

Occupational Health Hazards among Workers in Sewage Treatment Plants in Beni-Suef Governorate

Sahar Ahmad Shafik⁽¹⁾, Hanaa Abdelgawad Abdelmegeed⁽²⁾, Amany Mohamed Saad⁽³⁾, Rania Abd El Mohsen Abo Elnour⁽⁴⁾.

⁽¹⁾ Professor of Community Health Nursing, Faculty of Nursing, Helwan University, ⁽²⁾ Professor of Community Health Nursing, Faculty of Nursing, Benha University ⁽³⁾ Lecturer of Community Health Nursing, Faculty of Nursing, Helwan University ⁽⁴⁾ Nursing specialist, Beni-Suef Health Technical Institute
Corresponding Author: Sahar Ahmad Shafik

Abstract: Background: Sewage treatment plants are associated with various health hazards. Aim: Assess the occupational health hazards among workers in sewage treatment plants in Beni-Suef governorate. Design: A descriptive research design. Setting: This study was conducted at 15 sewage treatment plants in Beni-Suef Governorate. Tools: Two tools were used for data collection; Tool I: Structural interview questionnaire Tool II: Observational checklist of personal protective equipment, environmental safety and its hazards. Results: The present study revealed that more than half of workers have poor level of knowledge regarding occupational hazards in the work place, related to practice more than three fifth of workers used safety boots as personal protective equipment. Also there were statistical significance difference between using personal protective devices and their chemical and mechanical health problems, there were statistical significance difference between total satisfactory level of knowledge about occupational hazards and their biological, chemical and psychological hazards. Conclusion: More than one half of the workers in sewage treatment plants have poor level of knowledge regarding their occupational hazards. There was relation between workers using personal protective devices and their health problems. There was relation between workers knowledge about occupational hazards and their health problem
Recommendations: Regular implementation of health education and training programs about environmental safety and health hazards, first aid related to sewage treatment plants accidents and proper use of personal protective equipment.

Key words: sewage treatment plants, workers, occupational hazards.

Date of Submission: 21-12-2018

Date of acceptance: 05-01-2019

I. Introduction

Workers exposed to varieties of hazards in the occupational environment which may cause various diseases. These are related to physical condition such as temperature, humidity, noise, light & chemical agents in the form of vapors, fumes, droplets, gases, unsafe, unprotected machines & technical equipment responsible for causing accidents.^[1]

More than 2.9 billion workers throughout the world are exposed to mechanical, chemical, physical and psychosocial hazards. According to projects by the world health organization (WHO) the International Labour Organization (ILO) on the global burden of occupational injuries and diseases, these workers suffer from 140,000 to 355,000 occupational injury deaths per year. These numbers are influenced in part by the degree of economic development and the status of policies and services designed to protect working populations.^[2]

Work in the waste water treatment field was considered the most hazardous, especially due to deaths involving confined space entry. This field is considered somewhat less hazardous today, but treatment plant workers still do experience health problems and deaths. These experiences occur in specific incidents involving chemicals in the sewer system and in regular work exposures throughout the plant and its processes.^[3]

The sewage and sanitary workers suffer mainly from chemical and biological hazards. This can be prevented through engineering, medical and legislative measures. These workers should also be benefited from occupational health services, which should include pre-placement and periodic health monitoring. Also, regular awareness programs should be conducted to impart education regarding safer work procedures and use of personal protective devices.^[4] Sewage workers are exposed to different occupational noxious agents, which may lead to the development of chronic lung function changes and respiratory symptoms. These symptoms may be due to exposure to endotoxins and airborne bacteria by way of bioaerosols.^[5]

Sewers must wear suitable protective equipment. In general, Personal Protective Equipment (PPE) must protect against hazards such as burns, sparks, spatter, electric shock, and radiation. The use of PPE is a

good safe practice and may be required by regulatory agencies. For example, occupational safety hazard administration requires the use of PPE when working and administrative controls are not feasible or effective.[6] Occupational health is a multidisciplinary field of health care concerned with enabling an individual to undertake their occupation, in the way that causes least harm to their health. Health has been defined as it contrasts, for example, with the promotion of health and safety at work, which is concerned with preventing harm from any incidental hazards, arising in the workplace.[7]

Health and safety first aid regulations require employers to provide adequate and appropriate equipment, facilities to ensure that employees receive immediate attention if they are injured or taken ill at work although there is no mandatory list of items to be included in a first-aid kit.[8]

Occupational health nursing is concerned with the nursing component of comprehensive occupational health care & contributes health promotion, protection of the health of disabled workers. The nurses dealing with occupational health she/he can play a major role in promotion, protection, prevention and control of diseases & disabilities.[9]

II. Significance of the study

Workers represent half of the world's population. Maintaining a safe working environment is reflected on a health of workers.^[10]The International Occupational Safety and Health Information Centre found that waste water treatment operators encounter no fewer than 15 accident hazards in their daily duties. The injury rate for workers in the waste water treatment in 2012 was 5.2 injuries per 100 workers.^[11]

Egypt had 389 municipal waste water treatment plants in 2015. The capacity of Egypt's wastewater treatment plants was more than 13.5 million cubic meters per day.^[12]The largest waste water treatment plant in Egypt is located in Gabal el Asfar to the northeast. Another large waste water treatment plant is located at AbuRawash.^[13]

The most occupational hazards in a sewage treatment plant are slip and fall, water born disease, air born infection, skin ailments as well as hearing lost.^[14]

1.2 Aim of the study

The aim of this study is to assess the occupational health hazards among workers in sewage treatment plants in Beni-Suef Governorate, through :

- 1- Assessing the knowledge of the workers about occupational safety and health hazards related to sewage treatment plants.
- 2- Assessing the workers' health problems.
- 3- Assessing the workers' using of personal protective devices.
- 4-Assessing the work site,environmental safety and hazards.

1.3 Research Questions:

- 1- What are the level of knowledge of the workers about occupational hazards ?
- 2- Is there relation between workers using personal protective devices and their health problems?
- 3- Is there relation between workers knowledge about occupational hazards and their health problems?

III. Subjects and methods

2.1 Research design:

A descriptive research design was used to conduct the present study.

2.2 Research setting:

The study was conducted in all sewage treatment plants in Beni-Suef Governorate (15 plants).

2.3 Subjects:

The subjects of the existing study were 150workers at Beni-Suef Governorate.

2.4 Sampling technique: Convenience sample. The total number of workers in sewage treatment plants in Beni-Suef Governorate was 300 workers, the number of workers that was available in morning shift was 165 workers,15 of them were pilot study so that the total number were 150 workers included in the sample.

2.5 Tools of data collection

Tool I:Structural interview questionnaire was developed by the investigator to collect the necessary data: It consist of two parts: First Part: Socio-demographic characteristics, second part: medical history. Third Part: Knowledge about personal protective equipment, occupational hazards and safety.^[15]

Scoring system for knowledge items:

- For the knowledge items, a correct answer was scored (one)score& incorrect answer was scored (zero). The score of the items summed –up and converted into percent score.(The worker had poor level of knowledge when his total score were below 50%,when total score(50<75) were considered average and good when total score more than 75%).

Tool II: Observational checklist of personal protective equipment, environmental safety and its hazards, it was developed by Ahmed in 2016.^[16]

Scoring systems for practice:

Questions related to using personal protective equipment was scored as the following: Zero was given for not available, one score was given for not used and two given for available and used this equipment and devices

Scoring system for observational of environmental safety:

Using score system in observational sheet, the score ranged from poor take zero, good take one.

Scoring system for the total practice: The total practice scores were categorized as the following:

The practice level considered in adequate when the score was less than 50% and considered adequate when the score was equal or above 50%.

2.6 Validity:

These tools were reviewed by 5 experts in the field of Community Health Nursing –Benisuef university (2 experts), two experts from Helwan university and one expert from Benha university

2.7 Reliability of tool:

To assess reliability, the study tools were tested by the pilot subjects at first session and retested after 2weeks as test-retest reliability for calculating Cronbach's Alpha which was 0.894 for the questionnaire.

2.6 Pilot study

A pilot study was carried out with 10 % of workers (15) of the study subjects. Its aim were evaluated the clarity of the tools. It also helped in the estimation of the time needed to fulfillment in the forms. According to the results of the pilot study, simple modifications were done or rephrasing the pilot study was excluded from the actual study sample.

2.7 Fieldwork

Approval from the director of Beni-Suef water and sanitation company was obtained through an official permission and also oral consent was taken from the workers. Interviewing the workers was carried out in specialized room in the sewage plant after the investigator introduced herself and explained the nature and the purpose of the study. The average time taken to complete each questionnaire was around 20-25 minutes depending on the person response to questions. Observation checklist was done by the investigator herself, it took from 10-15 minutes. Data was collected 2 days/week in the morning shift from 9am to 1pm, the number of persons ranged from 3-4 person /day, within 6 months from first of July 2017 to the end of December 2017 till the needed sample was completed.

2.8 Ethical considerations:

An official approval was obtained from community nursing department that was approved by the Faculty of Nursing, Helwan University. Another official approval taken from the ethical committee, Faculty of Nursing ,Helwan university. The aim of the study was explained to each worker before applying the tools to gain their confidence and trust. An oral consent was obtained from each worker to participate in the study, after ensuring that data collected were treated confidentially and he has the chance for withdrawal at any time.

2.9 Data management:

Data entry and statistical analysis were done using SPSS version 19 (Statistical Package for Social Science). Data were presented as mean and standard deviations. Chi-square and Fisher Exact tests were used to compare between qualitative variables. P-value considered statistically significant when $P < 0.05$.

IV. Results

Table(1):The current study reveals that the majority of the workers (88.0%) were male ,while only (12.0%) were female . More than half of workers (54.0%) were in the age group 41-60 years , while only (46.0%) were 20-40 years. The mean age was 44.2 ± 4.7 .

Table(2) :Workers distribution according to medical history in the work place shows that the majority of them (86.7%) have medical examination before work. The majority of studied sample (76.0%) not making medical examination periodically .More than half (55.6%) of them making medical examination annually. About(37.7%) suffer from hypertension and also diabetes, while only (6.6%) suffer from weakness or hearing loss. Only about (13.3%) of workers suffer from infectious disease. More than half (55.0%) of them were have hepatitis C.

Regarding exposure to accident during work about(31.3%) had exposed to accident during the work. According to types of accident it was observed that more than one third (36.2%) of them had chest allergy , while only (10.6%) were exposed to sliding. Regarding to health habits (46.0%) of them were smoking cigarettes.

Regarding to absent from work the majority (82.0%) of workers were absent from work and minority (26.8%) of them were absent due to professional diseases, while slightly less than three fourth (73.2%) were absent due to other diseases.

Table (3): Illustrates knowledge regarding to personal protective equipment in the work place for studied sample, more than half (52.7%) of them identify its importance to a protective from hazards , while about (47.3%) identify its importance to protective from accidents ,infection and others . Regarding to types of protective equipment less than two fifth (38.7%) know gloves, while only (5.3%) know a phosphoric robe. Regarding to cleaning work clothes about (37.3%) clean them every day, while only (3.3%) clean it when necessary.

Table (4): Shows knowledge regarding to occupational health hazards in the work place for studied sample, regarding to physical hazards more than one third (34.0%) mentioned it as burns, while only (2.7%) mentioned it as hearing loss. Regarding to mechanical hazards less than one third (32.0%) of studied sample mentioned it as back pain, while only (1.3%) not mentioned the mechanical hazards. Regarding to biological hazards (26.0%) mentioned it as respiratory system diseases, while only (1.3%) mentioned dyspepsia. Regarding to chemical hazards more than one fifth (21.3%) mentioned it as inflammation of skin, while only (2.7%) mentioned it as cough. Regarding to psychological hazards (46.0%) have stress and nervous tension, while only (8.0%) have family problem.

Table(5): Illustrates distribution of workers regarding to environmental safety the investigator observed that the work condition were have safe stairs (80.0%) , while (100.0%) haven't waste disposal system .According to washing facilities it were clear that about four fifth (80%) were number of toilets not suitable to number of workers and about (73.3%) weren't kept clean. Regarding to medical facilities it was cleared that the majority (86.7%) of work environment have clinic nearby, while all the work plants (100.0%) haven't ambulance equipped with emergency facilities.

Regarding to fire control measures the majority (93.3%) of the plants have suitable fire extinguishers and about two fifth of workers (40.0%) were trained to put fire off . It was cleared that the majority (86.7%) of work place have clearly marked emergency exit. Regarding to storage system, it cleared that majority (80.0%) of storage area far from the workers, As well as minority (13.3%) have containers that labeled with chemical names.

Table(6):Illustrates distribution according to exposure to environmental hazards in the work place for studied sample ,it cleared that morethanthreefifth (62.0%) exposed to noise as physical hazards , while only (38.0%) exposed to electricity. Regarding to mechanical hazards about (28.7%) were exposed to sudden movement, while only (4.0%) were bending for long period. Regarding to biological hazards more than three quarters (76.7%) were exposed to polluted air and water. In addition the majority of chemical hazards (78,0%) of workers used gases .Regarding to types of chemicals used less than three quarters (72.7%) use chlorine and only about (2.7%) use sodium hydroxide(NaOH).Regarding to psychological hazards slightly less than one third (32.0%) not exposed to psychological hazards , while only (28.7%) were exposed to increased work load.

Figure (1): Reveals distribution of total score for environmental safety of studied places, it observed that less than three quarters (74.3%) had inadequate safety environment ,while there were only one quarter (25.7%) had an adequate safety environment.

Table(7): Shows the relation between workers total satisfactory level of knowledge about occupational hazards and their health problems, it cleared that there were statistical significance difference between total satisfactory level of knowledge about occupational hazards and some of their health problems as (biological, chemical and psychological) hazards p values=(0.000,0.007 and 0.001) respectively. Also it noticed that no statistical significance between total satisfactory level of knowledge about occupational hazards and health problem (physical and mechanical).

Table (8) Reveals the relation between workers using personal protective devices and their health

problems, it cleared that there were statistical significance difference between using personal protective devices and their health problems as (mechanical and chemical) hazards p values=(0.007 and 0.008) respectively. Also it noticed that no statistical significance difference between using personal protective devices and their health problems as (physical, biological and psychological) hazards.

V. Discussion

Sewage treatment plant is associated with various inherent occupational hazards which may result in severe consequences on health of workers performing this task. For many years, waste water treatment plants have been regarded as dangerous work environments. Treatment plant workers experience health problems and accidents result from exposure to wide range of hazards related to plant design and processes^[17]. The workers of sewage treatment plants deal with mechanical equipment, treatment tanks, and chemicals. Those activities can expose them to range of hazards, in the course of their daily duties^[18].

The current study findings revealed that the majority of the studied sample was male this might be due to this work not suitable for female because this need pull and push heavy objects. This is in agreement with a study done by **Kasaeinasab et al**^[9] who conducted out in Iran, about safety and health at work place, who said that about four fifth of workers were male. This were disagreement with the study carried in Accra, Ghana about neck, wrist and back pain among solid waste done by **Norman et al**^[19] who found that about three quarters of waste water treatment workers were female.

the current study findings clarified that the mean age of workers was (44.2 ± 4.7) & there were more than one half at age group of 41-60 years. This finding was in contrast with study conducted by Saad et al^[20] in Egypt, about occupational health problem of sewage workers, who found that more than one third of workers were at age group of 28 – 36 years and the mean age of workers were (33.0 ± 10.0) . This might be due to increase the work age in Egypt. The current study findings revealed that slightly less than one third had exposed to accident during the work and more than one third exposed to chest allergy, this might be due to chemical and gases used in this plants and more than one fifth exposed to falling. From the investigator point of view, this due to increase hazards in the work place. This findings was in accordance with Malakahmed et al^[17] who implemented study in Malaysia about application of occupational health and safety management system at sewage treatment plant and reported that more than one third exposed to accidents, about one quarter exposed to falling, slings and about two fifth of them suffered from chest allergy and cough with phlegm as well, this result was contrasted with Kasaeinasab et al^[9], who noticed that more than two fifth exposed to accident and more than two third of them exposed to chest diseases, about only (10.17%) of workers exposed to falling.

In relation to smoking the current study showed that more than two fifth of the studied workers were smokers. This was disagreement with AbouElwafa et al^[21], in Mansoura, Egypt about musculoskeletal disorder among municipal waste collector who mentioned that only (10.8%) of workers in sewage treatment plant were smokers.

The current study findings revealed that less than two fifth of the workers known gloves as personal protective equipment and slightly less than one third of them know helmet. This study findings were contrasted with Johnson and Motilewa^[22], carried out a study in Nigeria, about knowledge and use of personal protective equipment among auto technicians, they found that the most of workers known about over all uniform and boots.

Concerning the knowledge about physical hazards, more than one third of workers exposed to burns. This findings were in agreement with Malakahmed et al^[17] who stated that about one third of workers exposed to burns and the minority of them exposed to hearing loss. This was disagreed with a study done in Kumasi, Ghana by Kvernberg^[23] about performance assessment of a waste water treatment plants, who found that about one fifth of workers exposed to electric shock and one fifth of them exposed to hearing loss and ten percent of them exposed to burns.

The current study findings about knowledge of mechanical hazards showed that less than one third of workers exposed to back pain. This result was in the same line with Asante^[24] in Kenda about low back disorder among waste collection workers, and mentioned that about two fifth of workers exposed to low back disorder. From the investigator point of view this is due to lack of equipment facility in most of the plants this is lead to the workers lifting, pushing and pulling heavy objects.

Regarding to biological hazards the current study finding indicated that more than one quarter of workers exposed to respiratory diseases and slightly less than one fifth exposed to eye infection. This supported by Kasaeinasab et al^[9] who found that more than one third of workers exposed to respiratory diseases and cough. This result was contrasted with Malakahmed et al^[17] who found that one third of workers exposed to eye infection and about two fifth exposed to respiratory diseases.

Related to knowledge about chemical hazards the current study finding showed that about one fifth exposed to inflammation of the skin and choking. This findings was supported by Moravia^[25] in United States,

about water and waste water treatment operators, who found that less than one third exposed to inflammation of the skin.

Related to psychological hazards the current study findings revealed that less than half of workers exposed to stress and nervous tension and minority of them not exposed to psychological hazards. From the investigator point of view this due to increase work load and increase exposure to environmental hazards as high voice of machines for the workers.

The current study showed that more than half of workers had poor level of knowledge regarding exposed to occupational hazards in the work place. The above mentioned results exposed and proved the research question number one, which asked about level of knowledge of workers about occupational hazards. This finding was contrasted with Amabya[26] in Ethiopia about occupational risk & hazards exposure, knowledge of occupational health, safety practice & safety at measures among workers in Ethiopia, found that the majority of workers had good level of knowledge regarding occupational hazards in the work place. This may be due to decrease training program in the current work place.

The finding of present study noticed that about one quarter of sewage treatment plants had adequate safety environment. This may be due to increase hazards, dangers and decrease safety measures and lack of supervision.

Also

The present study findings illustrated that majority of the workers in sewage treatment plants were exposed to physical hazards such as, noise. This may be due to lack of awareness, availability & usage of personal protective equipment. The current study findings were in disagreement with Saad et al[20] who found that minor of workers were exposed to physical hazards as noise & electricity.

As shown by the present study findings the workers reported that less than one third of them complained from sudden movements as mechanical hazards and slightly more than one quarter exposed to standing for long period. This findings were in accordance with Paxeux[27] in Sweden about organic pollutants in the effluents of large waste water treatment plants who observed that more than two third complained from sudden movement and long period of standing and were contrasted with Abo Elwafa et al[21] who found that three fifth of workers exposed to falling and 14% of them exposed to standing for long period.

Concerning to the relation between workers total satisfactory level of knowledge about occupational hazards and their health problem, it was noticed that there were statistical significant differences in biological, chemical and psychological hazards. The above mentioned results clarified and proved the research question number three which asked about the relation between workers knowledge about occupational hazards and their health problems. The current study disagree with Amabya[26], who found that there were no significance difference between workers knowledge and psychological hazards.

According to the relation between workers using personal protective devices and their health problems, the present study findings clarified that there were statistical significance difference between using personal protective devices and their health problems as (mechanical and chemical) hazards. The above mentioned result showed and proved the research question number two, which asked about the relation between workers using personal protective devices and their health problems. This results was supported by Das[28] in Surat city, Gujarat about occupational health problems among solid waste handlers, who found statistical significance difference between using personal protective equipment and mechanical, chemical hazards.

Also the current study found no statistical significance between using personal protective devices and physical & biological hazards this contrasted with Paxeux[27], who found statistical significance difference with using personal protective equipment and physical & biological hazards.

VI. Conclusion

More than one half of the workers in sewage treatment plants have poor level of knowledge regarding occupational hazards in the work place and also in occupational health and safety. Their poor knowledge regarded to inadequate use of personal protective equipment. So most of them exposed to all types of occupational hazards. Less than three quarters of them worked under inadequate safety environmental conditions.

VII. Recommendations

On the basis of the current study findings, the following recommendations are suggested: Regular implementation of health education & training programs for workers about environmental safety, health hazards and problems related to sewage treatment plant and first aid. Proper use and maintenance of personal protective equipment. Further researches are recommended to investigate sustainable preventive strategies about sewage related safety and health hazards in order to preserve the health of workers in the small and large plants.

Table (1): Workers distribution according to their socio-demographic characteristics (n=150)

Socio-demographic characteristics	No	%
Gender		
Male	132	88.0
Female	18	12.0
Age		
20- 40	69	46.0
41- 60	81	54.0
Mean ± SD =	44.2 ± 4.7	

Table (2): Workers distribution according to their health conditions regarding history of disease (n=150).

Medical history	No	%
Having a medical examination before work		
Yes	130	86.7
No	20	13.3
Having a medical examination periodically		
Yes	36	24.0
No	114	76.0
Time of making medical examination		
Every six months	16	44.4
Annually	20	55.6
Suffer from chronic diseases:		
Yes	61	40.7
No	89	59.3
Types of chronic diseases (n=61)		
Hypertension	23	37.7
Diabetes	23	37.7
Heart disease	5	8.2
Arteriosclerosis	6	9.8
Weakness or hearing loss	4	6.6
Suffer from infectious disease:		
Yes	20	13.3
No	130	86.7
Type of infectious disease(n=20)		
TB	9	45.0
Hepatitis C	11	55.0
Exposure to accident during work:		
Yes	47	31.3
No	103	68.7
Types of accident (n=47)		
Falling	10	21.3
Sliding	5	10.6
Burns	7	14.9
Food poisoning	8	17.0
Chest allergy	17	36.2
Smoking		
Yes	69	46.0
No	81	54.0
Types of smoking (n=69)		
Cigarette	69	100.0
Smoking during the work (n=69)		
Yes	20	29.0
No	49	71.0
Drink other drugs		
Yes	4	2.7
No	146	97.3
Absent from work :		
Yes	123	82.0

Medical history	No	%
No	27	18.0
Causes of absent of work (n=123)		
Professional diseases	33	26.8
Other diseases*	90	73.2

* : Any disease its cause not related to the work

Part II :Table (3): Workers knowledge regarding topersonal protective equipment in the workplace for studied sample (n=150).

Items	No	%
Important of personal protective equipment:		
Protective from hazards	79	52.7
Protective from accidents, infection and others	71	47.3
Types of protective equipment		
Helmet	49	32.7
Gloves	58	38.7
Safety boot	21	14.0
A phosphoric robe	8	5.3
The muzzle	14	9.3
Cleaning work clothes		
Every day	56	37.3
Twice of week	55	36.7
Every weak	34	22.7
Others(when necessary)*	5	3.3

*: Others: mean when become unclean

Table (4): Workers level of knowledge about occupational health hazards in the work place(n=150).

Items	No	%
Physical hazards:		
Electric shocks	36	24.0
Burns	51	34.0
Sleep disorders	14	9.3
Headache	8	5.3
Nervous	9	6.0
Hearing impairment	28	18.7
Hearing loss	4	2.7
Mechanical hazards		
Varicose veins	34	22.7
Back pain	48	32.0
Torsions	9	6.0
Fractures	47	31.3
Pain in the neck	4	2.7
Ligament rupture	6	4.0
Not exposed	2	1.3
Biological hazards		
Diarrhea	18	12.0
Respiratory system diseases	39	26.0
Eye infection	29	19.3
Hepatitis virus	10	6.7
Dyspepsia	2	1.3
Bowel ulcers	13	8.7
Typhoid diet	22	14.7
Food poisoning	12	8.0
Others*	5	3.3
Chemical hazards		
Burns	22	14.7
Chest allergy	10	6.7
allergy	17	11.3
Choking	30	20.0
Inflammation of the skin	32	21.3
Cough	4	2.7
Breathing difficulties	15	10.0
Two approaches	20	13.3
Psychological hazards		
Stress and nervous tension	69	46.0
		14.0

Repeated absence	21	19.3
Job dissatisfaction	29	8.0
Family problems	12	12.7
No exposure	19	

*:As skin disease, skin irritation, cough

Table (5) Observational checklist for assessing environmental safety for studied places (n=15)

Items	Present		Not present	
	No	%	No	%
1.Workcondition				
Good ventilation	5	33.3	10	66.7
Adequate lighting	6	40.0	9	60.0
Enough space between machines	1	6.7	14	93.3
Safe source of radiation	3	20.0	12	80.0
Safe stairs	12	80.0	3	20.0
Waste disposal system	0	0.00	15	100.0
Cleanliness	3	20.0	12	80.0
Eating and rest area	8	53.3	7	46.7
2.Washing facilities				
keep clean	4	26.7	11	73.3
Number of toilets suitable to number of workers	3	20.0	12	80.0
3.Medical facilities				
Clinic nearby	13	86.7	2	13.3
Ambulance equipped with emergency facilities	0	00.0	15	100.0
Enough first aid supply	12	80.0	3	20.0
Presence of safety occupational supervisors	11	73.3	4	26.7
4.Fire control measures availability				
Suitable fire extinguishers	14	93.3	1	6.7
Enough extinguishers	2	13.3	13	86.7
Easily accessible extinguishers	4	26.7	11	73.3
Workers are trained to put fire off	6	40.0	9	60.0
5. Emergency exit				
Exit enough to allow prompt escape	2	13.3	13	86.7
Exit clearly marked	12	86.7	3	13.3
6. Storage system				
The storage area far from the workers	12	80.0	3	20.0
Chemicals are stored correctly	6	40.0	9	60.0
Containers are labeled with chemical name	3	13.3	12	86.7

Table (6): Observational checklist for assessing environmental hazards in the work place (n=150)

Types of hazards	No	%
Physical hazards		
Noise	93	62.0
Electricity	57	38.0
Mechanical hazards		
Heavy objects	38	25.3
Stand for long periods	39	26.0
Bending for long period	6	4.0
Sit for long period	9	6.0
Falling and sliding	15	10.0
Sudden movement	43	28.7
Biological hazards (polluted air and water)		
Yes	115	76.7
No	35	23.3
Chemical hazards		
Gases	117	78.0
Chemical materials	16	10.7
No exposure	12	8.0
Others	5	3.3

Types of hazards		No	%
Types of chemical used			
	Chlorine	109	72.7
	Sodium hydroxide(NaOH)	4	2.7
	Gear	9	6.0
	Hydrochloric acid	16	10.7
	Others	12	8.0
Psychological hazards			
	Verbal abuse	4	2.7
	Length of work	35	23.3
	Lack of cooperation	2	1.3
supervisors	Lack of appreciation of	18	12.0
	Increased workload	43	28.7
	No exposure	48	32.0

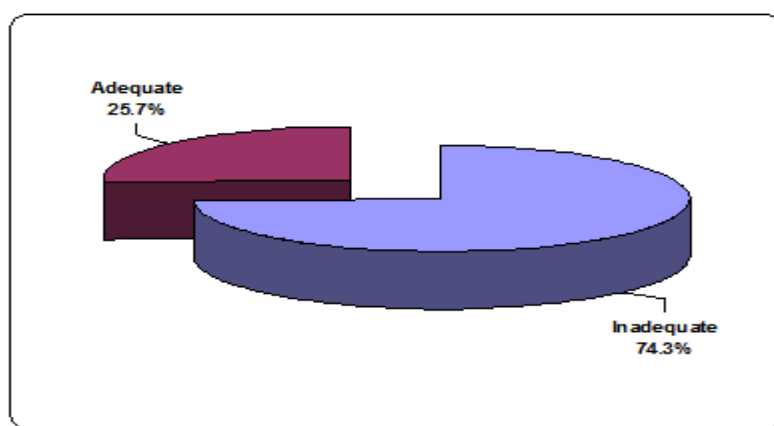


Figure 1: Distribution of total score for environmental safety of studied places at BeniSuif Governorate.

Table (7): Relation between workers total satisfactory level of knowledge about occupational hazards and their health problems

Health problems	Total satisfactory level of knowledge	
	χ^2	P
Physical hazards	50.589	0.744
Mechanical hazards	63.016	0.303
Biological hazards	18.274	0.000**
Chemical hazards	9.818	0.007**
psychological hazards	17.596	0.001**

** Statistically Significant at ($p \leq 0.05$)

Table (8): Relation between workers using personal protective devices and their health problems

Health problems	Using personal protective devices	
	R	P
Physical hazards	0.141	0.052
Mechanical hazards	0.195	0.007**
Biological hazards	0.129	0.075
Chemical hazards	0.192	0.008**
psychological hazards	0.128	0.078

** Statistically Significant at ($p \leq 0.05$)

References

- [1]. **Anand, T., Chauhan, A., Kushora, J., Danielsen, T., and Asante B.,(2016):** low back disorder among waste collection workers, prevalence and risk factors, master thesis of science in the department of community health and epidemiology in college of medicine ,university of Saskatchewan.
- [2]. **Forst,L., Nickles,I.,Conroy,I.,(2015):**The who modules in occupational safety and health: Training for prevention. public health Rep.2015 feb,124(1):169-176 .
- [3]. **Nellie J and Brown M.S., C.I.H (2014) :** Cornell University Chemical Hazard Information Program Dr. James Platner, Toxicologist Director Health Hazard Manual Waste water treatment plant and Sewer workers (exposure to chemical hazards and biohazards).
- [4]. **Tiwari,A., Nagar,O., and Abad, M.(2014):**Occupational medicine division, National institute of occupational health, India, Occupational Medicine Division. Article in IJOEM(Indian Journal of Occupational and Environmental Medicine). **5-**
Thorn J, Beijer L and Rylander R.(2016): Work related symptoms among sewage workers: A nationwide survey in Sweden. Occup Environ Med. 2012;59:562–6. [PMC free article] .
- [5]. **Occupational Safety and Health Administration (OSHA),(2017):** United states ,department of labor, occupational safety, United states ,department of labor, occupational safety, available at:<https://www.osha.gov/SLTC/Personal protective equipment/>,(accessed at 2 october 2017,8pm
- [6]. **Benjamin,O.(2012):** Fundamental principles of occupational health and safety, International Labour Office, pp 17.
- [7]. **Kasaenasab ,A.,Jahangiri, M.,Karimi, A.,andSafariS.,(2017):** Respiratory disorder among workers in slaughter houses (safety and health at work)department of occupational health engineering school of health, student research committee ,Shiraz university of medical science ,Shiraz, Iran.
- [8]. **Suryakiran M.(2016):** Study to assess the knowledge regarding occupational hazard , by Rajiv Gandhi university of health sciences, Bangalo.
- [9]. **Mostafa,N S., and Momen, M.,(2014):**Occupational health and safety training :knowledge, Attitude and practice among technical Education students, Egyptian journal of occupational medicine,Vol.,38(2):153-165.
- [10]. **Amirhossein, M.,Alan, D., Siti, F.,(2012) :** Application of Occupational Health and Safety ,Management System at Sewage Treatment Plants (Civil Engineering Department, Faculty of Engineering, University Technology Petronas, Malaysia).
- [11]. **Ahram(2016):** Ministry of agriculture,agriculture research center, available at: Agri.ahram.org.eg/newscontent/9/7846/ministry of agriculture, agriculture research center(accessed at 2016-10-18,7pm).
- [12]. **Devex (2013):** AbuRawashwastewatertreatmentplantin Egypt, Development and implementation of apublic-private partnership for upgrade and expansion. Devex Retrieved 28 December 2013
- [13]. **Tanski,H.,Reonen,T.,Koivunent,J(2017):**Air borne enteric coliphages and bacteria in sewage treatment plants,water research,43,2558-2566,201
- [14]. **Ibrahim,A.,(2014):**Relationship between occupational health hazards and the used of safety measures among workers in Textile Factory in Port Said City. Published master thesis, Faculty of Nursing ,Port Said University.
- [15]. **Ahmed,S.,(2016):**Assessment of knowledge and practice of health team toward infection control in blood banks at Assuit city ,published master thesis.
- [16]. **Malakahmed A, Downe A and Fadzile S.,(2014):**Application of occupational health and safety management system at sewage treatment plants ,Business Engineering and Industrial Application Colloquium (BEIAC),School of Business, Curtin university, Sarawak ,Malaysia.
- [17]. **Frank ,R.(2018):** Bureau of labor statics ,U.S. Department of labor, Occupational out look,2018 11Edition,Water and liquid waste water treatment plant and system operator.
- [18]. **Norman I, Kretchy J and BrandfordE.,(2013):** Neck, wrist and back pain among solid waste collectors ,case study of Ghanaian waste management company open puplic heal ,journal ,pp 59_66
- [19]. **Saad , A., Ebrahim ,Y and Abdelshakour, A.,(2015):** Environmental and occupational medicine department and air pollution research department ,national research Centre, Egyptian journal of occupational medicine,2015,27(2):201-228.
- [20]. **Aboelwafa H , Elbestar S , Elgilany A and Awad E ,(2013):** Musculoskeletal disorder among municipal waste collectors in Mansura ,Egypt,occupational and environmental medicine research ,BritishMed J.open,vol.2,2013.
- [21]. **Johnson O and MotilewaO,(2018):** knowledge and use of personal protective equipment among auto technicians in Uyo, Nigeria ,British journal of education ,society ,behavioral science, ISSN 2278-0998,page 1-8 ,original-research article ,department of community health ,university of Uyo teaching hospital ,Uyo, Nigeria.
- [22]. **Kvernberg E,(2017):** Performance assessment of awaste watertreatment plant in Kumasi ,Ghana ,master thesis,university of life science ,department of mathematical sciences and technology.
- [23]. **Asante B,(2016):** low back disorder among waste collection workers, prevalence and risk factors, master thesis of science in the department of community health and epidemiology in college of medicine ,university of Saskatchewan.
- [24]. **Moravia A ,(2016):** Water and waste water operators in united states ,chronicle guidance created in cooperation with the water environment Fderation.
- [25]. **Amabya G,(2016):**Occupational risk &hazards exposure, knowledge of occupational health, safety practice,safety at measure among workers of Sheba leather Ethiopia.Vol.4.Issue,2.
- [26]. **Paxeux N,(2017):** Organic pollutants in the effluents of large waste water treatment plant in Sweden, GRYAAB, Goteborg regional sewage workers, Sweden.
- [27]. **Das S,(2016) :** Occupational health problems among door to out door solid waste handlers in Surat city ,Gujarat ,master thesis ,achuthamenoncentre for health sciences studies ,search trairunal institute for medical science and technology thiruvananthapuram, Kerala.

Sahar Ahmad Shafik" Occupational Health Hazards among Workers in Sewage Treatment Plants in Beni-Suef Governorate" IOSR Journal of Nursing and Health Science (IOSR-JNHS), vol. 8, no.01, 2019, pp. 04-14.