb´an-P´erez et al., (2017)** [22] who verified that the bulk of the workers under study only had a primary education. In addition, **Mohamed et al., (2018)** [23] discovered that 9% of workers had a university degree and more than one-third had only completed secondary school. Also, **ELsayed et al., (2018)** [1] cleared that 35.8% of the sample had secondary education. Moreover, **Mohsin et al., (2022)** [6] who conducted study in China to evaluate the occupational health risk management and performance: a case study of gas station workers and **Franzoi et al., (2022)** [25] who reported that 65.4% of studied sample had high education.

In terms of social status, the current study showed that, respectively, slightly less than one-fifth and less than one-third of the workers had high and low social status. The fact that one-quarter of the workers in

the study had a secondary education may help to explain these results.

Based on the years of experience of the workers; the current study revealed that more than half of the workers had less than five years of experience. The fact that more than one-third of them are under 25 years old could help to explain this. This result was incongruent with **Mohsin et al., (2022)** [6] who cleared that 38.5% of studied workers had one to three years of experience. In addition, disagreed with **Quaigrain et al., (2022)** [26] who carried a study in Ghana to evaluate occupational health and safety orientation in the oil and gas industry and they revealed that 28.2% of the respondents had less than five years of experience. Moreover, these results disagreed with **Rocha et al., (2013)** [27], **Mohamed et al, (2018)** [23] **and ELsayed et al., (2018**) [1] who discovered that, respectively, 38%, 43.4% and 58.8% of the sample under study had jobs lasting longer than six years or less than ten years.

In relation working hours; the current study found that more than one-third of the workers were interviewed in the morning, and more than three-fifths were on duty in the evening shift. These results disagreed with **Mohsin et al., (2022)** [6] who reported that 80.8% of the studied workers met at daytime shift.

The current study found that, in terms of working hours per day, over half of the workers under investigation put in eight to ten hours a day, and one-fifth worked more than ten hours. This might have to do with the workers' regular daily schedule in the nation under study. These findings were at odds with **Mohamed et al., (2018)** [23] who reported that 37.4% of workers' daily hours were in the range of 8 to 13 hours. **ELsayed et al., (2018)** [1] reported that 21.2% of the studied workers worked during day system. Moreover, these results contradicted with **Alam et al., (2014)** [28] who conducted a study in Pakistan to assess lung function abnormalities among fuel filling workers and they recorded that most of the studied workers lived in the working establishment and spent more than 12 hours shift.

The present study showed that less than three-quarters of the studied workers attended training courses at the work place; one-third, more than two-fifths, less than one-fifth and about one-fifth of the studied workers reported to have training course in using working equipment, occupational hazards, actions in emergency situation and using personal protective equipment respectively. These results are supported by **Quaigrain et al., (2022)** [26] who reported that workers received training on how to use personal protective equipment. However, these finding were in contrast with **ELsayed et al., (2018)** [1] who showed that 55.4%, 49.6%, 50.8% and 44.2% of studied workers had training in nature & risks of the work, using work's machines, using the personal protective equipments and emergency situation &safety respectively.

As regard to workers' roles at the gas stations; the current study revealed that more than two-fifths, slightly less than one-quarter and less than one-fifth of studied workers were providing fuel servicers, oil servicers and car lubrication respectively. In the researchers point of view these variation in workers' roles may be related to their educational level or may be related to work needs. These results weren't in the same line with **Mohamed et al., (2018)** [23] who showed that 69% of the selected sample had fuel service followed

by18%& 9% had car washing and oil service respectively. In addition, these results disagreed with **ELsayed et al., (2018)** [1] who reported that all workers worked in refueling cars, 60.4% changing motor oil, 61.9% lubrication of the cars, 87.7% car cleaning & 5.4% changing tires.

The fact that findings of the present study revealed that more than three-fifths of the studied workers had good knowledge and more than one-third of them had poor knowledge about occupational hazards and safety measures. These results may be related to less than half of workers had secondary education.

These results were disagreed with **Mukhtar et al., (2020)** [29] who carried a study in Malaysia to assess knowledge, attitude and practice on occupational safety and health among workers and viewed that 95.7% of their studied workers had high level of knowledge, 2.9% had moderate and 1.4% of them had low level. Also, these findings contradicted with **Mohamed et al., (2018)** [23] who reported that the majority of the respondents have good knowledge and awareness towards occupational health measures. Also, **Nicholas et al., (2019)** [18] who conducted a study in Nigeria to assess attitude and practices regarding occupational hazards and safety measures among oil and gas workers and they revealed that the majority of workers have good knowledge of occupational hazards and relevant safety measures. In addition, **Langkulsen et al., (2011)** [30] who carried a study in Thailand to assess workers' safety and health and they reported that 95.7% of the respondents had high knowledge on occupational safety and health, 2.9% had moderate knowledge and only 1.4% had low knowledge. Also, these findings weren't in the same line with **Quaigrain et al., (2022)** [26] who showed that most workers had a relatively high level of knowledge of occupational health hazards.
The current results disclosed that there were statistical significant differences between workers' knowledge and their residence, time of work, type of work, daily working hours and workers' role. On the other hand, workers' age, years of experience, educational level, training seminars and social class hadn't significant association with workers' knowledge. On the researchers' point of view, these findings may be related to workers from urban areas and worked during morning shift for long hours exposed to more situations that made them had more chance to increase their knowledge.

These finding aligned with a study conducted in China which cleared that there was a positive relation between experiences and knowledge score (p=0.01) and there wasn't statistical significance relation between knowledge score with age (p=0.11) **Ni et al., (2017)** [31]. Moreover, these findings supported by **Nicholas et al., (2019)** [18] who found that knowledgeable employees of petroleum companies are about occupational hazards and safety protocols were not significantly influenced by the age of the employees. In contrast, **ELsayed et al., (2018)** [1] noticed that there was a significant relation between the knowledge of gas station workers and their age and education level. Moreover, the length of services of the employees significantly influenced the knowledge of occupational hazard and safety measures among the workers as those with more years of work experience

had good knowledge of hazards and safety in the workplace [18].

Also, **Nkrumah et al., (2021)** [32] who assess occupational health and safety management practices and work performance in the oil and gas sector in Ghana and they exposed that research has stipulated that the level of education of respondents could influence workers' knowledge, attitude, and compliance to health safety practices. In addition, **Lui et al., (2020)** [33] indicated that training emerged as a significant predictor of employee safety knowledge.

As the regard to the studied workers' attitude toward occupational health hazards, the present study found that more than three-fifths of the studied workers had positive attitude. These may be related to workers' level of knowledge which had effect on their attitude. Also, these finding may be due to empowerment of rules and regulations in the working place. These findings supported by **Mukhtar et al., (2020)** [29] who showed that 70% of the workers had positive attitude. This was contrasting **Nicholas et al., (2019)** [18] who showed that 67% of the respondents had negative attitude towards the practice safety measures for occupational hazards. Correspondingly, **Aluko et al., (2016)** [35] who assess workers' knowledge, attitude and perceptions of occupational hazards and safety practices in Nigeria and reported that 80% of respondents had positive attitude.

Also, **Akalonu et al., (2017)** [36] who conducted a study in Nigeria to assess workers' awareness on causes of occupational injuries, illnesses and fatalities and they disclosed that a significant number of employees in the oil and gas industry have a negative attitude towards the prevention of occupational hazards. In contrast, **Quaigrain et al., (2022)** [26] explored that most workers had a positive attitude toward occupational hazards.

The current study found that there was statistically significant relation between workers' attitude and their residence, time work and workers' role but there wasn't significant relation with workers' age, experience and education. These findings disagreed with **Quaigrain et al., (2022)** [26] who viewed that workers higher experience foster positive attitude toward occupational health safety. Moreover, these findings contradicted with **Nkrumah et al., (2021)** [32] who cleared that workers' education influenced their attitude toward occupational hazards.

Concerning workers' reported practices about occupational health hazards; it was obvious from the current study that more than two-fifths of them had satisfactory reported practices level. While, more than half of them had unsatisfactory reported practices of occupational safety measures. These results may be due to financial reasons and non-availability of safety devices that are provided by the stations. These results were supported by **Mukhtar et al., (2020)** [29] who showed that 48.6% of respondents had satisfactory practices of safety measure. In addition, these results were in the same regard as **Chijioke, (2020)** [34] who disclosed that workers' practices were unsatisfactory. Moreover, these findings contradicted with **OE and QM, (2018)** [24] who reported that only 7.0% of studied sample used personal protective equipment.

On the other hand, these findings contradicted **ELsayed et al., (2018)** [1] who reported that three-quarters of workers had unsatisfactory practice regarding to safety measures. Also, **Nicholas et al., (2019)** [18] reported 60.0% of the respondents do not practice safety measures for occupational hazards. The present study showed that there was statistical significant relation between workers' practices and their working hours and attending training courses while, workers' practice wasn't affected by their age, education and years of experience. This wasn't in the same regard with **Nicholas et al., (2019)** [18] who revealed that there was significant relation in the reported practices of safety measures of occupational hazards among the respondents based on their length of service. Moreover, **Quaigrain et al., (2022)** [26] reported that workers' experience promotes their safety practices. Also, **Nkrumah et al., (2021)** [32] found that workers' level of education affects their health and safety practices.

Encouraging a healthy work places environment fosters favorable social and financial progress. Unfortunately, the present study highlighted that slightly less than five sixths of the working environment were unsafe, these results disagreed with **ELsayed et al., (2018)** [1] who cleared that more than half was safe environment.

Workers at gas stations frequently deal with demanding jobs and substantial workloads, which wear them out and have detrimental effect on their health. Additionally, workers were exposed to a variety of psychosocial stressors at work, which are linked to high levels of occupational stress [37].

The present study disclosed that more than three-fifths of studied workers had moderate stress level. These results weren't in the same line with **Batubara, (2017)** [38] who reported that stress levels were low in 52.94%, moderate in 44.12% and high in 2.94% of studied workers.

A few studies have focused on the negative impact of work-related health issues on workers' health both at work and outside work in gas stations over work ruins workers' ability to cope with their surroundings, leading to emotional and stress-related changes like anxiety, irritability, depression, and sadness [25].

The present study reported that there were statistically significant differences between workers' stress level and their working time and working hours. These findings related normal consequences when persons work more that cause more exhaustion and more stress.

These results supported by **Alb´an-P´erez et al., (2017)** [22] who observed that the workload, work hours and shiftwork were associated with works' level of stress **[39]**. Moreover, some studies reported a positive association between works hours and overload with occupational stress. [40, 41]

Conclusion

Based on the results of this study; it was concluded that less than two-thirds of gas stations' workers had good level of knowledge and had positive attitude, more than half of them had unsatisfactory reported practices and more than two-thirds experienced moderate level of stress.

Additionally, among Assiut City gas stations' workers, there was a significant relation between socio-demographic traits and knowledge attitude, reported practices and the level of stress among the studied workers. Moreover; less than two-thirds of gas stations' working environment was unsafe.

Recommendations

1. Ongoing practical training programs should be implemented to provide gas stations' workers with appropriate practices.
2. It is advised to regularly inspect the working environment of gas stations.
3. Further studies using different research designs to analysis the effects of gas stations risk factors on human and environmental health.
4. A larger sample size is recommended for the generalizability of the study findings.

Strength and obstacles of the study:

Few researches on gas workers' stations so the current study sheds light on occupational health, environmental safety risks and stress among gas station workers. Some workers declined to volunteer for the study out of concern that they would be singled out by the management this can be considered as obstacle. This was mitigated, though, by the consent form's guarantee that the information provided would be kept private and not disclosed to management.

References

1. ELsayed A, Ahmed H, Hala M, Mohamed H. Occupational Hazards among Gas Station Workers. Egyptian Journal of Health Care. 2018; 9 (4) :443- 463.

2. Kyalo M. Occupational hazards awareness and safety practices among petrol service station workers in Nakuru county, Kenya. A thesis Master of Science, Environmental and Occupational Health, Egerton University. 2020: 1-106

3. Attaqwa Y, Mahachandra M, Prastawa H. Analysis of benzene exposure considering workers characteristic in the oil and gas industry. International Conference on Advanced Mechanical and Industrial Engineering. 2020; 909: 1- 9.

4. Makka K, Kampova K, Lovecek T, Petrlova K. An environmental risk assessment of filling stations using the principles of security management: A case study. Slovak Republic. Sustainability. 2021; 13(22): 12452. https://doi.org/10.3390/

5. Ameen M, Abdulla S. Prevalence of respiratory disorders among Petrol Pump workers: A cross-sectional descriptive study. Journal of Medical. Chemical Sciences. 2023; 6(9): 2164-2176

6. Mohsin M, Yin H, Huang W, Zhang S, Zhang L, Mehak A. Evaluation of occupational health risk management and performance in China: A case study of Gas Station Workers. International Journal of Environment Research Public Health. 2022; 19 (7): 3762.

7. Margrove G, Smith A. The demands-resources-individual effects (DRIVE) model: Past, present, and future research. In: Haque A, editor. Handbook of Research on the Complexities and Strategies of Occupational Stress [Internet]. US: IGI Global. 2022; 13-32. Available from: https://doi.org/10.4018/978-1-6684-3937-1.ch002

8. Alroomi A, Mohamed S. Occupational stressors and safety behaviour among Oil

and Gas Workers in Kuwait: The mediating role of mental health and fatigue. International Journal Environment Research Public Health. 2021; 18(21): 11700. https://Doi.org/10.3390/ijerph182111700.

9. Ahmad A, Rahman M, Yasmin S, Jaffri N, Abrar U, Olume A. Impacts of workplace stress: An exploratory cross-sectional study of Oil and Gas Sector in Pakistan. Journal of Management and Business. 2021; 8 (1): 70-97.

10. Suparnan S, Jaiswal A. Occupation health and safety. Anthropo-Indialog. 2021; 1(3): 261-269.

11. Attia N, Sorour A, Ahmed F. Occupational health hazards among Faculty of Nursing students in Zagazig University. Zagazig Nursing Journal. 2022; 14 (1):133-134.

12. Mohamed O, Elhassan A, Ibrahim A, Hamdan M. Effects of the occupational exposure on health status among petroleum station workers, Khartoum State, Sudan. Toxicology Reports. 2021; 8(5): 171–176.

13. Rahhal B. The effect of occupational exposure to petrol on pulmonary function parameters: A cross sectional study in Palestine. Journal Mater. Environ. Sci. 2022; 13(6): 732-738.

14. Attih G, Ugdebor J, Ugwoha E. Assessment of risk exposure in oil and gas depots of Niger Delta, Nigeria. International Journal of Research in Environmental Science and Technology. 2022; 8(1): 4338-6212.

15. El- Gilany A, EL-wehady A, and El Wasify M. Updating and validation of the socioeconomic status scale for health research in Egypt. East Mediterranean Health Journal. 2012; 18962-968 https://Doi.org/10.26719/2012.18.9.962.

16. Nneka O, Mansur O, Godwin G, Ango T, Yunusa U. Knowledge of occupational hazards and safety practices among petrol station attendants in Sokoto metropolis, Sokoto State, Nigeria. JOHE Summer. 2017; 6 (3): 122-127.

17. Hamad O. Occupational and environmental hazards among workers in Petroleum Stations, Khartoum State, Sudan (2013-2015). A thesis submitted to the University of Gezira. Degree of Doctor Philosophy, Environmental Pollution, Environmental Health Faculty. 2018; 1-175.

18. Nicholas A, Maynard E, Aminaho M. Knowledge, attitude and practices regarding occupational hazards and safety measures among oil and gas workers in South-South Nigeria. International Journal of Science & Technology. 2019; 71(2): 13-19.

19. Sabry A, Ibrahim H, Khalaf S. Knowledge, attitude, and practices of primary schools' teachers regarding COVID-19 at Assiut City. Assiut Scientific Nursing Journal. 2022; 1(30): 232 -241.

20. Mohamed S, Darweesh A, Mohamed N, Abd Elhamed N. Occupational stress, its psychosomatic symptoms on nurses and coping strategies of nurses at Assiut University Hospital. Assiut Scientific Nursing Journal. 2014; 2 (3): 90-110.

21. Almadi T, Cathers I, Hamdan A, Chow C. An Arabic version of the perceived stress scale: Translation and validation study. Int J Nurs Stud. 2012; 49(1): 84-9. Doi: 10.1016/j.ijnurstu.2011.07.012. Epub 2011 Aug 17. PMID: 21851941.

22. Albán-Pérez G, Pando-Moreno M, Laca-Arocena F, Colunga-Rodríguez C, Verdesoto-Galéas Á, Sarabia-López L, et al. Psychosocial factors at work and occupational stress ingas station attendants

in Ecuador. Psychology. 2017; 8(13): 2215-2225.

23. Mohamed O, Elhassan A, Abdalla A, Mohamed M, Chaouiki A. Assessment of knowledge, attitude, and practice (KAP) of petroleum stations worker's towards adverse health effects of their activities, Khartoum State, Sudan (2013-2015). Appl. J. Envir. Eng. Sci. 2018; 4(4): 497-511.

24. OE J, QM U. Assessment of occupational hazards, health problems and safety practices of petrol station attendants in Uyo, Nigeria. Journal of Community Medicine and Primary Health Care. 2018; 30 (1): 47-57.

25. Franzoi I, Granieri A, Sauta M, Agnesone M, Gonella M, Cavallo R, et al. Anxiety, posttraumatic stress, and burnout in health professionals during the COVID-19 Pandemic. Comparing mental health professionals and other healthcare workers. Health care. Journal Health Care (Basel). 2022; 9(6):635.

26. Quaigrain R, Manu D, Edwards D, Hammond M, Martek I. Occupational health and safety orientation in the oil and gas industry of Ghana: Analysis of knowledge and attitudinal influences on compliance. Journal of Engineering Design and Technology. 2022; 1(3):1726-0531.

27. Rocha L, Vaz-Cezar M, Bonow C, Costa Z. Use of personal protective equipment by gas stations workers: A nursing contribution. Texto & Contexto-Enfermagem. 2014; 23(1):193-202.

28. Alam R, Zafar A, Ghafoor A, Naseem A, Ali Q, Imtiaz F. Lung function abnormalities among fuel filling workers in Karachi. Environmental & Earth Sciences. 2014; 1(1):183-187.

29. Mukhtar M, Yusof A, Isa M. Knowledge, attitude and practice on occupational safety and health among workers in petro chemical companies, IOP Conf. Series: Earth and Environmental Science. 2020; 436 (1): 1-7.

30. Langkulsen U, Vichit-Vadakan N, Taptagaporn S. Safety and health in the petrochemical industry in Map Ta Phut. Thailand Journal of Occupational Health. 2011; 53(5): 384–392.

31. Ni K, Chen B, Jin H, Kong Q, Ni X, Xu H. Knowledge attitudes and practices regarding environmental cleaning among environmental service workers in Chinese Hospitals. American Journal Infection Control. 2017; 45(9):1043-1045.

32. Nkrumah E, Lui S, Fiergbor D, Akoto L. Improving the safety–performance nexus: A study on the moderating and mediating influence of work motivation in the causal link between occupational health and safety management (OHSM) practices and work performance in the oil and gas sector, International Journal of Environmental Research and Public Health. 2020; 18(10): 5064. Doi: 10.3390/ijerph18105064.

33. Lui S, Nkrumah E, Akoto L, Gyabeng E, Band Nkrumah E. The state of occupational health and safety management frameworks (OHSMF) and occupational injuries and accidents in the Ghanaian oil and gas industry: Assessing the mediating role of safety knowledge. BioMed Research International. 2020; 13(6354895): 1-14.

34. Chijioke A. Effect of occupational hazards and safety practices among petrol attendants in Nigeria. European Journal of Public Health. 2020; 30(5): 1035-50.

35. Aluko O, Adebayo A, Adebisi T, Ewegbemi M, Abidoye A, Popoola B. Knowledge attitudes and perceptions of occupational hazards and safety practices

in Nigerian healthcare workers. BMC Research Notes. 2016; 9(1): 71.

36. Akalonu G, Nwaogazie L, Ejikeme U. Awareness assessment on causes of occupational injuries, illnesses, and fatalities for selected companies in Nigeria. International Journal of Health Safety and Environments. 2017; 3(5): 81-101.

37. Yin Y, Tan X, Fan J. Occupational fatigue, and health of gas station workers. National Library of Medicine. 2023; 76(2): 707–726.

38. Batubara M. Stress at work and well-being: Study of stress level at work to improve employee well-being on Pertamina's operators with standard 'Pertamina Way' in Bandung. In: Abdullah A, Hamidah I, Aisyah S, Danuwijaya A, Yuliani G, Munawaroh H. Ideas for 21st Century Education. London: CRC Press; 2017, 37-41.

39. Fan J, Smith A. A preliminary review of fatigue among rail staff. Front Psychol. 2020; 9(7): 634.

40. Pan H. The cause of human fatigue and scenario analysis in the process of marine transportation. Journal of Southeast University (English Edition) [Internet]. 2020; 36(1):107-117.

41. Qiu D, Zhang Q, Wang X, Jing X, Gong X, Xie S. Investigation on status of occupational fatigue among clinical nurses in three grade-A tertiary hospitals of Mianyang City. Occupational Health. 2020; 36(16): 217