Assiut Scientific Nursing Journal
http://asnj.journals.ekb.eg
http://www.arabimpactfactor.com
http://olddrji.lbp.world/indexedJournals.aspx
DOI: 10.21608/ASNJ.2022.159242.1425

Effect of Supportive Information Regarding Water-Related Diseases Health Risks Prevention among Fayoum City Sewage Workers

Soad Ahmed[1], Fatma Mohamed Abdelhamid[2] & Eman Hafez Ahmed[3]
[1.] Lecturer of Community Health Nursing, Faculty of Nursing, Fayoum University, Egypt.
[2.] Lecturer of Medical Surgical Nursing, Faculty of Nursing, Zagazig University, Egypt.
[3.] Lecturer of Community Health Nursing, Faculty of Nursing, Fayoum University, Egypt.

Abstract
Background: Workers in the sewage industry are particularly vulnerable to infections associated with human excreta and waste water, including a wide spectrum of water-related diseases. **Aim:** To evaluate the effect of supportive information regarding water-related diseases health risks prevention among Fayoum city sewage workers. **Design:** A quasi-experimental research design was utilized. **Setting:** The study was conducted at three locations in Fayoum city, which are affiliated to Fayoum drinking water and Sanitation Company. **Sample:** A stratified sample was used, and 114 sanitation workers were recruited based on the inclusion criteria. **Tools:** two tools were utilized: **Tool I:** An interviewing questionnaire consisted of five parts (Socio-demographic and occupational characteristics of sewage workers, the provision of health care services, personal protective equipment (PPE) availability, and self-reported health effects based on worker health history), and A structured questionnaire to assess workers' knowledge regarding water-related diseases. **Tool II:** self-reported practice checklist concerning workers safe health practices. **Results:** Revealed a significant improvement in sewage workers knowledge. Where the mean of total knowledge scores of them had significantly improved from 28.78±9.91 pre- test to 46.13±4.96 immediately post-test, and there was a statistically significant difference in the total practices regarding water-related diseases' health risks prevention pre and post-application of supportive information. **Conclusion:** The study concluded that the application of supportive information was effective in improving sewage workers' knowledge and practices regarding water-related disease health risk prevention. **Recommendation:** Periodic educational sessions on various water-related diseases health risks prevention, first-aid, safety measures, and personal protective equipment training.

Keywords: Health Risk Prevention, Supportive Information, Sewage Workers& Water-Related Diseases

Introduction:
The genuine analogue of the word "life" is "water." Water is a critical essence of life and growth for all living things, notably humans **(Al-Taai, 2021).** But its role as a carrier of disease-causing organisms has become a serious challenge. Around the world, water-related diseases have surpassed all other causes of death and disease, particularly in low-income countries **(Manetu & Karanja, 2021).**

Water-related diseases **(**WRDs**)** are "any significant adverse effects on human health, such as death, disability, illness or disorders, caused directly or indirectly by the condition, or changes in the quantity or quality, of any waters.Water-related diseases can be classified into four groups based on the route of contact and transmission: waterborne, water-washed, water-based, and water-related vector-borne diseases **Domenico et al. (2022).**

Water-borne diseases are those spread by drinking contaminated water with human or animal excreta or eating contaminated food. Typhoid fever, ascariosis, leptospirosis, poliomyelitis, hepatitis, and cholera are only a few examples of water-borne diseases that are usually spread by the fecal-oral route **Manetu and Karanja (2021)**. Water-washed infections are the second group of WRDs caused by a lack of clean water and, particularly, contact with contaminated water.These diseases are primarily connected with poor household and personal hygiene, such as leprosy, skin infections, trachoma, ulcers, scabies, and conjunctivitis **Kumar et al. (2020).**

According to the World Health Organization **(WHO, 2019)**, the third group of WRDs are water-based infections are those that must spend part of their lives in aquatic environments and transmitted through penetrating skin or ingestion. Water-related vector-borne diseases spread by insect vectors that breed in or bite near water.

Working with faecal sludge and wastewater, as well as machinery utilized during emptying and conveyance, tight spaces, aerosol exposure, and cuts and abrasions from solid waste, places sewage workers at risk. In addition to their heavy workforce and the usage of hazardous cleaning products are also make them susceptible to other chemical and physical risks.

Acute and long-term exposure of sewage workers to hazardous substances found in sewage water, including disease-causing microbes such as bacteria, fungi, parasites, and viruses, resulting in sewage workers being the principal victims of infections and diseases **(Mokhtar et al., 2022; Kohli, 2014).**
Furthermore, numerous WRDs have been labelled as "neglected diseases of neglected people," with sewage workers being a particularly vulnerable group **(Al Khati, 2016).**
According to the Centers for Disease Control and Prevention **(CDC, 2021; Soju et al., 2015)**.
Preventative measures that to lower the risk of acquiring water-borne diseases for workers handling human waste or sewage, include basic hygiene practices, such as wearing personal protective equipment (PPE) recommended for handling human waste or sewage, such as liquid-repellent coveralls, and receiving training on disease prevention, use, and disposal of PPE, as well as receiving the recommended vaccines.
Occupational health nurses are playing an important role in preventing workplace hazards by identifying worker health problems, potential industrial health risks, and unsafe health habits.They also help to plan and promote worker health by assessing their needs and developing appropriate educational programs for use on the job, and training workers on using preventive measures; also encouraging them to use health-care services **(Nour-Eldien Mohammed, 2022). Ribeiro et al. (2019)** added added that the guidance delivered by the occupational health nurse, is not confined to the workplace itself, as workers act as multipliers of the information received within their families and communities.

Significance:

According to worled health organization and the United Nations Children's Fund (UNICEF); 4 billion cases of WRDs result in at least 3.4 million fatalities globally per year, making them the leading causes of morbidity and mortality **(WHO & UNICEF, 2021).** Further more in many developing countries, the situation is considerably worse **(Osiemo et al., 2019; Abd Elrazak et al., 2018).**

Workers in the sanitation industry are among the most vulnerable workers in the world.Despite the fact that they render a prominent global service, they frequently do so at the expense of their dignity, safety, health, and living situations. They encounter a variety of problems, including being exposed to major occupational and environmental health dangers that could result in disease, injury, or even death. including water borne diseases **(WHO, 2019; CDC, 2021).** Even though, sewage workers are deemed a high-risk population, but data concerning their health in Egypt over the last decade is limited. There is a need to enrich the knowledge of sewage workers regarding prevention of health problems, protection from health issues and promotion of their health **(Hassanein et al., 2019; Gomathi & Kamala, 2020)**.So, the present study aimed to provide sewage workers with necessary information and skill sets regarding occupational health risks associated with a variety of WRDs, as well as enhance workers' role in maintaining not only their own but also their family members' health through adherence to safety measures and proper use of safety protection equipment, as well as modifications in their personal habits. Moreover the current study will considers as a baseline data to that can help policy makers in Egypt in focusing on providing and maintain a safe work place environment.
Therefore, offering supportive information on water-related diseases health risks prevention can improve the level of knowledge and practices of sewage workers.

Aim of the study:

To evaluate the effect of supportive information regarding water-related diseases health risks prevention among Fayoum city sewage workers through the following:

1. Assess sewage workers' knowledge and reported practices toward water-related diseases' health risks prevention.
2. Assess preventive health care services provided to sewage workers.
3. Design, and implement supportive information based on sewage workers' needs.
4. Evaluating the effect of applying supportive information regarding water-related disease health risk prevention on sewage workers' knowledge and practices.

Hypothesis:

The following research hypotheses were formulated to fulfill the present study aim:
Hypothesis 1: The application of supportive information will increase knowledge regarding water related disease health risks prevention among Fayoum city sewage workers.
Hypothesis 2: The application of supportive information will improve practices of sewage workers regarding water related disease health risks prevention.

Operational definition:

Supportive information about water-related diseases health risks prevention.

In this study, refers to the provision of information and preventive measures (basic hygiene practices or personal habits, hand washing, first aid measures, and use of personal protective equipment) to sewage

workers regarding water-related diseases health risks prevention.

Subjects and Method:

Research design: A quasi-experimental research design was utilized to conduct this study

Setting: The current study took place in three locations in Fayoum city; Kiman Fares sewage station, Al taeawuniaat and a Garage AL Kash station, which are affiliated to Fayoum drinking water and Sanitation Company.

Subjects: The study sample consisted of 114 workers who met the following criteria for inclusion: (a) have been employed at the station for at least a year; (b) be free of communication (speech and hearing) issues; and (c) consent to participate in the study.

Sample size: The required sample size was calculated using the statistical software EPI Info 6.04 version. Assuming a maximum of 50% variability. Using a power analysis formula with a margin of error 5%, a level of confidence 90% and a population size 535, Accordingly, the required sample size was 114.

Sampling technique: This study's subjects were recruited using a stratified sample technique.

First stratum (sewage stations): All Fayoum city sewage stations affiliated with the Fayoum drinking water and sanitation company were divided into two sectors, with six stations in the east sector and three in the west sector; two stations were chosen from the east sector and one from the west sector using a simple random sampling technique.

Second stratum (study subject):

This stratification was carried out based on the data of the chosen sewage stations. The total number of participants in the first station was 215, 175 in the second station, and 132 in the third sewage station, resulting in a total population (N) of 535 workers. The research involved 20% of the total number of workers from each station. The first, second, and third stations each had 43, 35, and 29 workers, respectively.

Tools for data collection: Two tools were used for data collection. The researchers developed them all based on a literature review, as described below.

Tool I: An interview Questionnaire: it classified into five parts;

Part 1: Socio-demographic and occupational characteristics of the studied sewage workers; including age, level of education, marital status, residence, number of family members, employment years, working hours per day, and training received over the last two years. **Part 2: the provision of health care services to sewage workers,** involve questions about the provision of health care services to sewage workers, such as pre-employment medical examinations, regular periodic examinations, and receiving recommended vaccinations.

Part 3: Personal protective equipment availability, to assess PPE availability, including goggles, helmets, and work uniforms, as well as non-human equipment and supplies such as first aid kits and personal hygiene supplies.

Part 4: Sewage workers' self-reported health effects based on their health history as a result of wastewater exposure, including effects on the respiratory and gastrointestinal systems, as well as general and external effects.

Part 5: A structured questionnaire to assess sewage workers' knowledge about water-related diseases, and it was composed of 7 categories, including definition, mode of transmission, manifestations of water related diseases, and the most common types. Occupational hazards as a result of sewage-water exposure; preventive measures during and after handling sewage; and first aid measures to reduce the risk of exposure to water related diseases.

The total scores for all knowledge questions ranged from 0–65, with one mark awarded for each correct answer and zero for the wrong answer.The knowledge level was categorized into three levels as; Poor = scores of less than 50% of total scores (0-less than 32.5 marks), Fair= scores 50% to less than 65% of total scores (32.5-less than 42.25 marks), and Good = scores more than 65% of total scores (more than 42.25 marks).

Tool II: Sewage workers' self-reported practise checklist was developed, guided by the handling human waste or sewage guidelines **(CDC, 2021**), and modified by the researchers in a simple Arabic language, based on the related literature review and expert opinions. This tool was designed to assess sewage workers' self-reported safe health practices to prevent exposures to water-related diseases health risks resulting from sewage exposure. It was classified into 3 categories, including hand washing, personal habits, and the use of personal protective equipment.

These statements require a response on a 3-point Likert-rating scale with 3 continua (rarely, sometimes, and always). Each step was given a score in SPSS as always = 2 marks, sometimes = 1 mark, and rarely = 0 mark.

Pilot study

A pilot study was carried out on 10% of the study sample (11). To evaluate the clarity and applicability of the research tools, as well as to estimate the time required for data collection. As a result, the necessary modifications were done, some questions were clarified or omitted, and others were added.

Validity and Reliability:

Validity: The validity of the developed tools was tested for content validity by a jury of five experts in the fields of community health nursing and their recommended modifications were done accordingly.

Reliability: Reliability of the tool was tested by using Cronbach's alpha test, and the result was 0.923 for the practice tool and 0.738 for the knowledge tool.

Field work: The current study was accomplished in three main phases:

Administrative procedures and ethical considerations

An official letter from the dean of the Faculty of Nursing was submitted to the director of the drinking water and Sanitation Company in Fayoum to obtain permission to conduct the study. The study was carried out after getting ethical approval from the Scientific Research Ethical Committee. Further, oral consent was obtained from each participant after a full explanation of the study's aim, and they were assured that the collected data would be treated confidentially and used only for the purpose of research. They were also informed of their right to withdraw from the study at any time.

The data collection phase: The study started at the beginning of September 2021 and ended at the end of February 2022, for a total of 6 months.

The supportive information was planned out in detail, including session times, teaching locations, and teaching materials. The researchers started by introducing themselves and clarifying the aim of the study to the station manager and the studied workers.

To avoid work disruptions, the researchers divided the workers into six groups and interviewed them throughout the morning and afternoon shifts at the selected stations for two days a week. Each group attended nine sessions; the first session included a pretest. The average length of each session ranged from 30 to 45 minutes, depending on the time set by the researchers and the study participant.

The supportive information sessions were conducted in the sewage stations' age courtyard of the se stationmain building, by using presentations, demonstrations, educational booklets, and banners. Finally, study participants completed an individual post-test immediately post application the supportive information with researchers guidance and support for those who couldn't read or write, in order to evaluate the effect of the supportive information on the sewage workers' knowledge and practices regarding water-related disease health risks prevention.

The supportive information content:

The supportive information was developed after reviewing relevant literature, guided by **(CDC, 2021; Soju et al., 2015)**.It involves theoretical and practical parts, which are covered in the following sessions.

Session 1: In the preliminary meeting, the researchers explained the aim of the SI, duration, location, meeting schedule, and the basic rules of the sessions, and pretest was done.

Session 2: Provided an overview of WRDs definition, and classification (waterborne, water-washed, water-based, and water-related vector-borne diseases), the most common WRDs caused by sewage exposure, as well as their most common manifestations and modes of transmission.

Session 3: This session is designed to offer information about the occupational health risks due to wastewater exposure (biological,
chemical, environmental, and psychological hazards).

Session 4: The researchers for this session focused their efforts on providing relevant information about preventive measures during and after sewage handling, starting with hand hygiene, including importance, appropriate time, and adequate period required for hand washing, and participants were trained on performing hand washing steps.

Session 5: The basic hygiene practices for workers or personal habits during and after handling sewage were the essence of this session. Include avoiding touching the face or an open wound, and covering any wound or abrasion on the skin before work; don't smoke, eat, or drink; removing the work clothes before leaving the work site; and washing the work clothes with chloride on a daily basis.

Session 6: This session was mainly concerned with PPE and its importance. It recommended types for workers handling human sewage, such as goggles and a splash-resistant face mask or face shield, as well as liquid-repellent coats, waterproof gloves, and rubber boots, to avoid exposure to sewage and sewage splashes. In addition to training the study participants on proper use and PPE disposal.

Session 7: First aid measures in the case of simple wounds or abrasions, as well as if the human wastes or wastewater touch the workers' eyes.

Session 8: Educating sewage workers about the importance and types of recommended vaccinations

Session 9: Final evaluation (post test) and programme closure. Afterward, the researchers expressed gratitude for the respondents' contributions.

Data analysis

Following data collection, it was sorted, coded, organized, categorized, and analyzed by using the statistical software SPSS (Statistical Package for Service Solutions) v23.Data was presented by using descriptive statistics in the form of frequencies and percentages. Arithmetic mean ± standard deviation (X± SD) was used for continuous variables and percentages for categorical variables. The T test and the Wilcoxon signed rank test were used for comparison between 2 paired within one group. An

ANOVA test was used for comparison between and within groups.The Pearson correlation coefficient test was used to create a correlation between two quantitative variables to clarify whether there was a positive or negative correlation. P< 0.05 was considered to be statistically significant.

Results:

Table (1): Distribution of the studied Sewage Workers' according to their Socio-demographic and Occupational Characteristics N= (114)

Items	No.	%
Age by years		
20 - < 30years	15	13.1
30 -< 40	49	43.0
≥ 40	50	43.9
$\bar{x}$ **± SD** = 37 ± 6.55		
Marital status		
Single	6	5.3
Married	105	92.1
Widow	2	1.8
Divorced	1	0.9
Residence		
Rural	69	60.5
Urban	45	39.5
Family members number		
Less than 3	6	5.3
3 - 5	61	53.5
6 - 8	28	24.6
8 and more	19	16.7
Employment years		
Less than 5yrs.	24	21.1
5 - < 10	15	13.1
10 - < 15	25	21.9
≥ 15	50	43.9
Working hours/ day		
8	103	90.4
9 – 12	11	9.6
Training over the last two years*		
Safety measures	9	7.9
Proper handling of dangerous materials	7	6.1
First aids	8	7.0
Proper using personal protective equipment	2	1.8

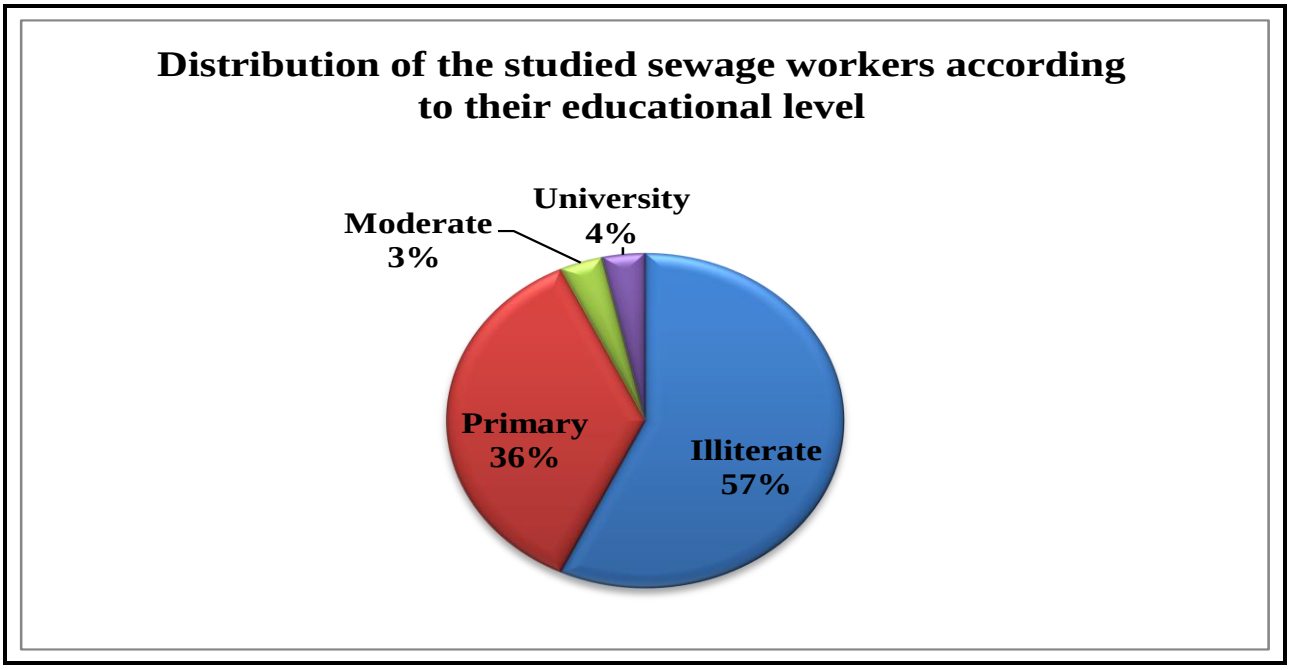

Figure (1): Distribution of the studied sewage workers according to their Educational level

Table (2): Distribution of studied workers according to their provision of health care services

Items	N=(114)	%
Pre-employment medical examination	69	60.5
Provision of all recommended vaccinations*	8	7.0
Hepatitis A vaccine (HAV)	6	5.3
Hepatitis B vaccine (HBV)	0	0.0
Tetanus vaccine	6	5.3
Regular periodic examination	16	14.0

Table (3): Sewage Workers Knowledge Scoring Level regarding Water Related Diseases and their related Average Change Pre and Immediately Post the Application of Supportive Information N = (114)

Items	Pre		Immediately Post		% of change	Test of significance	P-value*
	N	%	N	%			
Definition and mode of transmission of water related diseases (11 Marks)							
Good	35	30.7	73	64.0	53.19	x^2= 78.39	0.000
Fair	7	6.7	32	28.1			
Poor	72	63.2	9	7.9			
$\bar{x}$ **±SD**	5.32±2.5		8.15±1.75			t= 13.918	0.000
The most common water related diseases (15 Marks)							
Good	12	10.5	73	64.0	175	x^2= 143.22	0.000
Fair	1	0.9	30	26.3			
Poor	101	88.6	11	9.6			
MD	4		11			z= 7.969	0.000
The most common manifestations of water related diseases (8 Marks)							
Good	33	28.9	72	63.2	40	x^2= 58.04	0.000
Fair	35	30.7	41	36.0			
Poor	46	40.4	1	0.9			
$\bar{x}$ **±SD**	4.33±1.94		6.06±1.33			t= 10.002	0.000
Preventive measures to reduce the risk of exposure to the water related diseases (10 Marks)							
Good	26	22.8	76	66.7	133	x^2= 94.45	0.000
Fair	13	11.4	33	28.9			
Poor	75	65.8	5	4.4			
MD	3		7			z= 7.903	0.000

Items	Pre		Immediately Post		% of change	Test of significance	P-value*
	N	%	N	%			
First-aid measures to reduce the risk of exposure to the water related diseases (7 Marks)							
Good	26	22.8	93	81.6			
Fair	28	24.6	18	15.8	67.8	x^2= 91.46	0.000
Poor	60	52.6	3	2.6			
$\bar{x}$ **±SD**	3.39±1.41		5.69±1.16			t= 18.093	0.000
Occupational risks due to sewage water exposure (14 marks)							
Good	24	21.1	38	33.3			
Fair	33	28.9	68	59.6	25	x^2= 52.22	0.000
Poor	57	50	8	7.0			
□$\bar{x}$ **±SD**	7±2.82		8.78±1.65			t= 6.693	0.000
Total score of knowledge = 65 marks							
Good	16	14.0	92	80.7			
Fair	14	12.2	22	19.3	60.3	x2= 139.259	0.000
Poor	84	73.8	0	0.0			
□$\bar{x}$ **±SD**	28.78±9.91		46.13±4.96			t=23.65	0.000

z for Wilcoxon Signed Ranks test; t for Paired t test; x^2 for Chi-square test; P Significance;

** Significant (p≤ 0.05); $\bar{x}$ ±SD = Mean ±Standard Deviation; MD = Median*

Table (4): Distribution of the Sewage Workers According to their reported practice level and their related Average Change Pre and Immediately Post the Application of a Supportive Information N = (114)

Items	pre		Immediately post		% of change	Test of significance	P-value*
	N	%	N	%			
Hand washing (26 marks)							
Satisfactory	7	6.1	114	100	128.5	x^2=201.62	0.000
Unsatisfactory	107	93.9	0	0.0			
□$\bar{x}$ **±SD**	9.94±3.74		22.71±1.87			t=39.072	0.000
Personal habits (24 marks)							
Satisfactory	13	11.4	114	100	130.1	x2=181.323	0.000
Unsatisfactory	101	88.6	0	0.0			
$\bar{x}$ **±SD**	9.07±4.58		20.87±1.52			t=30.864	0.000
Using Personal Protective Equipment (10 marks)							
Satisfactory	16	14.0	27	23.7	20.3	x2=3.468	0.045
Unsatisfactory	98	86.0	87	76.3			
$\bar{x}$ **±SD**	4.53±1.62		5.45±1.63			t=8.703	0.000
Total reported practice score (60 marks)							
Satisfactory	5	4.4	114	100	108.1	x^2=208.84	0.000
Unsatisfactory	109	95.6	0	0.0			
$\bar{x}$ **±SD**	23.56±7.71		49.04±3.12			t=41.981	0.000

***z for** Wilcoxon Signed Ranks test; x^2 for Chi-square test; **t** for Paired t-test; **P** Significance;*

Significant (p≤0.05); $\bar{x}$ **±SD= Mean± Standard Deviation; **MD**= Median.*

Table (5): Relationships between demographic and occupational characteristics of the studied sewage workers and their total knowledge score about water related diseases pre and post implementation of SI (n=114)

Demographic and occupational characteristics	Total knowledge score (Total =65 marks)	
	Pre Mean (SD)	Post Mean (SD)
Age		
20 - < 30	27.27(10.18)	44.53(6.53)
30 -< 40	28.69(10.73)	46.06(5.06)
≥ 40	29.32(9.12)	46.68(4.28)
Significance		
F	**0.247**	**1.091**
P-value*	**0.781**	**0.340**
Education		
Illiterate	29.1846(8.87)	46(4.46)
Primary	26.26(10.74)	45.14(5.32)
Secondary/ Moderate	34.75(9.17)	50.5(5.06)
University	42(5.88)	52.75(0.95)
Significance		
F	**4.070**	**4.294**
P-value*	**0.009**	**0.007**
Employment years		
Less than 5	32.37(11.33)	46.7(5.9)
5 - < 10	24(5.7)	44.66(4.36)
10 - < 15	25.60(7.73)	44.24(4.98)
≥ 15	30.08(10.05)	47.24(4.34)
Significance		
F	**3.584**	**2.705**
P-value*	**0.016**	**0.049**

F (one way-ANOVA) *P (significance)* ** Significant (p< 0.05)*

Table (6): Relationships between demographic and occupational characteristics of the studied sewage workers and their total reported practice score about the water related diseases pre and post implementation of SI (n=114)

Demographic and occupational characteristics	Total reported practice score (Total =60 marks)	
	Pre Mean (SD)	Post Mean (SD)
Age		
20 - < 30	23.13(5.6)	48.93(3.55)
30 -< 40	24.18(9.65)	49.51(3.53)
≥ 40	23.08(6.01)	48.62(2.49)
Significance		
F	**0.277**	**1.018**
P-value*	**0.759**	**0.365**
Education		
Illiterate	22.66(7.1)	48.58(2.78)
Primary	24.43(8.68)	49.56(3.57)
Secondary/ Moderate	23.5(8.26)	50(2.94)
University	29.25(4.27)	50.25(3.3)
Significance		
F	**1.204**	**1.174**
P-value*	**0.312**	**0.323**

Demographic and occupational characteristics	Total reported practice score (Total =60 marks)	
	Pre Mean (SD)	Post Mean (SD)
Employment years		
Less than 5	26.87(8.6)	50.54(3.59)
5 - < 10	21.33(5.83)	48.4(3.54)
10 - < 15	20.72(8.15)	48.24(2.75)
≥ 15	24.06(6,98)	48.92(2.73)
Significance		
F	**3.284**	**2.757**
P-value*	**0.024**	**0.046**

F (one way-ANOVA) *P (significance)* ** Significant (p< 0.05)*

Table (7): Correlation between Knowledge and Reported Practise Scores of Studied Sewage Workers, Pre and Immediately Post Application of Supportive Information.

Predictor	Knowledge score			
	r		P-value*	
	Pre	Post	Pre	Post
Reported practice score	0.613	0.312	0.000*	0.001*

r: for Pearson correlation *If r ≤ 0.5 = weak correlation*
P value significant if ≤ 0.05 *If r > 0.5 = strong correlation*

Table (1): Portrays the distribution of the studied sewage workers according to their demographic and occupational characteristics. It was noticed that 43.9% of the studied sewage workers were aged 40 years or more, with a mean of 37 ± 6.55 years, and 92.1% of them were married. Also, it was observed that 60.5% of the studied sewage workers lived in rural areas. In addition, 43.9% and 90.4% of them were employed for 15 years, and were working for 8 hours per day, respectively. Concerning the training over the last two years, only 7.9% and 6.1% of the studied workers attended training about safety measures and proper handling of dangerous materials.

Figure (1): Show the distribution of the studied sewage workers according to their educational level. It was discovered that 57% of workers were illiterate, with only 4% having a university degree.

Table (2): Explains distribution of studied group according to their provided health care services. It was found that 60.5%, 14% and 7% of them received pre-employment medical examination, regular periodic examination and all recommended vaccinations respectively.

Table (3): Regarding the knowledge scoring level of studied workers about the water related diseases and their related average change pre and immediately post the application of the supportive information indicates that improvement in the mean knowledge scores among studied workers from 28.78±9.91 pre- test to 46.13±4.96 immediately post test, with significant difference (p≤ 0.05) per and post test. The total knowledge scores increased by 60.3% following the application of the supportive information.

In relation to, worker knowledge of the WRDs definition and its' mode of transmission it was noticed that 30.7% of the studied workers showed a good level of knowledge pre application of the supportive information with a mean of 5.32±2.5. While, immediately post the application of SI, the good score level of knowledge represented 64% of them with a mean of 8.15±1.75.

Concerning the preventive measures to reduce the risk of exposure to WRDs, it was noticed that 22.8% of the studied sewage workers had a good level of knowledge before the application of supportive information. However, 66.7% of them showed a good level of knowledge immediately post the application of the supportive information.

In term of occupational risks due to sewage water exposure, it was observed that 21.1% of the studied workers had a good level of knowledge with a mean of 7±2.82 pre the application of SI. However, 33.3% of them showed a good level of knowledge with a mean of 8.78±1.65 immediately post the application of SI. The difference was significant (p≤ 0.05) between pre and immediately post the application of the SI regarding all the previous items.

Table (4): Shows the distribution of the studied workers according to the satisfactory level of their reported practice and their related average change pre and immediately post the application of a SI, it was noticed that 11.4% of the studied workers had a satisfactory level of practice regarding personal habits

with a mean of 9.07±4.58 pre the application of SI. However, all of them showed a satisfactory level of practice with a mean of 20.87±1.52 post SI application.

Concerning using personal protective equipment, it was observed that 14% of the studied workers showed a satisfactory level of practice with a mean of 4.53±1.62 pre the application of SI. However, 23.7% of them showed a satisfactory level of practice with a mean of 5.45±1.63 post SI application. The difference was significant ($p \leq 0.05$) between pre and post the application of the SI regarding all previous items.

Regarding the overall total practice scores, Table 4 revealed that improvement in the mean of practice scores among studied sewage workers from 23.56±7.71, pre-test to 49.04±3.12 immediately post-test, with a significant difference ($p \leq 0.05$) between pre and post the application of SI.

Table (5): Reveals relationships between demographic and occupational characteristics of the studied sewage workers and total knowledge score about the water related diseases pre and post implementation of SI related to demographic characteristics, it was observed that there was a statistically significant difference between total knowledge score and education in pre and post-test (F = 4.070, P = 0.009) (F = 4.294, P =0.007) respectively.

Concerning occupational characteristics, it was observed that there was a statistically significant difference between total knowledge score and employment years in pre and post-test (F = 3.584, P = 0.016) (F = 2.705, P =0.049) respectively.

Table (6): Reveals relationships between demographic and occupational characteristics of the studied sewage workers and total practice score about the water related diseases pre and post implementation of SI. It was observed that there was a statistically significant difference between total practice score and employment years in pre and post-test (F = 3.284, P = 0.024) (F = 2.757, P = 0.046) respectively.

Table (7): Shows that a strong positive correlation was observed between knowledge and reported practice scores of the studied sewage workers at pre-test (P = 0.000 and r = 0.613). In addition, a positive correlation was observed between the knowledge and reported practice scores of the studied sewage workers at post-test (P = 0.001 and r = 0.312).

Discussion:

Water has a significant impact on human health. However, if it contaminated, it could become a source of water-related diseases.Many countries' populations, particularly in the developing countries, have been affected by water-related diseases. Because the supply of basic water, sanitation, and hygiene in low-income countries is unsatisfactory **(Yarima & Yarima, 2018).**Workers in the sanitation industry struggle to ensure that we have access to these vital services, but they often face serious health and safety risks on the job **(WHO, 2019)**.

Sewage workers are forced to work in tough and filthy conditions, making it impossible to maintain good hygiene and avoid unintentional contact with sewage. As a result, they are extremely susceptible to diseases caused by human excreta and waste water, including a wide spectrum of waterborne illnesses (**Hassanein et al., 2019).**

The acquisition of the necessary skill and knowledge to avoid health hazards is a basic requirement for sewage workers, via regular education and the use of preventive measures, the morbidity and mortality among sewage workers can be reduced **(Jaiswal, 2018).** The present study was conducted to evaluate the effect of supportive information regarding the water-related disease health risks prevention among Fayoum city sewage workers. The findings of the current study affirmed our hypotheses, as the supportive information was effective in improving sewage workers' knowledge and practices regarding water-related disease health risk prevention.

According to the findings of this study, the participants' mean age was 37 ± 6.55 years, and less than half of them aged 40 years and more. This findings contradicted with that of **(Shafik et al., 2018)** who discovered that that more than half of the studied sample was in the age range of 41 to 60 years, with a mean age of (44.2 ± 4.7)

Additionally, in the previous two years, only a minority of the current study workers received safety measures and proper handling of dangerous materials training. This result is supported with that of **(Abd El Hamid et al., 2016)** who found that a small portion of the study population got training in safety, health, and first aid. These results in congruent with those of **(Abd El-Wahab, 2014)** who mentioned that the most of studied sample, particularly those directly involved in waste disposal, received job safety and hygiene training.

Contrary to the CDC guidance, that recommend receiving vaccination for workers handling human waste or sewage including tetanus, polio, typhoid, hepatitis A and hepatitis B vaccines to reduce the risk of contracting waterborne diseases **(CDC, 2021).**The current study found that the vast majority of workers did not receive the recommended vaccinations, which could be attributed to a shortage of these services along with workers' lack of knowledge about the recommended types of vaccines and the importance of vaccination in disease prevention.

These findings are noticed to be similar with that of study conducted in Ethiopia **(Degavi et al., 2021)**, and found that the most of solid waste handlers did not receive tetanus toxoid vaccine, and about two-thirds of the workers reported did not have access to vaccine.

Managing risks in the workplace entails focusing on providing workers with the knowledge and skills they need to avoid unnecessary risky incidents and to be aware of situations that may cause harm.Where the workers are inspired when they have adequate knowledge and awareness about hazard prevention **(Wekoye., et al 2020).**This is reflected in the current study findings, which revealed an overall improvement in knowledge of sewage workers regarding health risks prevention related to water related disease, as these findings demonstrate that there was a significant change in sewage workers' total knowledge following application of SI. These findings in accordance with the results of **Abad-Elzaher et al. (2018)**, who reported that after applying the educational programme, workers' knowledge improved.

In relation to worker knowledge about the water related diseases mode of transmission the present study results revealed that less than one third of sewage workers showed a good level of knowledge pre application of the supportive information. This findings was consistent with **(John, 2020)** study aimed to find out the knowledge among sanitation workers regarding occupational disease and its prevention, and stated that the sanitation workers had lack of knowledge regarding occupational disease and its prevention. In contrast to **Jaremków et al. (2018)**, who concluded that the most of study participants mentioned all possible routes of pathogen entry into the human body in his study titled harmful factors in wastewater treatment plant–knowledge and awareness of workers about hazards.

As shown in the findings of this study, slightly less than two-thirds of the workers investigated had a good level of knowledge immediately following supportive information. This is in accordance with the results of **(Abad-Elzaher et al. (2018)**, who reported that after applying the educational programme, workers' knowledge improved.

As regard sewage workers knowledge about preventive measures to reduce the health risks associated with water-related diseases. It was noticed that less than one quarter of studied sewage workers had a good level of knowledge prior to the application SI. This can be explained by the minority of sewage workers had received training about safety measures, which may affect their knowledge level. This result go in the same line with that of **Abd El Hamid et al. (2016).** Who assessed occupational health hazards among sewage workers in Egypt's Al-Qalyobia Governorate and discovered that the majority of participants lacked adequate knowledge of safe procedures during work stages. Also these results consistence with **(Kasemy et al., 2021)** who found that low levels of knowledge about safety measures that improved after health education was implemented.

Concerning sewage workers' reported practice regarding WRDs health risks prevention. The current study revealed that there was an improvement among the study group from a minority of workers who had satisfactory levels prior to the SI, to all of them having satisfactory levels after the supporting information. Also, the findings clarified that improvement in the mean of practice scores among studied workers from 23.56±7.71, pre-test practice scores compared to 49.04±3.12 immediately post-test with a significant difference ($p\leq 0.05$).This could be attributed to workers gaining adequate knowledge about WRD health risk prevention, which is reflected in enhancing their practices. These finding is similar to the results of **Kasemy et al.(2021)**, study aimed to assess knowledge, attitude, and practice towards hazardous exposure and safety measures among workers in the waste management field, and found that slightly more than a quarter of waste workers had safe practices prior to the implementation of health education. After receiving health education, this improved to the point of most of them had safe practices, with significantly higher post than pre-health education ($P<0.001$).

Hand washing is the cornerstone of hygienic practices, it proposed that around one-third of all waterborne disease episodes, can be reduced by hand washing **(Ravindra & Pinnaka, 2019)**.Prior to the application of supportive information, a minority of workers were found to have a satisfactory level of subjective practise related to hand washing. According to the researchers, this may be due to they do not have access to hand washing facilities throughout their daily working shift. This is in conformity with the findings of **(Lakshmi & Paul, 2019)**, who discovered that more than a third of the sanitary workers had adequate hand hygiene. Also **Nuripuoh et al.(2022)** who found that all participants stated that they "wash their hands, and added that their response is not representative of reality on the ground.

The present study showed that the workers had a satisfactory level of practice related to hand washing immediately post application of supportive information. According to the researchers, these findings can be explained by having enough information that aids in enhancing their awareness of the importance of hand hygiene, for minimizing their

susceptibility to water disease risks. In line with **Degavi et al. (2021)**, study aimed to assess sanitary workers' knowledge, attitudes, practise, and associated factors on the prevention of occupational risks and health hazards, and observed that the majority of study participants had a hand washing habit, which was clarified as being due to their good knowledge of preventing occupational health risks.

Combating occupational risks may entail avoiding direct exposure to the risks through the successful execution of appropriate safety measures, including the use of PPE **(Patwary et al., 2021).**Regarding using PPE among workers, the finding of the current study showed improvement after the application of SI than before, with a significant difference ($p \leq 0.05$), and the mean practise score among the study participants improved from 4.53±1.62 to 5.45±1.63 with a percent change of 20.3. Researchers assumed that this slight improvement in worker practice may be due to only less than a fifth of workers reporting the availability of PPE such as work uniforms, face masks, goggles, rubber gloves, and safety boots. In the same context, **Fatmi, et al. (2022)** who reported that majority of workers weren't using any form of PPE. Also, the results agreed with a study conducted in Ethiopia by **(Degavi et al., 2021)** and stated that the more than half of studied workers claimed they did not use PPE because they lacked PPE.In the same context, **Kasemy et al. (2021)**, who reported that workers' practice towards safety measures showed poor levels that improved after health education.

Concerning workers personal habits, the current study found that less than a quarter of sewage workers showed satisfactory level of practice prior to the application of SI, this could be due to the majority of them lacking knowledge about the most common modes of WRDs transmission. As the vast majority of them reported that they wiping their face by using a piece of cloth or by sleeve of their work clothes (avarol), and only minority of them reported do not eat, drink, smoke, or touch their face, eyes, or nose while working. These findings contradict **WHO, (2020)** guidelines, as declare that sanitation workers should follow best practices for safeguarding their health, including avoiding contact with their eyes, nose, and mouth with unwashed hands. Also in-congruent with the findings of the **(Degavi et al., 2021)** study, which indicated that more than half of the workers reported eating at work.

Also minority of workers reported that they always cover any wound or abrasion on their skin before work, don not touch their opened wounds during working, and they sanitize any wound directly after happening. This can be attributed to more than half the participants had inadequate knowledge of first-aid measures, as well as as well as the carelessness that was noticed during the application of SI sessions, as reported by some workers, who stated that there was no need to cover the wound because it would be removed once they started their work. Moreover, the majority of them pointed out the lack of supplies, such as a first aid kit or hand sanitizer. This results agreed with **(Mohammed et al., 2022)** who found that the majority of workers had poor performance, due to a lack of awareness about occupational health, risks, safety measures, and first aid. These findings, in conjunction with a study conducted among sewage works by **(Jaiswal, 2018)** revealed that worker safety awareness is a basic requirement, which includes gaining the necessary skills and information to avoid hazards among workers.

Concerning relationship between demographic and occupational characteristics and total knowledge score among the studied workers the results indicates that there was a statistically significant relationship between workers knowledge and their education level in pre and post-test. According to the researchers, the low educational levels of more than half of the studied workers may contribute to their desire to learn more about the WRDs. This result is in accordance with **(Ajmal et al., 2022)** who stated that socioeconomic factors such as illiteracy is the principal determinant factors of water-borne diseases seeing as illiterate people may be less aware of how waterborne diseases spread.

The results of the current study detected a positive correlation between total knowledge, and reported practices scores regarding WRDs health risks prevention.From the researchers' view, this may be because sanitation workers have acquired at least basic knowledge regarding the prevention of health risks of WRDs, which affected their practices significantly. However this result inconsistent with those of **(Abd Elrazak et al., 2018)** who stated that there was no significant correlation between the knowledge and the practices of their study participants from sanitarians workers.

Limitations of the study:

The use of self-reported practise tool was one of the study's limitations because the researchers were unable to observe workers using personal protective equipment.

Conclusion:

In the light of the present study results it can be concluded that:

- The application of supportive information was effective in improving sewage workers' knowledge and practices regarding water-related disease health risk prevention.

- A statistically significant difference in the total practices regarding water-related diseases' health risks prevention pre and post-application of supportive information.
- A positive correlation was observed between total knowledge and reported practices scores regarding WRDs health risk prevention.

Recommendation:

- Regular health check-ups for sewage workers are required for early detection of water-related diseases, and they should all have the recommended vaccinations.
- Periodic education and training program on water related disease health risk prevention, as well as first-aid, PPE, and safety measures.
- Supplying sufficient personal protective equipment for sewer workers to promot healthy working condition.
- Further research is required to investigate the occupational health risks of various water-related diseases and factors influencing their prevalence among sewage workers.

References:

- **Al Khatib, G. (2016):** Environmental Factors Associated with Common Waterborne Diseases among Al Shuka Community-Rafah Governorate (Doctoral dissertation, Al Azhar University Gaza).
- **Ajmal, U., Jamal, S., Ahmad, W., Ali, M., & Ali, M. (2022):** Waterborne diseases vulnerability analysis using fuzzy analytic hierarchy process: a case study of Azamgarh city, India. Modeling Earth Systems and Environment, 8(2), 2687-2713.
- **Abd El-Wahab, E., Eassa, S., Lotfi, S., El Masry, S., Shatat, H., & Kotkat, A. (2014):** Adverse Health Problems Among Municipality Workers in Alexandria (Egypt). International Journal of Preventive Medicine, 5(5), 546.
- **Abad-Elzaher, O., Ibrahim, H., El-Magraby, N., & Hassan, A. (2018):**.Occupational Health Program about Prevention and Control of Health Hazards among Bakery Workers in Assuit City-Egypt." IOSR Journal of Nursing and Health Science (IOSR-JNHS), vol. 7, no.4, pp. 24-31.
- **Abd Elrazak, H., Elkazeh, E., & Mohamed, N. (2018):** Effect of The Self Learning Module on Knowledge and Practices of Health Team Regarding Water-borne Diseases. development.International Journal of Novel Research in Healthcare and Nursing Vol. 5, Issue 3, pp: (607-627),
- **Abd El Hamid, M., Ali, S., & Kamel, W. (2016):** Occupational Health Hazards among Sewage Workers at Al–Qalyobia Governorate. Zagazig Nursing Journal, 12(2), 204-220.
- **Al-Taai, S. (2021):** Water pollution Its causes and effects. In IOP Conference Series: Earth and Environmental Science (Vol. 790, No. 1, p. 012026). IOP Publishing.
- **Centers for Disease Control and Prevention (2021):** Handling Human Waste or Sewage, available at www.cdc.gov/healthywater/emergency/sanitation-wastewater/workers_handlingwaste., access at 20/4/ 2021.
- **Centers for Disease Control and Prevention (2021):** Guidance for Reducing Health Risks to Workers Handling Human Waste or Sewage, available at https://www.cdc.gov/healthywater/global/sanitation/workers_handlingwaste, accessed at 1/5/ 2021.
- **Domenico, B., Alice, D., Lorenza, L., Torre, G. L., Cocchiara, R., Sestili, C., & Torre, G. (2022):** The Impact of Environmental Alterations on Human Microbiota and Infectious Diseases. In Environmental Alteration Leads to Human Disease (pp. 209-227). Springer, Cham.
- **Degavi, G., Dereso, S. Shinde, S.G. Adola, P., & Kasimayan, P (2021):** Prevention of Occupational Hazards Among Sanitary Workers: Knowledge, Attitude, and Practice Survey in Bulehora, West Guji Zone, Oromia, Ethiopia Risk Management and Healthcare Policy, Volume 14 (2021), pp. 2245-2252.
- **Fatmi, S., Mansoori, N., & Mubeen, S. (2022):** Health Related Quality of Life amongst Sewerage and Sanitary Workers of Karachi, Pakistan. Pakistan Journal of Medical Sciences, 38(7):1986-1991.
- **Gomathi, P., & Kamala, K. (2020):** Threatening Health Impacts and Challenging Life of Sanitary Workers. Journal of Evolution of Medical and Dental Sciences, 9(41), 3055-3062.
- **Hassanein, F., Masoud, I., & Shehata, A. (2019):** Infection hazard of exposure to intestinal parasites, H. pylori and hepatitis viruses among municipal sewage workers: a neglect high risk population. Parasitologists United Journal, 12(2), 130-138.
- **John, M. (2020):** Effectiveness of Educational programme on knowledge regarding occupational disease and its prevention. Mukt Shabd Journal, Volume IX, Issue VI, pp. 794-801.
- **Jaremków, A., Kawalec, A., & Pawlas, K. (2018):** Harmful factors in wastewater treatment plant–knowledge and awareness of workers about hazards. Problemy Higieny i Epidemiologii, 99(2), 189-195.
- **Jaiswal, A. (2018):** Sewage Work and Occupational Health Hazards: An Anthropological

Insight.Archaeology & anthropology open access journal.Vol. 2, Issue 3. pp 1-7 .DOI: 10.31031/AAOA.2018.02.000538.

- **Kohli, G., Kohli, M., & Galhotra, V. (2014).** Diseases among Sewage Workers.Research & Reviews: Journal of Medical Science and Technology Volume 3, Issue 1, pp: 1-6.
- **Kumar, S., Haikerwal, A., & Saxena, S. (2020):** Etiological Agents of Water-Associated Infectious Diseases. In Water-Associated Infectious Diseases (pp. 5-9). Springer, Singapore. doi.org/10.1007/978-981-13-9197-2_2
- **Kasemy, Z., Rohlman, D., & Abdel Latif, A. (2021):** Health disorders among Egyptian municipal solid waste workers and assessment of their knowledge, attitude, and practice towards the hazardous exposure. Environmental Science and Pollution Research, 28(24), 30993-31002.
- **Lakshmi, A., & Paul, C. (2019):** A cross sectional study on adoption of standard precautions among sanitary workers, Tamil Nadu. International Journal of Community Medicine and Public Health, 6(4), 1442-5.
- **Mohammed, E., Ahmed, H., & Esmat, O., Mona Abo Bakr Abd El Latef. (2022):** Health Awareness Regarding Occupational Hazards among Workersin Sewage Treatment Plan.Egyptian Journal of Health Care, 2022 EJHC Vol 13. No.2.
- **Manetu, W., & Karanja, A. (2021):** Waterborne disease risk factors and intervention practices: a review. Open Access Library Journal, 8(5), 1-11.
- **Mokhtar, A., Makhtar, M., & Mokhtar, A. (2022):** Waste and Health: Sewage Sludge and Its Hazard to Human. In Waste Management, Processing and Valorisation (pp. 135-158). Springer, Singapore.
- **Nuripuoh, J., Duwiejuah, A., & Bakobie, N. (2022):** Awareness and health risk protection behaviours of scavengers in the Gbalahi landfill site, Ghana, in the era of sustainable development. Discover Sustainability, 3(1), 1-14.
- **Mohammed, N., Abd El-Hameed, H. & Sobhy, D.M (2022):** Safety Measure and First Aid Program among Workers in Delta Fertilizer and Chemical Company regarding Occupational Health Hazards. Journal of Nursing Science Benha University, 3(1), 610-624. doi: 10.21608/jnsbu.2022.215177.
- **Osiemo, M., Ogendi, G., & M'Erimba, C. (2019):** Microbial quality of drinking water and prevalence of water-related diseases in Marigat Urban Centre, Kenya. Environmental health insights, Volume 13: 1–7.
- **Patwary, M., Hossain, M., Shuvo, F., Ashraf, S., Sultana, R., & Alam, M. (2021):** Protecting sanitation workers in low-middle income countries amid COVID-19. Annals of work exposures and health, 65(4), 492-493.
- **Ribeiro, B., Martins, J., da Silva, V., Teston, E., da-Silva, A., & Martins, E. (2019):** Occupational health nursing in civil construction: contributions based on Roy's adaptation theory. Revista Brasileira de Medicina do Trabalho, 17(2), 260.
- **Soju, A., Trivethi, P., & Prohit, D. (2015):** Occupational health issues of sewage and sanitary workers. An Official Newsletter of ENVIS-NIOH, 10(2), 1-8.
- **Shafik, S.A., Mohamed, A.H., Saad, & Elnour, R.A. (2018):** Occupational Health Hazards among Workers in Sewage Treatment Plants in Beni-Suef Governorate.IOSR Journal of Nursing and Health Science (IOSR-JNHS).Volume 8, Issue 1 Ver. I. PP 04-14
- **World Health Organization, (2019):** Surveillance and outbreak management of water-related infectious diseases associated with water-supply systems. Copenhagen: WHO Regional Office for Europe; 2019. Licence: CC BY-NC-SA 3.0 IGO.available at http://apps.who.int/iris/
- **World Health Organization. (2020):** Water, sanitation, hygiene, and waste management for the COVID-19 virus: interim guidance . Available at https://www.who.int/publications/i/item/WHO-2019-nCoV-IPC-WASH-2020.4
- **Wekoye, S., Moturi, W., & Makindi, S. (2020):** Factors Influencing Non-compliance to Occupational Safety and Health Practices in the Informal Non-food Manufacturing Sector in Kampala City, Uganda. Current Journal of Applied Science and Technology, 38(6): 1-12.
- **Health, safety (2019):** .World Health Organization and dignity of sanitation workers: an initial .assessment Washington, DC: World Bank. © World Bank. Available at https://openknowledge.worldbank.org/handle/10986/32640 License: CC BY 3.0 IGO."
- **WorldHealth Organization, and the United Nations Children's Fund (UNICEF) (2021):** Progress on household drinking water, sanitation and hygiene 2000-2020: five years into the SDGs.available at https://www.who.int/publications.
- **Yarima, S., & Yarima, U. (2018):** The Occurrence of Waterborne Bacterial Disease and Water Quality in Higher Institution of Learning.International Journal of Innovative Environmental Studies Research 6(3):1-7