

Occupational Health Hazards among Workers in Sewage Treatment Plants

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Abstract

Background: Workers in sewage treatment plants exposed to many occupational hazards and risks during performing their duties all over the day. **Aim of the study:** To assess the occupational health hazards among workers in Sewage Treatment Plants. **Research design:** A descriptive research was utilized. **Setting:** The study was conducted at sewage treatment plants and lifting stations at Benha City. **Study subjects:** A Convenience sample of all sewage treatment plants and lifting stations presented at Benha City 220 worker divided around 3 treatment plants and 9 lifting station at Benha City. **Tools of data collection:** Two tools were used; **Tool I:** A Structured interviewing questionnaire divided into four parts: **First part:** It was concerned with **A:** Socio-demographic characteristics of the studied sewage workers & **B:** Characteristics of work of the studied sewage workers, **second part:** health problems of the workers during last six months, **third part:** knowledge of the workers about occupational hazards, safety measures and first aids, **fourth part:** workers' reported practices regarding first aids related exposed occupational hazards and **Tool II:** Observational check-list to assess environmental safety condition. **Results:** 14.1% of the studied workers had tachypnea, 20.5% of them had gastrointestinal problems and H pylori, 73.6% of the studied sewage workers had poor knowledge and 65.5% of the studied sewage workers had unsatisfactory total practices regarding first aid practices. **Conclusion:** The majority of the studied sewage workers had health problems and the total practices score of the studied sewage workers were unsatisfied. **Recommendations:** Conducting health education program for sewage workers about occupational health hazards and preventive measures.

Keywords: Occupational Health Hazards, Sewage Treatment Plants, Workers

Introduction:

Sewage is generated by residential and industrial establishments. It includes household waste liquid from toilets, baths, showers, kitchens, sinks, and so forth that is disposed of via sewers. In many areas, sewage also includes liquid waste from industry and commerce. The separation and draining of household waste into greywater and black water is becoming more common in the developed world. Greywater is water generated from domestic activities such as laundry, dishwashing, and bathing, and can be reused more readily. Blackwater comes

from toilets and contains human waste (Arivalagan & Narmatha, 2020).

Sewage treatment begins with physical treatment processes such as screening and grit trapping to remove large material and debris from the raw water, followed by biological treatment. The most common method of biological Sewage treatment is the Conventional Activated Sludge (CAS) process. Aeration and recirculation of biologically active solids (“bio solids” or “solids”) maintain diverse communities of microorganisms in CAS to degrade a wide range of organic compounds and nutrients.

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Clarification (gravity settling) separates treated water from the bio solids, followed by disinfection and discharge to the environment (**Crini & Lichtfouse, 2019**).

Occupational hazards that may potentially exist in the sewage plant are chemical, biological, and physical hazards. Exposure to these potential occupational hazards can lead to work-related diseases and adverse health effects. As a result, much previous literature shows that workers at sewage treatment plants are at high risk of experiencing a broad range of adverse health impacts, including respiratory disorders (asthma or chronic obstructive pulmonary disease), infections (such as tuberculosis, leptospirosis, hepatitis A, or tetanus), gastrointestinal problems (for example, gastroenteritis), skin illnesses (for instance, contact dermatitis or eczema), cancers (such a lung, stomach, and renal cancers), and general symptoms (such as unusual tiredness and headache) (**Muzaini et al., 2021**).

The workers in Sewage Treatment Plants (STP) are dealing with machines, mechanical equipment and large numbers of chemical materials in order to treat the sewage water expose them to different hazards on their occupational health. As stated in a study, a huge amount of chemical and organisms make the deal with sewage waste dangerous since they transfer to the workers in different ways as hand to mouth contact, the fecal-oral route (eating, drinking or smoking), touching the face with contaminated hands and inhalation of aerosols containing microorganisms (**Dannoun & Nouban 2021**).

Occupational health nurses plays important role in protecting sewage workers' health against health hazards occurring in the work environment, promoting sewage workers' health by appropriate work culture, work organization, promoting mental health, healthy

lifestyle and preventing infections by using specific workplace health polices and management tools. Maintaining work ability and employ ability throughout working life reduce health care costs caused by work injuries, diseases, illnesses, and premature retirement by using resources effectively and efficiently and protecting environment (**Nurwana & Jamaluddin, 2023**).

Globally, occupational injury is becoming a public health emergency. It killed more than 300,000 labor force every year and it caused many more cases of disability. Health at work and healthy work environments are an input to the national economies via improved productivity, product quality, work motivation, job satisfaction and overall quality of the worker's life and society. Though occupational injury is preventable, it is becoming amongst the major public health problems that causes an estimated economic loss of 5–10% growth national product beyond its increased risk of fatality and morbidity rates, in which 14 deaths reported per 100,000 workers (**Alamneh et al., 2020**).

Wastewater treatment plants workers are exposed to many different occupational hazards. In Egypt there are about 15716 cases have non-fatal occupational hazard by economic activity. About 582 workers of them are in the sewage treatment sector. At the same estimation there are found that the numbers of injuries per 100000 workers was 13.8 for both sex male and female at Egypt (**International Labor Organization (ILO), 2021**).

Aim of the study:

This study aimed to assess the occupational health hazards among workers in sewage treatment plants at Benha City.

Research questions:

- What are health problems of the sewage workers related to their work in sewage

treatment plants at last six months?

- What are the studied workers' knowledge regarding occupational health hazards related to sewage treatment plants?
- What are the studied workers' reported practices regarding prevention of occupational health hazards related to working at sewage treatment plants?
- Is there a relation between sociodemographic characteristic of the studied workers and their knowledge and practices regarding occupational health hazards related to sewage treatment plants?
- Is there a relation between knowledge and practices of the studied workers regarding occupational health hazards related to sewage treatment plants?

Subjects and method:

Research design:

A descriptive research design was utilized to conduct this study.

Setting:

This study was conducted in all sewage treatment plants (12) plant station of Benha City.

Sampling

Convenience sample was used in this study. The total number of workers available at the studied setting were (220) worker, these workers are divided according to their place of work as treatment plants (3 plants) have 68 workers and pump plants (9 pump station) have 152 workers.

Tools of data collection:

Two tools were used for data collection:

Tool (I): A structured interviewing questionnaire which was consisted of four parts:

Part 1: A): Socio demographic characteristics: This tool included age, educational level, marital status, member of family, family type, residence place and monthly income. **B): Characteristics of work:** work hours /day, off days/week, work days/week, experience years, received training courses, name of training courses, number of training courses and occupational safety specialist.

Part 2: Health problems:

Concerned with medical history of the studied sewage workers including previous and current medical history.

A)- Previous medical history included two closed ended questions first about medical examination conducted for workers before working in sewage treatment plants and the vaccination that were taken before work in sewage treatment plants. **B)-** Current medical history included six open ended questions about periodic medical examination that were conducted for the workers during work, the dates for periodic examination, periodic checkups that were done to the workers by the plant during work, chronic diseases, infectious diseases and health problems experienced by workers in sewage treatment plants that were included about seven systems of the human as breathing problems, skin problems, hearing problems, eye problems, digestive problems, problems with the nervous system and bone problems.

Part 3: Workers' knowledge:

It was concerned with workers' knowledge about:

A- Knowledge of the workers about sewage treatment plants included three closed ended questions about meaning, components and stages of treatment of sewage.

B- Knowledge of the workers about occupational hazards consisted of two closed

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ended questions about meaning and types of occupational hazards as physical hazards, chemical hazards, biological hazards, mechanical hazards and psychological hazards.

C- Knowledge about occupational health and safety included seven closed ended questions about meaning, goals, general procedure, occupational safety and health documents and preventive measures before, during and after performing a task in sewage treatment plant.

D- Workers' knowledge about first aids that included two closed ended questions about first aids meaning and supplies.

Scoring system:

The scoring system for workers' knowledge was calculated as follows: (2) score for correct and complete answer, and (1) score for correct and incomplete answer, while (0) score for don't know.

The total knowledge score = 40 point.

The total knowledge score was considered good if the score > 75% (>30 point), while considered average if it equals 50 - 75% (20 – 30 point) and considered poor if it equals < 50% (< 20 point).

Part 4: Workers' reported practices:

Workers' reported practices regarding wearing personal protective equipment and first aids related exposed occupational hazards which contained eight items that consisted of 80 closed ended questions about burning, electric burning, injury, suffocation, sinking, falling, electrical shock, fainting and using personal protective equipment.

Scoring system

The scoring system of sewage treatment plants workers' practices was calculated as follows (1) for done or (used) and (0) for not done or (not used).

The total reported practices score = 80 points.

The total reported practices score considered satisfactory if the score $\geq 75\%$ (≥ 60 points) and unsatisfactory if it $< 75\%$ (< 60 points).

Tool (II): An observational checklist

It included ten items that contained 63 point as follows; **Ventilation** containing 8 points; good ventilation, available windows, open doors, fans, air suction, fans for machines rooms, empty space between rooms and available trees and green areas. **Lightening** which contained 7 points; sufficient lightening, enough number of lamps, light bulbs, led and safe lamps, night lightening, light signals for night work and diesel engine. **Cleanliness** which consisted of 5 points; number of toilets enough for workers, cleaning supplies, enough number of washing basins, chlorine and disinfectant solution and clean and disinfectant toilets. **Roofs and floors** that contained 4 points; free from fraction and protrusion, anti-slippery floors, overcrowded with work disposals and busy with machines and instruments. **Fire control system** that consisted of 6 points: enough number of fire extinguishers, appropriate types of fire extinguishers, easy reach and use of fire extinguishers for workers, fire extinguishers contain instructions label written on it, routine checkup made on fire extinguishers periodically and results of periodic checkup written on checkup label. **Emergency exit** which consisted of 5 points; enough numbers of entrances and exits, exits are free from obstacles, well-marked, separate light and dry and clean exits. **Storage area** that contained 8 points; enough space for storage, equipment and machinery stores, spare parts stores, scarp stores, chemicals are stored appropriately, chemicals stored are labeled with highly dangerous, stores keys present in safe place and storage area kept dry and clean. **Diesel unit** which contained 4 points; separate room,

contain fire extinguishers, contain stake to remove fumes and contain instructions board. **Electrical distribution board** that contained 9 points; separate room, dielectric board, standardize and valid, running keys are labeled in the board, contain master key, high dangerous label, safe keys, all keys defined and contain fire extinguishers in its room. **Health clinics** that consisted of 7 points; emergency equipment, ambulance, enough number of nurses, available and easy reached, first aid kits, all specialty available and contain referral sheets.

Scoring system

The scoring system for environmental conditions of sewage treatment plants was calculated as follows (1) for present and (0) for not present. The total environmental conditions score was (63 point). The total environmental conditions score was considered sanitary if the score $\geq 80\%$ (≥ 51 point) and unsanitary if it $< 80\%$ (< 50 point).

Validity of the tools:

The tools validity was done by three of Faculty's Staff Nursing experts from Community Health Nursing Specialties who reviewed the tools for clarity, relevance, comprehensiveness, applicability and reliability. Modifications were done accordingly based on their response.

Reliability of the tools:

The reliability of the tools was done by Cornbrash's Alpha coefficient test which revealed that which the two tools consisted of relatively homogenous items as indicated by the moderate to high reliability of each tool. The internal consistency of knowledge was 0.751 and 0.766 for practices.

Ethical Consideration:

All ethical issues were assured; oral consent has been obtained from workers before conducting the interview and given them a brief

orientation to the purpose of the study. They were also reassured that all information gathered would be treated confidentially and used only for the purpose of the study. The workers had the right to withdraw from the study at any time without giving any reasons. The study didn't show any physical, social, or psychological risks. Ethics, values, and cultures were respected.

Pilot study:

The pilot study was carried out on 22 workers who represented 10% of the total sample size (220 workers). The pilot study was made to assess the tools clarity, applicability and time needed to fill each sheet as well as to identify any possible obstacles that may hinder the data collection. The pilot study was included as no modifications were done.

Field work:

The actual field work was carried out over a period of 6 months from the beginning of January 2022 up to the end of June 2022. Workers' consent was obtained before collection of the data. The researcher visited the treatment plant from 9 A.M. to 12 P.M., three days per week (Saturdays, Mondays and Thursdays) to collect the data from the workers. The average time needed to fill the tool was around 30 to 40 minutes; the average number of interviewed workers was 3 workers per day depending on understanding and response of the interviewers.

Statistical analysis:

All data collected were organized, tabulated, and analyzed using appropriate statistical tests. The data were analyzed by using the Statistical Package for Social Science (SPSS) Version 21, which was applied to calculate number and percentages for qualitative data and mean \pm S.D for quantitative data as well as test statistical significance and associations by using chi-square test and

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correlation test (r) to detect the associations between the variables for (p value).

- Highly significant (HS) $P \leq 0.001$
- Significant (S) $p \leq 0.05$
- Not significant (NS) $P > 0.05$

Results:

Table (1): Shows that; 50.9 % of the studied workers' age were from 30-<40 years with mean age was 39.52 ± 6.98 , 84.1 % of them were married, 55.9 % of them had from 3-<6 members of family, 62.7 % of studied workers had nuclear family and 68.2% of the studied workers live in rural areas. As regards monthly income, 55.9% of the studied workers had enough only monthly income.

Table (2): Shows that 61.4% of studied workers worked 8 hours/day, 78.2% of them worked four days or more, and 82.3% of them had 7 years or more of work experience in sewage treatment plants. Also shows that 64.5% of the workers take training courses in occupational health and safety.

Table (3): Revealed that; as regard to respiratory problems; 14.1% of the studied workers had tachypnea, eye problems 20.5% of them had blurred vision, gastrointestinal problems 20.5% of the workers had H pylori, neurological problems 23.2% had tiredness and musculoskeletal problems 24.1% of the studied workers had lumber disc prolapse.

Figure (1): Shows that; 73.6% of studied workers had poor total knowledge while 12.7% of the studied workers had good knowledge about occupational hazards, first aids and occupational health and safety.

Figure (2): Revealed that 65.5% of the studied sewage workers had unsatisfactory total practices regarding first aid practices while 34.5% of them had satisfactory regarding first aid practices.

Figure (3): Revealed that 58.3% of the studied plants had sanitary environmental conditions while 41.7% of them had unsanitary environmental conditions.

Table (4): Indicates that there were a highly statistically significant relation between total knowledge level of the studied workers and their educational level $P < 0.001$.

Table (5): Shows that there were a highly statistically significant difference between total practices of the studied workers and their level of education (P- value < 0.001). While, there was statistically significant relation between total practices of the studied workers and their age (P- value < 0.05).

Table (6): Describes that there was statistically significant relation between total practices and total knowledge of sewage treatment plants workers.

Table (1): Frequency distribution of the studied workers regarding socio-demographic characteristics (n=220).

Socio-demographic characteristics	No.	%
Age/year		
20 - <30	14	6.4
30 - < 40	112	50.9
40 - < 50	64	29.1
50 +	30	13.6
Min –Max	26-55	
Mean ±SD	39.52±6.98	
Marital status		
Single	6	2.7
Married	185	84.1
Divorced	16	7.3
Widowed	13	5.9
Member of family		
< 3 members	27	12.3
3 - < 6 members	123	55.9
6 members or more	70	31.8
Family type		
Nuclear	138	62.7
Extended	82	37.3
Residence place		
Rural	150	68.2
Urban	70	31.8
Monthly Income		
Enough only	123	55.9
Enough and saved	63	28.6
Not enough	34	15.5

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Table (2): Frequency distribution of the studied workers regarding their work characteristics (n=220)

Work characteristics	No.	%
Work hours /day		
8 hours	135	61,4
12 hours	29	13.2
24 hours	56	25.5
Workdays/week		
Two days	25	11.4
Three days	23	10.5
Four days or more	172	78.2
Experience years		
1-3 years	8	3.6
4-6 years	31	14.1
7 years or more	181	82.3
* Name of training courses received		
Risk prevention	111	50.5
First aids	98	44.5
Occupational safety and health	142	64.5
Fire control	111	50.5
Dealing with emergencies and crises	74	33.6
Dealing with closed places	69	31.4
Control of chlorine leakage	68	30.9
Did not take any courses	50	22.7
Received training courses (yes)	170	77.3
Number of training courses (n= 170)		
One course	12	7.2
Two courses	38	22.3
Three courses	68	40
Four courses	25	14.7
Five courses or more	27	15.8

Table (3): Frequency distribution of the studied workers regarding health problems (n=220).

Health problems	No.	%
Respiratory problems		
Nasal irritation	18	8.2
Cough	20	9.1
Allergic bronchitis	30	13.6
Tachypnea	31	14.1
Pneumonia	23	10.5
None	98	44.5
Skin problems		
Cut wound	13	5.9
Skin allergy	22	10.0
None	185	84.1
Hearing problems		
Hearing weakness	4	1.8
Hearing loss	2	0.9
Vertigo or imbalance	14	6.4
Tinnitus	14	6.4
None	186	84.5
Eye problems		
Blurred vision	45	20.5
Redness of eyes	19	8.6
Sensitive conjunctiva	16	7.3
Headache	52	23.6
Vision disturbance	24	10.9
None	89	40.5
Gastrointestinal problems		
Gastroesophageal reflux	31	14.1
Vomiting	16	7.3
Stomach pain	18	8.2
H pylori	45	20.5
Gastroenteritis	43	19.5
None	77	35.0
Neurological problems		
Blurred vision	10	4.5
Headache	37	16.8
Tiredness	51	23.2
Fainting	18	8.2
None	114	51.8
Musculoskeletal problems		
Joint pain	42	19.1
Disc prolapse	53	24.1
Back pain	24	10.9
None	101	45.9

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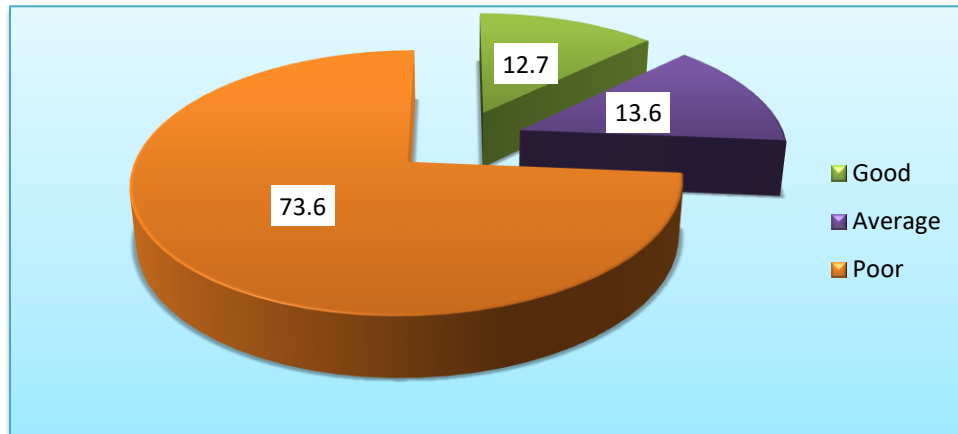


Figure (1): Percentage distribution of the studied workers regarding their total knowledge levels regarding occupational hazards, first aids and occupational health and safety (n=220).

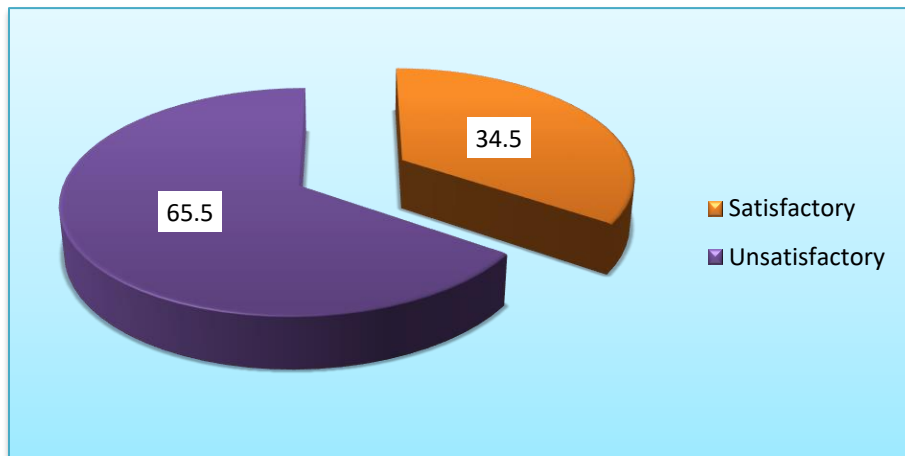


Figure (2): Percentage distribution of the studied workers' total practices levels regarding their first aid (n=220).

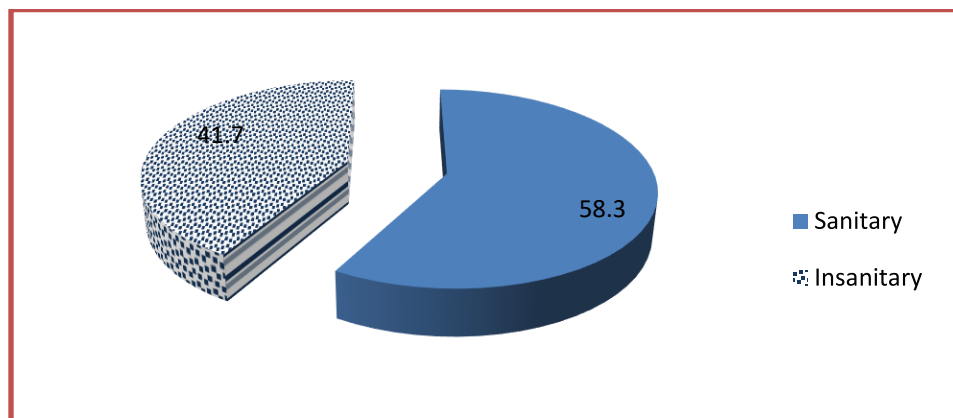


Figure (3): Total safety environmental condition (n=12).

Table (4): Relation between socio demographic characteristics of the studied workers and their total knowledge regarding occupational health hazards (n=220).

Socio-demographic characteristics	Total knowledge levels							
	Poor (n=162)		Average (n=30)		Good (n=28)		X ²	P-value
	No.	%	No.	%	No.	%		
Age/ years								
20 - <30	9	5.6	4	13.3	1	3.6	6.398	0.38
30 - <40	81	50.0	15	50.0	16	57.1		
40 - <50	52	32.1	5	16.7	7	25.0		
50+	20	12.3	6	20.0	4	14.3		
Educational level								
Not read and write	9	5.6	2	6.7	4	14.3	35.75	.000**
Read and write	28	17.3	5	16.7	5	17.9		
Primary education	25	15.4	3	10.0	2	7.1		
Secondary education	20	12.3	2	6.7	2	7.1		
Technical secondary education	45	27.8	4	13.3	2	7.1		
Above - average education (institutes)	30	18.5	3	10.0	2	7.1		
University education or more	15	9.3	11	36.7	11	39.3		
Marital status								
Single	3	1.9	2	6.7	1	3.6	3.321	0.768
Married	136	84.0	25	83.3	24	85.7		
Divorced	13	8.0	1	3.3	2	7.1		
Widowed	10	6.2	2	6.7	1	3.6		
Residence place								
Rural	112	69.1	18	60.0	20	71.4	1.13	0.568
Urban	50	30.9	12	40.0	8	28.6		
Monthly income								
Enough only	91	56.2	16	53.3	16	57.1	4.131	0.389
Enough and saved	45	27.8	12	40.0	6	21.4		
Not enough	26	16.0	2	6.7	6	21.4		

****Highly statistically significant difference p<0.001**

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Table (5): Relation between total practices level and socio demographic characteristics among studied sewage workers (n=220).

Socio demographic characteristics	Total practices levels					X ²	P-value
	Unsatisfactory (n=144)		Satisfactory (n=76)				
	No.	%	No.	%			
Age / years							
20 - <30	11	7.6	3	3.9	13.22	.004*	
30 - <40	72	50.0	40	52.6			
40 - <50	49	34.0	15	19.7			
50+	12	8.3	18	23.7			
Educational level							
Not read and write	12	8.3	3	3.9	32.92	.000* *	
Read and write	36	25.0	2	2.6			
Primary education	20	13.9	10	13.2			
Secondary education	11	7.6	13	17.1			
Technical secondary education	35	24.3	16	21.1			
Above - average education (institutes)	21	14.6	14	18.4			
University education or more	9	6.3	18	23.7			
Marital status							
Single	3	2.1	3	3.9	4.876	0.181	
Married	120	83.3	65	85.5			
Divorced	14	9.7	2	2.6			
Widowed	7	4.9	6	7.9			
Residence place							
Rural	99	68.8	51	67.1	0.062	0.803	
Urban	45	31.3	25	32.9			
Monthly income							
Enough only	81	56.3	42	55.3	3.093	0.213	
Enough and saved	37	25.7	26	34.2			
Not enough	26	18.1	8	10.5			

****Highly statistically significant difference p<0.001**

***Statistically significant difference p<0.05**

Table (6): Statistically relation between total knowledge and practices among the studied workers (n=220).

Total practices	Total knowledge							X ²	P-value
	Poor (n=162)		Average (n=30)		Good (n=28)				
	No	%	No	%	No	%			
Unsatisfactory (n=144).	113	69.8	18	60.0	13	46.4	6.201	.045*	
Satisfactory (n=76)	49	30.2	12	40.0	15	53.6			

***Statistically significant difference p<0.05**

Discussion:

Regarding the studied sewage workers' socio-demographic characteristics, the current study revealed that, slightly more than half of the studied sewage workers' age were from 30-40 years with mean age was 39.52±6.98 years.

According to the studied workers' educational level, the present study indicated that nearly one quarter of the studied sewage workers had technical education, while less than one tenth of them not write and read.

Regarding work characteristics of the studied workers, the present study displayed that less than two thirds of studied sewage workers worked 8 hours/day. This result agreed with **Chen et al., (2021)** who carried out a study entitled "Quantitative microbial risk assessment and sensitivity analysis for workers exposed to pathogenic bacterial bioaerosols under various aeration modes in two wastewater treatment plants in China", (n= 382) and reported that more than half (59.2%) of the studied sample worked about 8 hours daily.

Also, the current study demonstrated that more than three quarters of the studied workers worked four days or more per week. This result was consistent with **Xu et al., (2020)** who

conducted a study about "Bioaerosol in a typical municipal wastewater treatment plant: concentration, size distribution, and health risk assessment in China" (n= 95) and reported that most of the studied subjects (82%) work from 4 to 6 days/ week.

Concerning health problems of the studied sewage workers during last six months as reported by them, the present study portrayed that less than one fifth of them had tachypnea, about one fifth of them had blurred vision and had H pylori, and nearly one quarter of them had tiredness and had lumber disc prolapse. Similarly, **Lu et al., (2020)** mentioned that more than half of the studied subjects suffered from respiratory problems and gastrointestinal problems. Also, a study done by **Carducci et al., (2018)** revealed that less than one quarter of the studied workers had blurred vision.

According to the studied sewage workers' total knowledge level about occupational hazards, first aids and occupational health and safety, the present study represented that almost three quarters of studied sewage workers had poor total knowledge while less than one fifth of them had good knowledge. This may explained with the lack of courses and periodic evaluation and training of the workers at the work place.

Likewise, **LeChevallier et al., (2020)** who carried out a study entitled "Protecting wastewater workers from disease risks:

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Personal protective equipment guidelines", (n= 34) and stated that most of the studied subjects (83.6%) had poor knowledge occupational health hazards. On the other hand, **Wright, (2018)** who carried out a study about "Examining the Issue of Compliance with Personal Protective Equipment among Wastewater Workers across the Southeast Region of the United States" (n= 272) and reported that most of the studied workers (97%) had good knowledge about occupational health and safety.

Regarding the studied workers' total practices level regarding first aid practices and protective measures, the current study revealed that almost two thirds of the studied sewage workers had unsatisfactory total practices while more than one third of them had satisfactory regarding first aid practices and protective measures. This result matched with **AbouZeid et al., (2022)** who carried out a study entitled "Effect of an Educational Program on Utilization of Personal Protective Equipment among Municipal Waste Workers at Minia City, Egypt", (n= 168) and stated that more than two thirds of the studied subjects had unsatisfactory total practices about protective measures preprogram.

The present study clears that more than half of studied sewage workers environment had sanitary work environment. This result supportive with the study conducted by **Jodar, et al., (2019)** who studied "Wastewater Treatment and Water Reuse in Spain. Current Situation and Perspectives" (n=700). reported that 80% of the sewage plants were sanitary work environment.

As regard relation between socio-demographic characteristics of the studied sewage workers and their total knowledge, the current study showed that there was a highly statistically significant relation between total knowledge level of sewage workers and their educational level. It might be attributed to the positive effectiveness of the educational level in changing knowledge of workers. In the same line **Adekiya et al., (2022)**, who declared that there was a statistically significant relation between the studied workers' knowledge and their level of education. On contrary **Zaky et al., (2018)**, reported that there was significant relation between knowledge & years of experience of the studied subjects.

Regarding relation between total practices level and socio demographic characteristics among studied sewage workers, the current study represented that there were a highly statistically significant difference between total practices of the studied sewage workers and their level of education. While there were statistically significant relation between total practices of the studied workers and their age. It might be attributed to the positive effectiveness of age and the educational level in changing skills/practices of workers.

These findings were supported by a study carried out by **AbouZeid et al., (2022)** stated that there was a significant relation between practices of the studied workers and their level of education. Also, a study conducted by **Nyantakyi et al., (2020)** entitled "Investigating Occupational Health and Safety of Workers on Selected Construction Sites in the Sunyani

Municipality, Ghana", (n= 55) and reported that there was a significant relation between practices of the studied workers and their age. This can be interpreted with age and years of experience increase the quality of the work and acquire the workers good practices.

The current study clarified that there were statistically significant relation between total practices level and total knowledge level of sewage treatment plants workers. This can be explained as level of knowledge has a significant effect on level of practice among the studied workers.

This result was consistent with **Nasufi et al., (2022)**, who found that there were significant positive correlation between practices level and knowledge level of the studied subjects. Similarly, a study conducted by **Beheary et al., (2020)**, who reported that there was significant relation between knowledge and practice of the studied workers. This explained that if there is good knowledge of the workers this affect the performance of practices.

Conclusion:

About quarter of the studied sewage workers in sewage treatment plants exposed to lumber disc prolapse, tiredness and musculoskeletal problems. There was highly statistically significance relation between total knowledge level of the studied workers and their educational level. Also, there were a highly statistically significant difference between total practices of the studied workers and their level of education. Moreover, there were statistically significant correlation between total practices and total knowledge of sewage treatment plants workers.

Recommendations

- Conducting health education program to sewage treatment plants workers about occupational health hazards and the preventive measures.
- Further studies to be applied the same study on large sample and on the other governorate districts.

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مخاطر الصحة المهنية بين عمال محطات معالجة مياه الصرف الصحي

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يتعرض عمال محطات معالجة مياه الصرف الصحي للعديد من المخاطر الصحية المهنية علي مدار اليوم اثناء عملهم في هذا المجال. لذلك هدفت هذه الدراسة إلي تقييم مخاطر الصحة المهنية بين عمال محطات معالجة مياه الصرف الصحي. و تم استخدام التصميم الوصفي في هذه الدراسة. وقد أجريت الدراسة بمحطات معالجة مياه الصرف الصحي وروافع الصرف الصحي بمدينة بنها بمحافظة القليوبية بمصر . تم اختيار عينة ملائمة من جميع محطات معالجة مياه الصرف الصحي ومحطات الرفع في مدينة بنها شارك في هذه الدراسة ٢٢٠ عاملا مقسمين حول ٣ محطات معالجة و ٩ محطات رفع للصرف الصحي بمدينة بنها. الأدوات: تم استخدام أداتين: الأداة الأولى: استبيان مقابلة منظم مقسم إلى أربعة أجزاء: الجزء الأول: الخصائص الاجتماعية والديموغرافية لعمال الصرف الصحي المدروسين. ب: خصائص عمل عمال الصرف الصحي المدروسة, الجزء الثاني: المشاكل الصحية التي يعاني منها العمال خلال الأشهر الستة الماضية, الجزء الثالث: تعريف العمال بمخاطر المهنة وإجراءات السلامة والإسعافات الأولية, الجزء الرابع: ممارسات العمال فيما يتعلق بالإسعافات الأولية المتعلقة بالمخاطر المهنية المكشوفة, الأداة الثانية: قائمة المراجعة الرصدية لتقييم حالة السلامة البيئية. وقد اظهرت النتائج ان ١٤,١٪ من العمال الذين شملتهم الدراسة كانوا يعانون من تسرع التنفس، ٢٠,٥٪ منهم لديهم مشاكل في الجهاز الهضمي والبيكتيريا الحلزونية، ٧٣,٦٪ من عمال الصرف الصحي الذين شملتهم الدراسة كانت لديهم معرفة ضعيفة و ٦٥,٥٪ من عمال الصرف الصحي الذين شملتهم الدراسة كانت لديهم ممارسات إجمالية غير مرضية فيما يتعلق بممارسات الإسعافات الأولية. كما كشفت الدراسة الحالية أن غالبية عمال الصرف الصحي الذين شملتهم الدراسة يعانون من مشاكل صحية. وضح أيضاً أن مجموع درجات الممارسات لعمال الصرف الصحي المدروسين كانت غير مرضية. وأوصت الدراسة بإجراء برنامج تثقيف صحي لعمال الصرف الصحي حول مخاطر الصحة المهنية والتدابير الوقائية.