

Health Awareness Regarding Occupational Hazards among Workers in Sewage Treatment Plant

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Abstract

Background: Sewage treatment plants are associated with various health hazards. **Aim:** this study aimed to assess health awareness regarding occupational hazards among workers in sewage treatment plant. **Research design:** descriptive research design was used. **Setting:** the study was conducted at the Belqas Sewage Treatment Plant in Shoubra District. **Sampling:** a convenience sample was used and 100 workers were included in the study. **Tools of data collection:** two tools were used, **first tool:** a structured interviewing questionnaire about socio-demographic characteristic, previous medical and surgical history, health status of workers and knowledge of workers about work environment, occupational hazards, methods of prevention and first aid. **Second tool:** performance sheet about safety measures and first aid. **Result:** revealed that 89% of workers had total poor level of knowledge, 3% of them had good level of knowledge and 8% of them had average level of knowledge. Also, 90% of workers had total unsatisfactory performance. **Conclusion:** there was a strong statistically significant relation between the total knowledge score and the total performance score ($P < 0.005^{**}$). **Recommendations:** 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.

Key words: Occupational hazards, Workers, Sewage treatment plants.

Introduction

Occupational health is a multidisciplinary activity aimed at the protection and promotion health of workers by preventing and controlling occupational diseases and accidents and by eliminating occupational factors and conditions hazardous to health and safety at work, it also aimed to the development and promotion of healthy and safe work, work environments and work organizations, the enhancement of the physical, mental and social well-being of workers enabling workers to conduct socially and economically productive lives and to contribute positively to sustainable development (Kasacinab et al., 2017).

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 the international labour organization on the global burden of occupational

injuries and diseases, these workers suffer from 140,000 to 355,000 occupational injury deaths per year (Nickles & Conroy, 2017).

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 (Anand et al., 2016).

Sewage treatment is the process of converting the waste water collected from mainly households into treated water which can be disposed off safely into the environment, sewage treatment plant basically consists of primary, secondary and tertiary treatment processes with variation in treatment technologies depending upon the type of influent to be treated with the

ultimate aim of producing treated effluent which can be discharged into the environment with minimal harm to the water bodies (Agnihotri, 2019).

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, 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 (OSHA, 2017).

The sewage and sanitary workers suffer mainly from chemical and biological hazards, this can be prevented through engineering, medical and legislative measure, these workers should also be benefited from occupational health services, include periodic health monitoring and regular awareness programs should be conducted to impart education regarding safer work procedures and use of personal protective devices (Nagar & Abad, 2018).

Personal protective equipment belongs to a group of equipment that protects employees against dangers in the work, the decision to use such equipment must be preceded by all possible actions both technical and organizational aimed at reducing the hazard to an admissible level, a frequent cause of accidents in the workplace is failure to use personal protective equipment by the workers, workers reluctance to use PPE may result from the equipment not being well fitted to the needs of a user and additional conditions connected with work organization in a specific workplace (Salvendy, 2017).

Sewage workers must have the awareness on first aid in order to do for himself or to help others in an accident, mortality rates will be reduced and general health of population will be improved if focus on safety strategies in emergency and public awareness are expand, workers had poor awareness regarding first aid, after the training their awareness regarding both first aid was significantly increased (Singh et al., 2018).

Significance of the study:

Workers represent half of the world's population, maintaining a safe working environment is reflected on a health of workers, 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 2019 was 5.2 injuries per 100 workers (Amirhossein et al., 2019).

Egypt had 389 municipal waste water treatment plants in 2019, the capacity of Egypt's wastewater treatment plants was more than 13.5 million cubic meters per day (Devex, 2019).

Occupational health nursing is concerned with the nursing component of comprehensive occupational health care and contributes health promotion, protection of the health of disabled workers, the nurses dealing with occupational health can play a major role in promotion, protection, prevention and control of diseases & disabilities (Mostafa & Momen, 2019).

Aim of the Study

The study aimed to assess health awareness regarding occupational hazards among workers in sewage treatment plant through:

- 1- Assessing workers' knowledge regarding occupational health hazards
- 2-Assessing workers' performance towards occupational health hazards.

Research question:

- 1- What are the level of knowledge of the workers about occupational hazards?
- 2- What are the level of performance of the workers about occupational hazards ?
- 3-Is there relation between workers' knowledge and performance regarding occupational hazards?

Study design:

descriptive research design was used to conduct the study.

I-Technical design:

The technical design includes; the setting, subject & tools that used in the study.

Setting:

The study conducted at the Belqas Sewage Treatment Plant in Shoubra district because this the main place for sewage treatment in Cairo Egypt.

Sampling:**Sample type:**

Convenience sample was used

Sample size

The sample size was chosen in compliance with workers numbers in each department. The total number of workers in Belqas sewage treatment plant were 100 workers who agreed to participate in the study and fulfill the following criteria.

Criteria

Study subjects include the following criteria; workers who exposed to occupational hazards during working hours in sewage treatment plant.

Technique for selection:

The first worker who meets the inclusion criteria in the first day of the study period was included. Once the data covered, the next worker was included and so on, till the sample size achieved.

Tools of data collection:

Two tools were used for data collection:

First tool: An interviewing questionnaire It included four parts:

Part(1): Socio-demographic characteristics for workers

A) It was concerned with socio demographic characteristics as: age, marital status, level of education, number of family and income .

B) It was concerned with job characteristics as job type, work place, working experience and working hours.

Part(2): Previous medical and surgical history of the workers

It was concerned with the assessment of workers' medical history and surgical history related to previous disease, previous operation, operation as a result of occupational hazards and previous accident as fracture, burns, falling, sliding.

Part (3): Health status assessment of the workers

It was concerned with presence of occupational disease, pneumonia, Bronchial asthma, hypertension, hepatitis, hearing loss, diabetes, presence a clinic in sewage treatment plant, presence hospitals to follow up, previous test, type of medication.

Part(4): Worker's knowledge regarding work environment, occupational health, hazards and knowledge related to safety measures and first aid designed by **Lancaster and Momtaz (2016)**, modified by the researcher based on the recent related literature review and experts' opinion.

It was used to assess worker's knowledge regarding work environment, occupational health, occupational hazards, safety measures and first aid.

Scoring System for knowledge:

The scoring system included two levels: one point for correct answer, zero for incorrect answer. After that with proper statically analysis the total level of knowledge scores ranged from 0 to 194, score less than 50% from (0-95) were evaluated poor knowledge, score less than 75% from (96-143) as average knowledge and score equal or more than 75% from (144-194) as good knowledge.

Second Tool: Workers' performance sheet

It was included safety measures and first aid which adapted from safety and health inspection checklist sheet

Included two parts:

Part (1): Performance checklist of using personal protective equipment designed by **Downe (2016)**, modified by researcher and provide its content validity by research supervisors.

Performance checklist was designed to evaluate the workers performance with the using of personal protective equipment. It included nine items of personal protective equipment as apron, gloves, ear muffs, safety shoes, eye protection, respirator, mask for dust Face shield and helmet.

Part(2): Workers' performance checklist regarding first aid.

It was concerned with workers performance during situation as first aid of fracture, bleeding, epistaxis, electric shock, burn, chemical burn, electric burn and insertion foreign bodies into eyes.

Scoring System of performance:

Questionnaire for assessing performance of workers' personal protective equipment and first aid consisted of two point scale; it has a score range from 0 to 1 distributed as; done =1; not done=0. The total score for all items related to performance 78 grade and was categorized into two levels as followings less than 60% (0-45) denoting unsatisfactory and more than60% (46- 78) representing satisfactory.

Administrative design:

An official permission was obtained by submission of formal letter from the administrators of Faculty of Nursing, Ain Shams University to Managing Director of Cairo Sewage Treatment Plant company to get an approval for data collection to conduct the study after explanation of purpose of the study.

II Operational design:

The study to be completed passed through different phases included: preparatory phase, pilot study and field work phase.

A. Preparatory phase:

Review of the past and current available related literatures covering all aspects of the research subject, using the available books, journals, articles and nursing magazines. In order to get a clear picture on the research problem, as well as to design the study tools for data collection.

B. Pilot study:

A pilot study was carried out to test the study tools in terms of its clarity, arrangement, items and the time required to be filled, It was conducted on 10 workers of the study sample, were chosen from department. After that the researcher conducted with the subjects. Then they were excluded in the study sample. Data obtained from the pilot study were analyzed and accordingly the necessary modifications in the study tools were done.

Content and tools validity:

The tools were tested through five experts from community health nursing department, Faculty of Nursing, Ain Shams University.

The reliability:

It was done by Cronbach's Alpha coefficient worker test which revealed that the tools consisted of relatively homogenous items as indicated by the moderate to high reliability of each tool. The questionnaire was tested to be reliable with Cronbach's alpha coefficient worker test for items showed tool proved to be strongly reliable.

C. Fieldwork:

- An official permission including the title and purpose of the study were submitted from the dean of faculty of nursing Ain Shams University and directed Chairman of the Board and Managing directors of Cairo Sewage Treatment Company to get an approval for data collection to conduct the study.
- After obtaining a permit the researcher meet the chairman in sewage treatment plant and explain the aim and program content.
- After permission the researcher started with introducing herself to the selected workers in sewage treatment plant and explaining the aim of the study, assured that the data collected will be confidential and will used only to achieve the purpose of the study.
- Subjects of the study samples were selected by the helped of the occupational safety and health supervisors in the sewage treatment plant, because there was difference in the type of job for workers.

- The interview conducted in the morning to afternoon according to the presence of selected sample. The first workers with the inclusion criteria who met the researcher in the first day of the study period included. Once the data covered, the next worker included and so on.
 - The actual work of this study started and completed within three months from June (2020) and was completed by start of September (2020). The assessment phase was done for 100 workers and fulfilled through visited the setting two days/weeks (Saturday and Sunday), nearly 10 workers, little more or less were assessed per visit.
- When $P > 0.05$ it is statistically insignificant difference.
 - When $P < 0.05$ it is statistically significant difference.
 - When $P < 0.01$ or $P < 0.001$ it is high statistically significant difference.

Results:

Table (1): This table reveals that 43% of the workers aged more than 50 years old, and 36% of them aged 40 to less than or equal 50 years old. Where 87% were married, 21% of them had a secondary educational level. Also, 54% of them had more than 5 members in their families, and 64% of them had not enough family needs.

Table (2): Illustrates that 41% of the workers were technical operators, and all of them (100%) adhered to a daytime-work. Also, 73% of them had more than 10 years of experience with a mean \pm SD of 14.9 ± 5.5 . 90% of them worked for 6 to 8 hours daily.

Figure (1): describe that According to total knowledge of workers, only 3% of workers have good level of knowledge, 8% of them have average level of knowledge and 89% of them have poor level of knowledge Difference observed highly statistically significant P value < 0.01 .

Figure (2): describe that According to total performance of workers, 10% of workers have satisfactory performance, 90% of them have unsatisfactory performance . Difference observed highly statistically significant P value < 0.01 .

Table (3): illustrates strong statistically significant relations between workers' knowledge and performance regarding occupational hazards ($P < 0.005^{**}$). As, 85% and more of those with poor level of knowledge, had unsatisfactory level of performance.

Ethical consideration:

Approval was taken from the Dean and faculty ethical committee before starting the study. Verbal consent was taken from all subjects participating in the study. The study objectives and benefits were clarified to the sharing subjects; they were also informed about the tools of the study (the questionnaires they had to answer). They were reassured about the confidentiality of the study data.

Statistical Design:

Data were revised, coded, analyzed and tabulated using the number and percentage distribution and carried out at the computer, using appropriate statistical method.

The following statistical techniques were used:

Percentage, Mean value, Standard deviation, Chi-square (X^2), Correlation test (r) and Proportion probability (P -value).

Significance of results

Table (1): Distribution of workers according to their socio-demographic characteristics (n=100).

Items	NO	%
Age:		
• 30- <40 years	21	21.0
• 40- <50 years	36	36.0
• 50 +	43	43.0
	Mean \pm SD 46.8 \pm 8.1	
	Min= 32 years Max=59 years	
Marital status		
• Married	87	87.0
• Widow	2	2.0
• Divorced	11	11.0
Educational level		
• Illiterate	15	15.0
• Read / write	17	17.0
• Primary education	16	16.0
• Preparatory education	15	15.0
• Secondary education	21	21.0
• Highly education	16	16.0
Number of family members		
• 1-2 members	10	10.0
• 3-5 members	36	36.0
• More than 5 members	54	54.0
Monthly Income		
• Not enough to family need	64	64.0
• Enough to family need	36	36.0

Table (2): Distribution of workers according to their job characteristics (n=100).

Items	NO	%
Job		
• Chemistry technician	7	7.0
• Safety and health	4	4.0
• Electrical technician	14	14.0
• Technical operator	41	41.0
• Machinery maintenance worker	14	14.0
• Agricultural technician	20	20.0
Work system		
• Daytime work	100	100.0
Years of experience		
• 3- < 5 years		
• 5- < 10years	10	10.0
• > 10 years	17	17.0
	73	73.0
	mean \pm SD 14.9 \pm 5.5	
	Min= 3 years Max=35 years	
Work hours		
• 6-8 H		
• > 8 H	90	90.0
	10	10.0

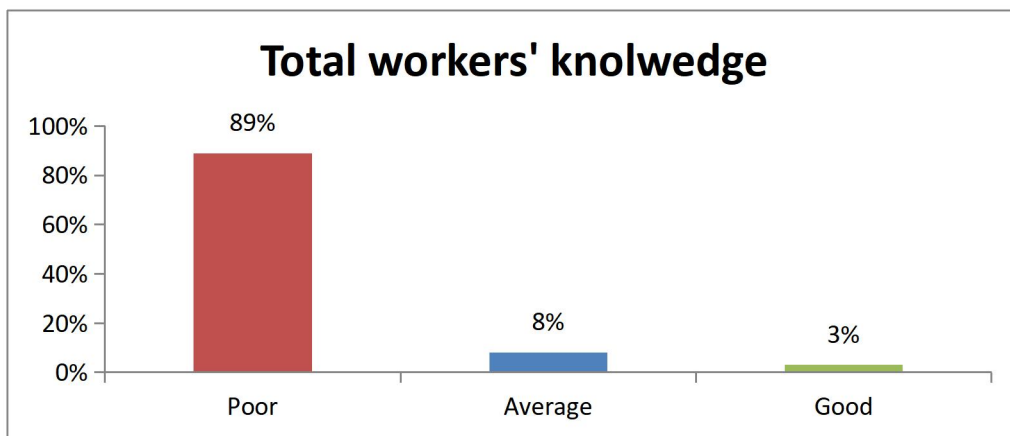


Figure (1): Distribution of workers regarding their total knowledge (n=100).

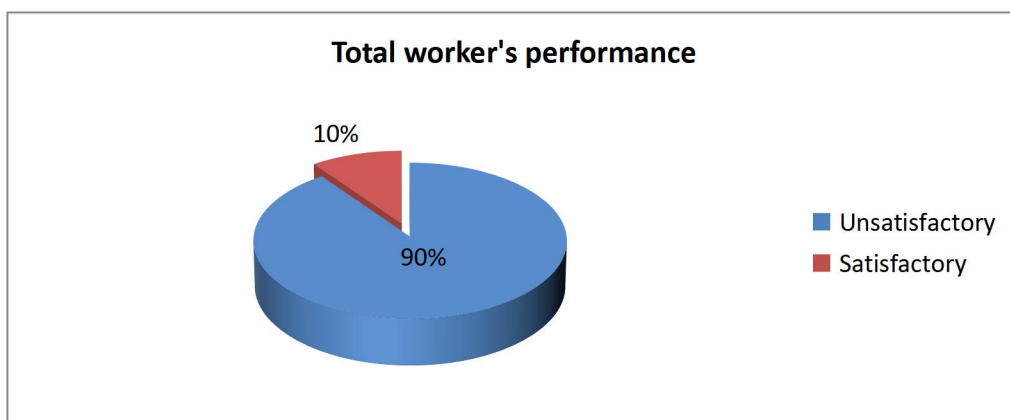


Figure (2): Distribution of the workers' performance (n=100).

Table (3): The relation between workers' knowledge and performance (n=100).

Workers' total performance	Workers' total knowledge						X ²	P value
	Poor		Average		Good			
	No	%	No	%	No	%		
Unsatisfactory performance	85	85.0	4	4.0	1	1.0	20.8	<0.000**
Satisfactory performance	4	4.0	4	4.0	2	2.0		

(**) High Significant at P < 0.01

Discussion

Socio-demographic characteristics for workers in sewage treatment Plant:

In the present study, more than third of workers their age 40 to less than or equal 50 years old, majority of workers are married, less than one quarter of workers have secondary education level. These findings were contrary with **El Hamid et al., (2016)** who studied occupational health hazards among sewage workers at Al – Qalyobia Governorate and found that third of the studied sample aged 40 to less than 50 years, about half of workers were married and more than third of workers were illiterate

Concerning monthly income, the present study revealed that more than half of workers haven't enough income to family need. The study also reflected that all workers adhered to a daytime-work so the most of them worked for 6 to 8 hours daily. These findings were in accordance with **El Hamid et al., (2016)** who studied Occupational health hazards among sewage workers at Al – Qalyobia Governorate and found most of the workers reported the monthly income was insufficient and majority of them worked for 24 hours. Also, more than half of workers had more than 5 members in their families, this finding was contrary with **El Hamid et al., (2016)** who reported that less than three quarters of workers had 5 members in their families.

Regarding the type of job, the result of the present study revealed that more than third of workers were technical operators. This finding was contrary with **Mubeena et al., (2019)** who studied an occupational health survey of sewage treatment plant workers of Dakshina Kannada, Karnataka and found that minority of workers were technician. The study also reflected that most of workers had more than 10 years of experience. This finding was contrary with **Mohammed, (2018)** who studied assessment of occupational health risks among workers in wastewater treatment plants, Gaza Strip and reported that minority of workers had more than 10 years of experience.

Concerning workers' total knowledge:

The current study illustrated that majority of workers had poor level of total knowledge regarding occupational hazards. This result was contrasted with **Amabya, (2016)** who studied 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.

Workers' total performance:

The present study showed that majority of workers had unsatisfactory performance regarding occupational hazards. This result was agree with **Shafik et al., (2019)** who studied Occupational health hazards among workers in sewage treatment plants in Beni-Suef, reported 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 study findings was in disagreement with **Saad et al.,(2015)** who studied Environmental and occupational medicine department and air pollution and found that minor of workers were exposed to physical hazards as noise & electricity.

Relation between workers' knowledge and performance regarding occupational hazards:

The current study illustrated that strong statistically significant relations between workers' knowledge and performance . This result was in contrasted with **Shafik et al., (2019)** who found that no statistical significance between using personal protective devices and physical & biological hazards. Additional, the finding was similar with **Paxeux, (2017)** who studied Organic pollutants in the effluents of large waste water treatment plant in Sweden and found that there was statistical significance

difference with using personal protective equipment and physical & biological hazards.

Conclusion

Based on the results, the present study concluded that:

The results of this study cast light on worker's knowledge and performance toward occupational hazards had unsatisfactory level of performance and poor level of knowledge.

A strong statistically significant relation was observed among workers' knowledge and performance ($P < 0.005^{**}$), majority of the workers had poor level of knowledge had unsatisfactory level of performance.

This returned to lack of awareness about occupational health, hazards, safety measures and first aid.

Recommendations

Based on these findings of the present study the researcher recommended;

- 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.
- **For further research in this field;**
- 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.
- In- services educational programs
- International standard occupational health and safety assessment series in sewage treatment plant to improve occupational health and safety performance of the workers and emphasizing on the importance and usefulness of personal protective equipment to be used in the right way.

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