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Knowledge, Attitude, and Practices of Infection Control Amongst Medical Staff

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Abstract

Background: Water contamination can be one of the main sources of diseases, especially in health centers and hospitals. In this regard, it is highly significant to investigate in the health workers' knowledge, attitude, and practice (KAP) related to infection control. The present study was aimed at examining the KAP of water pollution and infection control and their correlation among the health workers in hospitals in Sulaimani city, Kurdistan-Iraq.

Materials and Methods:

A descriptive cross-sectional study was carried out on 400 medical personnel and health workers in 12 hospitals in Sulaimani, Kurdistan-Iraq from June 2022 to April 2023. Required data were collected using a structured questionnaire which was completed through interviewing the participants. The collected data were analyzed using Statistics Package for Social Sciences (SPSS 24.0).

Results:

The results indicated that the participants aged 30 to over 40 years, with a mean of 37.2. A larger number of them (59.8%) were Females, and 55% of them held a technical diploma. Knowledge, attitude, and practice of water contamination were found to be fair in 42.5%, 46.25%, and 41.25% of the participants, respectively. It was also concluded that their knowledge was significantly correlated with their level of education (p-value=0.000). A significant correlation was seen between their attitude and their age and level of education (p-value=0.000). Their practice had a significant correlation with their age (p-value=0.000) and level of education (p-value=0.013). The results of both Chi-square test and Spearman rank correlation indicated that their knowledge had significant correlations with their attitude and practice (p-value=0.000).

Conclusion:

Health workers' attitude toward and practice of water contamination and infection control can be enhanced by promoting their relevant knowledge by providing them with training programs.

Introduction

Knowledge, attitudes, and practices (KAP) related to water, sanitation, and hygiene (WASH) are crucial considerations for the successful and lasting execution of WASH initiatives within societies. The knowledge, attitudes, and practices (KAP) concerning WASH play a significant role in determining the prevalence of waterborne illnesses in communities. Inadequate understanding of WASH principles leads to unsanitary habits and unfavorable attitudes that contaminate water sources and propagate disease (Miner et al., 2015). Insufficient knowledge of WASH principles results in an incorrect assessment of the quality of water, which in turn leads to a significant reliance on surface water sources for drinking purposes. Additionally, the acceptance of open defecation practices as normal and widespread, minimal usage of household water treatment methods to prevent illnesses, and suboptimal water collection and storage habits contribute to water contamination and the spread of diseases (Omarova et al., 2019). Inadequate knowledge and negative attitudes towards WASH lead to poor household and environmental hygiene practices. Moreover, children's fecal matter is often disregarded and considered harmless in sanitation programs, thereby increasing the risk of disease transmission. To address this problem, there is a pressing need to implement hygiene education programs and raise awareness to promote positive WASH practices and improve public health in communities. However, in Nigeria, there is a paucity of data on the current status of WASH, making it increasingly challenging to design effective WASH programs to enhance health and well-being (Islam et al., 2018).

A typical knowledge, attitudes, and practices (KAP) investigation into water quality among healthcare personnel typically comprises three key elements: knowledge, attitudes, and practices. The primary objective of such studies is to evaluate the healthcare staff's comprehension of water quality matters, including their awareness of potential water-related hazards in healthcare environments, such as the risk of waterborne infections. This could entail the use of surveys or interviews to evaluate the staff's knowledge. Furthermore, the investigation would appraise the healthcare staff's stance regarding water quality matters, encompassing their viewpoints on the significance of water quality in healthcare settings and their readiness to take steps towards improving water quality (Ider et al., 2012). This could entail the use of surveys or conducting focus group discussions to evaluate the staff's attitudes. Lastly, the research would evaluate the current water quality practices of healthcare personnel in healthcare environments, encompassing their compliance with established water quality guidelines and protocols, and their utilization of water-related equipment and facilities. This could entail conducting observations or reviewing records to assess the staff's practices (Aldhamy et al., 2023).

Preventing microbial contamination of a healthcare facility's water supply is preferable to treating the problem after it arises. To safeguard susceptible patients, hospitals must establish proactive water management and infection control programs, which are continuously updated to prevent the dissemination of waterborne pathogens. This is typically accomplished through routine monitoring and testing of water quality, maintenance of plumbing systems to impede the formation of biofilms and proliferation of harmful bacteria, and implementation of suitable water treatment technologies such as filtration and disinfection (Sha, 2015). Despite the appropriate monitoring and supplementary disinfection of the water distribution system, the most immunocompromised patients may still be susceptible to contracting waterborne infections. To evaluate such transmissions, whole genome sequencing can provide comprehensive epidemiological data. As a final option, point-of-use filters may be employed for the most vulnerable patients. In addition to technological solutions, healthcare personnel should be trained to adhere to stringent hand hygiene protocols and avoid introducing contaminants into the water system, while patients and their families should report any water quality or hygiene concerns (Decker et al., 2014).

Conducting knowledge, attitudes, and practices (KAP) investigations concerning water quality in hospital environments among healthcare personnel can facilitate the identification of knowledge, attitudes, or practices gaps concerning water quality management in hospitals. Based on the study outcomes, interventions can be devised to enhance water quality management in these settings. If the investigation reveals that healthcare personnel possess limited knowledge about water quality concerns in hospitals, interventions may be formulated to provide education and training on the significance of water quality and strategies to enhance it. Likewise, if the investigation reveals unfavorable attitudes of healthcare personnel towards water quality management in hospitals, interventions can be formulated to tackle these negative attitudes and prompt staff to take measures to enhance water quality in hospital environments. Overall, conducting a KAP study on water quality in hospital settings among healthcare personnel can enhance water quality management and foster safe and healthy surroundings for patients, staff, and visitors in hospitals (Pedrosa et al., 2011; Sabermoghaddam et al., 2015). In this regard, the present study was carried out in order to figure out the relationship between the medical personnel's knowledge about, attitude toward, and practice of water pollution and infection control in hospitals located in Sulaimani city, Kurdistan-Iraq.

Materials and Methods

Study design and setting

The present investigation was a descriptive cross-sectional study that evaluated the water quality and the medical staff's knowledge, attitude, and practice regarding water pollution in 12 hospitals located in the center of Sulaimani city. The study was performed from of June 2022 till April 2023

Participants

The study sample consisted of 400 medical staff and health workers who were randomly chosen from among a total of 4,232 medical personnel working in public hospitals and health centers in Sulaimani city.

Data collection method and measurement

Required data were collected onto the studied personnel's knowledge about, attitude toward, and medical practices of infection control. For this purpose, a structured interviewing questionnaire was employed. The questionnaire was aimed at collecting data on the availability of IC resources, infection control guidelines, hand hygiene, safety box, personal protective equipment, environmental cleaning, reusable devices, the type of clinic, the availability of IC guidelines, hand hygiene resources, availability of PPE, the presence of sterilization devices, and cleanliness of the clinic. It consisted of three sections. The first section included 17 questions and collected data on the participants' knowledge of water contamination and infection control. The second section had 27 questions and was aimed at collecting data on their attitude toward water pollution and infection control. The third section had 32 question and gather data on the staff's practices of water contamination and infection control. Cronbach's alpha was used to examine the reliability of the questionnaire, and the results revealed a reliability of 0.942.

Statistical analysis

All statistical computation is enhanced using statistical method (SPSS 24). The data were coded, tabulated, and presented in a descriptive form. The statistical procedure that was applied to determine the results of the present study included:

Inferential data analysis:

1. Chi- Square Test
2. Spearman Rank correlation

There were criteria of the probability level of determining the significance of the test (p-value) as:

1. High significant ($P< 0.001$)
2. Significant ($P< 0.05$)
3. Non-significant ($P> 0.05$)
4. Very highly significant ($P< 0.000$)

Ethical considerations

Ethical considerations were considered in this study. In this regard, the study was approved by the Ethics Committee of the College of Health and Medical Technology, Sulaimani Polytechnic University. Before collecting the water samples, informed consent was obtained from the hospital administration. An official letter was obtained from Suleimani Technical University to the Directorate of General Health in Sulaimani.

Results

Analyzing the participants' sociodemographic data revealed that (38.5%) of the participants aged between 30 – 40 years, only 29.8% were less than 30 years old. Most of the participants (59.8%) were females, and only (40.3%) were males. Regarding their education, the majority of them were graduated from institutes (55%), while (24.5%) held bachelor's degrees, and only (20.5%) held post-graduate degrees (See Table 1).

Table (1). The health workers' sociodemographic characteristics

Characteristics	Frequency (N)	Percentage (%)
Age (Years)		
< 30	**127**	**31.8**
30 – 40	**154**	**38.5**
More Than 40	**119**	**29.8**
Mean ± S.D.	**37.2 ~ 37 ± 0.783**	
Gender		
Male	**161**	**40.3**
Female	**239**	**59.8**
Level Of Education		
Technical Diploma	**220**	**55.0**
Bachelors	**98**	**24.5**
Postgraduate	**82**	**20.5**
Total	**400**	**100.0**

The results obtained about the participants' knowledge about, attitude toward, and practice of water contamination indicated that (42.5%) of them had fair knowledge about of water contamination, while 31.5% had good knowledge, and 26% had poor knowledge. Also, (46.25%) of them had fair attitude toward water contamination, 34.5% had good attitude, and 19.25% had fair attitude. Moreover, (41.25%) of the nurses had fair practice of water contamination, 26.5% had good practice, and 22.25% had poor practice (See Table 2 & Figure 1).

Table (2). Number of questions, range, scores, and levels of knowledge, attitude, and practices of water contamination

Items	Knowledge		Attitude		Practice	
Levels	**Fr.**	**%**	**Fr.**	**%**	**Fr.**	**%**
Poor	**104**	**26.0**	**77**	**19.25**	**89**	**22.25**
Fair	**170**	**42.5**	**185**	**46.25**	**165**	**41.25**
Good	**126**	**31.5**	**138**	**34.50**	**146**	**36.50**
Total	**400**	**100.0**	**400**	**100.0**	**400**	**100.0**

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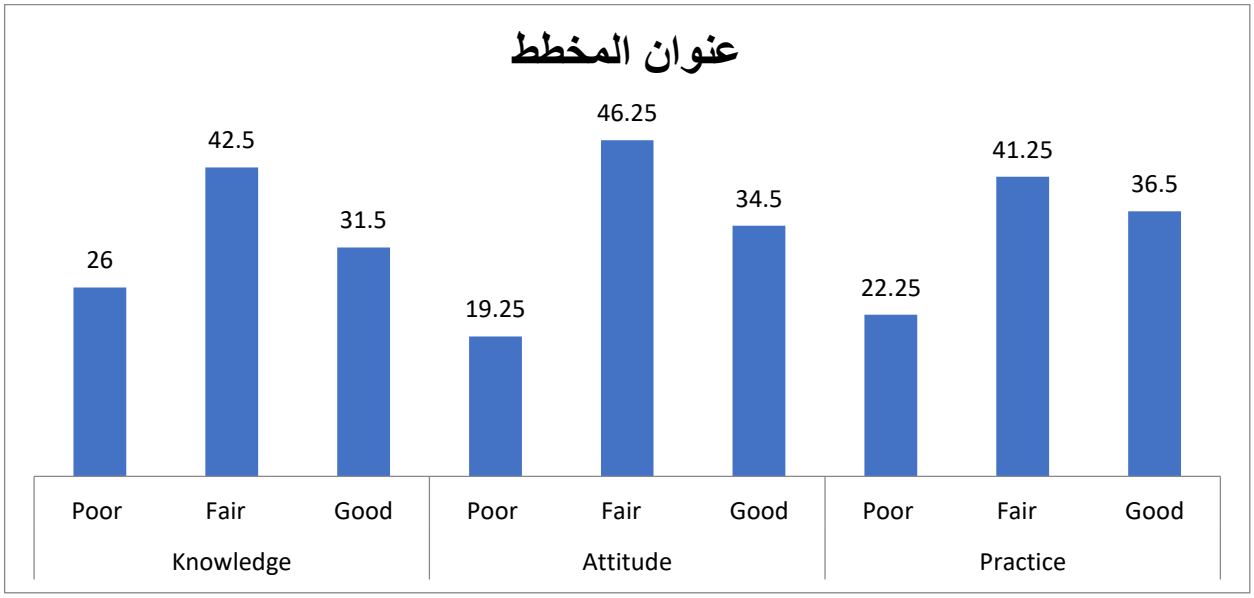

Figure (1). The nurses' knowledge about, attitude toward, and practice of water contamination

Table 3 shows the association between the knowledge of water contamination and the participants' sociodemographic characteristics. As the results show, there was statistically significant association between the participants' knowledge of water contamination and their level of education (p-value=0.000). However, their knowledge of water contamination was not significantly associated with their age (p-value=0.216) or gender (p-value=0.379) (See Table 3).

Table (3). Association between the knowledge of water contamination and sociodemographic characteristics

Variables	Items	Score Of Knowledge						Significant Test
		Poor		Fair		Good		
		Fr.	%	Fr.	%	Fr.	%	
Age (Years)	< 30	40	38.46	54	31.76	33	26.19	χ^2 =5.782 P=0.216
	30 – 40	40	38.46	66	38.82	48	38.10	
	> 40	24	23.08	50	29.41	45	35.71	
Gender	Male	36	34.62	73	42.94	52	41.27	χ^2 =1.939 P=0.379
	Female	68	65.38	97	57.06	74	58.73	
Level Of Education	Diploma	66	63.46	101	59.41	53	42.06	χ^2 =23.098 P=0.000
	Barcaroles	29	27.88	37	21.76	32	25.40	
	High Degree	9	8.65	32	18.82	41	32.54	
Total		104	100	170	100	126	100	
Significant Test Is Chi-Square Test								

Table 4 presents the association between the participants' attitude of water contamination and their sociodemographic characteristics. As indicated, there were statistically significant associations between their attitude of water contamination and their age (p-value=0.000) and their level of education (p-value=0.000). However, their attitude of water contamination was not significantly associated with their gender (p-value=0.235) (See Table 4).

Table(4). Association between the attitude of water contamination and sociodemographic characteristics

Variables	Items	Attitude Cores						Significant Test
		Poor		Fair		Good		
		Fr.	%	Fr.	%	Fr.	%	
Age (Years)	< 30	31	40.26	73	39.46	23	16.67	X^2 =31.695 P=0.000
	30 – 40	31	40.26	70	37.84	53	38.41	
	More Than 40	15	19.48	42	22.70	62	44.93	
Gender	Male	26	33.77	74	40.00	61	44.20	X^2 =2.247 P=0.325
	Female	51	66.23	111	60.00	77	55.80	
Level Of Education	Diploma	55	71.43	101	54.59	64	46.38	X^2 =22.894 P=0.000
	Barcaroles	18	23.38	49	26.49	31	22.46	
	High Degree	4	5.19	35	18.92	43	31.16	
Total		77	100	185	100	138	100	
Significant Test Is Chi-Square Test								

Table 5 indicates the association between the participants' practice of water contamination and their sociodemographic characteristics. As shown, there were statistically significant associations between their practice of water contamination and their age (p-value=0.000) and their level of education (p-value=0.000). However, their practice of water contamination was not significantly correlated with tehri gender (p-value=0.521) (See Table 15).

Table (5). Association between the practice of water contamination and sociodemographic characteristics

Variables	Items	Score Of Practice						Significant Test
		Poor		Fair		Good		
		Fr.	%	Fr.	%	Fr.	%	
Age (Years)	< 30	41	46.07	62	37.58	24	16.44	X^2 =45.585 P=0.000
	30 – 40	39	43.82	61	36.97	54	36.99	
	More Than 40	9	10.11	42	25.45	68	46.58	
Gender	Male	35	39.33	62	37.58	64	43.84	X^2 =1.303 P=0.521
	Female	54	60.67	103	62.42	82	56.16	
Level Of Education	Diploma	55	61.80	93	56.36	72	49.32	X^2 =12.601 P=0.013
	Barcaroles	26	29.21	39	23.64	33	22.60	
	High Degree	8	8.99	33	20.00	41	28.08	
Total		89	100	165	100	146	100	
Significant Test Is Chi-Square Test								

The relationship between knowledge of water contamination and attitude of water contamination is presented in Table 16 and Figure 18. As demonstrated, there is a statistically significant association between knowledge of water contamination and attitude of water contamination (p-value =0.000) (See Table 6 & Figure 2).

Table(6). Association between knowledge of water contamination and attitude of water contamination

Knowledge	Attitude						Total		Significant test
	Poor		Fair		Good				
	Fr.	%	Fr.	%	Fr.	%	Fr.	%	
Poor	61	15.25	37	9.25	6	1.50	104	26.00	156.448 P=0.000
Fair	11	2.75	93	23.25	66	16.50	170	42.50	
Good	5	1.25	55	13.75	66	16.50	126	31.50	
Total	77	19.25	185	46.25	138	34.50	400	100.00	

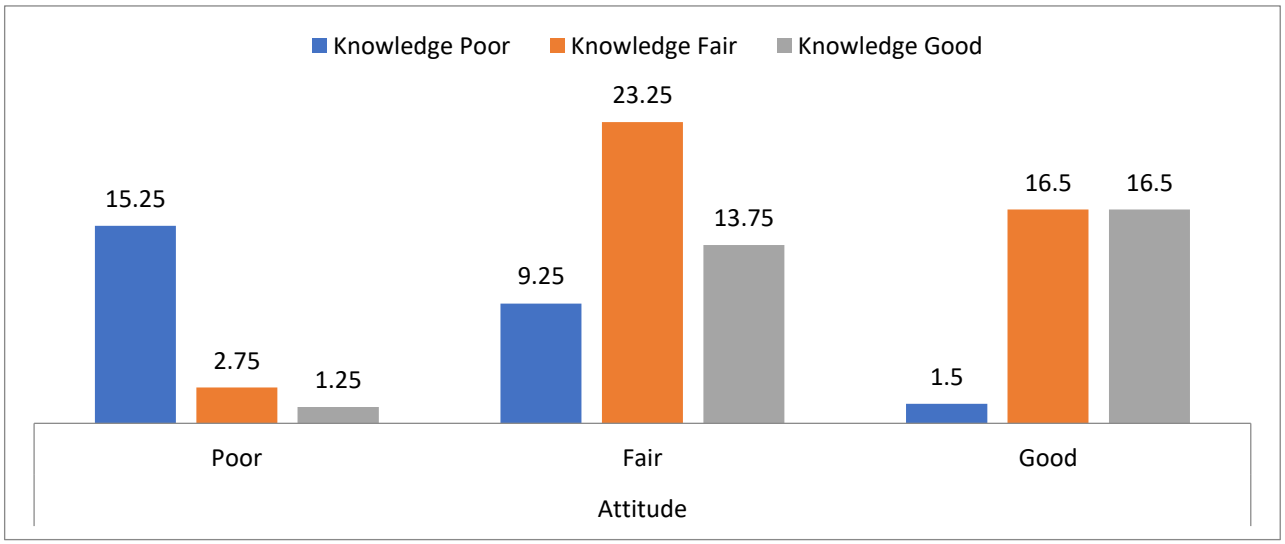

Figure (2). Association between knowledge of water contamination and attitude of water contamination

As shown in Table 17 and Figure 19, there was a statistically significant association between knowledge of water contamination and practice of water contamination (p-value =0.000) (See Table 7 & Figure 3).

Table(7). Association between knowledge of water contamination and practice of water contamination

Knowledge	Practice						Total		Significant test
	Poor		Fair		Good				
	Fr.	%	Fr.	%	Fr.	%	Fr.	%	
Poor	68	17.00	31	7.75	5	1.25	104	26.00	192.26 P=0.000
Fair	19	4.75	93	23.25	58	14.50	170	42.50	
Good	2	0.50	41	10.25	83	20.75	126	31.50	
Total	89	22.25	165	41.25	146	36.50	400	100.00	

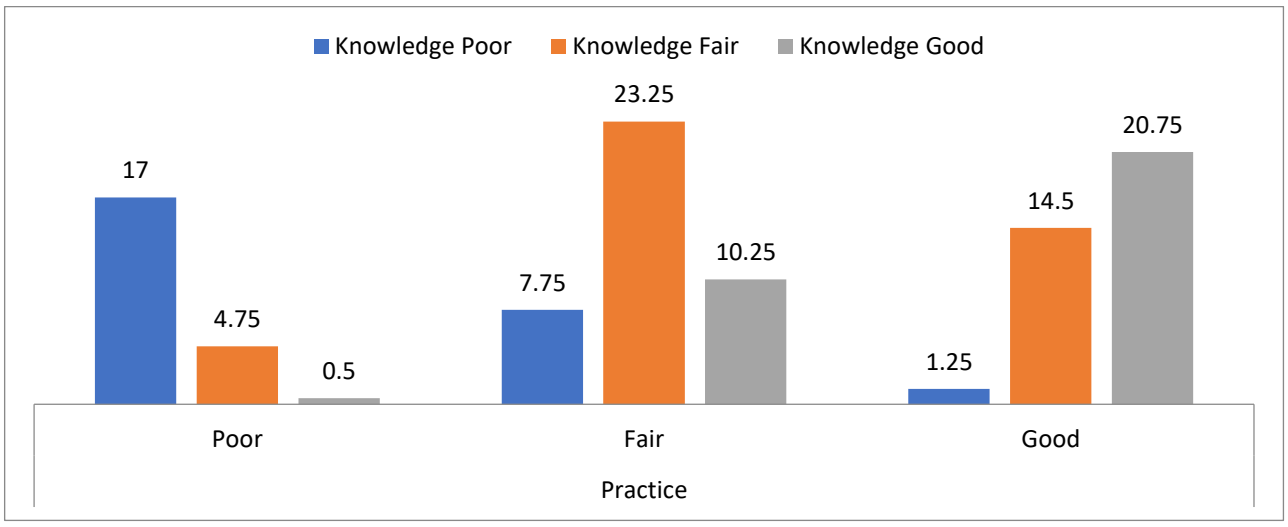

Figure (3). Association between knowledge of water contamination and practice of water contamination

The correlation between knowledge, attitude, and practice of water contamination was also examined through Spearman rank correlation, and the results revealed a significant strong positive statistical correlation between knowledge of water contamination and (attitude & practice) of water contamination which is (0.545 and 0.680), respectively (See Table 8).

Table (8). Correlation between knowledge of water contamination and (attitude & practice) of water contamination

Variables	Knowledge		
	Correlation	Sample	P-Value
Attitude	0.545	400	0.000
Practice	0.680	400	0.000
** Correlation Is Significant At The 0.05 Level (2-Tailed), Correlation: Spearman Rank Correlation			

Discussion

Assessing the knowledge, attitudes, and practices of medical personnel concerning water pollution and infection control is intended to comprehend and evaluate healthcare workers' comprehension, outlook, and actions in relation to the risks of waterborne infections and preventive measures in a hospital setting. This encompasses topics such as familiarity with waterborne illnesses, methods of water treatment and disinfection, hygiene practices, and their impact on mitigating the transmission of infections through contaminated water (Akkajit et al., 2020). The findings indicated that slightly less than 50% of the respondents held academic credentials, with roughly 25% possessing undergraduate degrees and approximately 20% having attained postgraduate qualifications. In a comparable investigation, Mothibi (2021) cautioned that inadequate knowledge and suboptimal practices concerning infection control procedures among healthcare personnel contribute to healthcare-associated infections. Consequently, healthcare workers must possess adequate knowledge of infection control measures and adhere to safe infection control practices.

Over 67% of the respondents had moderate to inadequate knowledge about water contamination, while slightly less than 33% had good knowledge. In a related investigation, Russotto et al. (2017) noted that bacteria forming biofilms on dry surfaces in hospitals pose a frequently neglected contamination hazard. Biofilms contain high concentrations of bacteria that can survive for extended periods on dry surfaces, becoming up to 1000 times more resistant to disinfection than free-floating bacteria. Bacteria present in biofilms on medical equipment, such as endoscopes, can withstand standard disinfection treatments. As a result, healthcare personnel must recognize that environmental contamination through biofilms contributes significantly to hospital-acquired infections. Sufficient awareness and comprehension of measures to mitigate this risk are necessary to enhance infection control and antibiotic stewardship.

Our findings indicated that slightly over 25% of the nurses had good practices in preventing water contamination. In a related investigation, Vaismoradi et al. (2020) posited that a robust culture of water contamination prevention among nurses can bolster patient safety and enhance the overall quality of healthcare. By prioritizing the prevention of waterborne infections, nurses can establish a safer environment for patients, staff, and visitors. Researchers in analogous investigations have documented a rise in culture positivity and a decrease in water contamination during specific

seasons. In another examination, Decker et al. (2014) suggested that hospitals must establish comprehensive water safety plans that incorporate preventive measures, as averting water system contamination is preferable to treating it. Whole genome sequencing can furnish epidemiological data linking patient infections to hospital water contamination, thereby enabling timely corrective actions. Overall, maintaining sound preventive practices regarding water contamination among nurses and other hospital personnel can substantially curtail infections, readmissions, and healthcare expenses.

The results demonstrated a significant association between the educational level of medical personnel and their knowledge of water contamination. However, no link was established between the age of the staff and their awareness of waterborne infections and risks. In a comparable investigation, Elrazak et al. (2018) advocated for ongoing training programs for healthcare personnel on waterborne diseases. They also affirmed that self-learning modules have a favorable impact on enhancing the knowledge and practice level of healthcare personnel concerning waterborne diseases. In addition, the investigation exposed a favorable association between the overall score of knowledge and the overall score of practice among community health nurses regarding waterborne diseases. However, no significant relationship was observed between knowledge and practice for health officers, environmental health technicians, and laboratory technicians.

The outcomes of the current investigation established noteworthy connections between the attitudes of participants concerning water contamination and their age and educational attainment. However, no substantial correlation was found between gender and attitudes. Therefore, the attitudes of hospital personnel towards water contamination were influenced by age and education, but not gender. A comparable investigation by Usman et al. (2016) revealed that the quality of drinking water at the point of use is subject to numerous factors within and surrounding the household. Socio-demographic factors, such as the age and gender of the household head, have been identified as influencing the quality of household drinking water. The size of the household and the level of education can also impact the quality of stored water. Ondieki et al. (2022) conducted a study examining social, cultural, and behavioral factors associated with household water treatment and storage and arrived at results similar to those of the present study. The researchers found that, in relation to age, older women tend to possess superior knowledge of water contamination in comparison to younger women, possibly due to increased exposure to health officers.

The findings of our investigation revealed notable associations between the practices of participants concerning water contamination and both their age and educational attainment. Conversely, self-reported practices displayed no significant correlation with gender. Consequently, the practices of hospital personnel with regard to water contamination were influenced by age and education, but not gender. Lowe et al. (2021) conducted a comparable investigation and revealed that insufficient hospital infrastructure, shortages of resources and personnel, inadequate education and training of staff on infection prevention and control, deficient in-service training and supervision, and high numbers of visitors pose obstacles to infection prevention and control in hospitals, akin to those observed in other resource-constrained settings. In light of their findings, which are consistent with

those of the current study, it is imperative to devise tailored infection prevention and control programs that are both feasible and sustainable in unstable settings.

A significant statistical relationship was observed between the knowledge and attitude of participants concerning water contamination. Greater familiarity with water contamination was associated with a more favorable attitude towards addressing this concern, indicating that enhancing public knowledge can have a positive impact on public perception. Sharma et al. (2023) conducted a related study that disclosed medical personnel's inadequate implementation of standard precautions concerning water contamination, despite possessing adequate knowledge, resulting in a "know-do gap." While high workload and insufficient knowledge affect attitudes, incorrect assumptions, and inadequate compliance due to complacency also hinder proper practices. Enhancing knowledge through repeated hands-on training, combined with endeavors to cultivate positive attitudes, can assist in narrowing this gap and consequently curbing healthcare-associated infections.

A significant statistical correlation was established between knowledge of water contamination and the implementation of practices to prevent it. In a similar investigation, Ssemugabo et al. (2019) revealed that individuals possessing a greater level of knowledge are more cognizant of water contamination taking place at the water source. Additionally, these individuals acknowledged the hazards linked with consuming unsafe water and recognized that boiling drinking water can serve as a crucial measure in preventing diarrheal diseases.

The outcomes of the Spearman rank correlation test indicate a robust positive association between the knowledge of water contamination among respondents and their attitude and practices related to this matter. These findings imply that enhancing the awareness and comprehension of individuals can profoundly impact not only their perspectives but also their actual conduct in mitigating water contamination. Kumah et al. (2022) conducted a comparable investigation and reported a moderately robust association between the knowledge of water contamination among respondents. Additionally, the authors highlighted that, while knowledge is a critical factor that influences human behavior, as posited by the Theory of Planned Behavior and the Health Belief Model, other factors such as attitudes, social norms, and self-efficacy also contribute to this phenomenon. Therefore, augmenting participants' awareness through educational interventions necessitates complementing these efforts with endeavors to foster positive attitudes, social influences, and perceived behavioral control to maximize the impact on practices.

Conclusion

The findings indicate that most of the participants were females between the ages of 30 to 40, with a bachelor's or institute degree. Approximately 42.5% demonstrated fair knowledge, 46.25% had a fair attitude, and 41.25% exhibited fair practice towards water contamination. A significant association was observed between the level of education and the knowledge, attitude, and practice of water contamination. Nonetheless, age was significantly linked to attitude and practice but not knowledge, while gender was not significantly associated with any of the parameters. Moreover, a

noteworthy positive correlation was established between knowledge of water contamination and both attitude and practice, implying that enhancing knowledge can positively influence attitudes and practices related to mitigating water contamination. Overall, the outcomes underscore the necessity for educational interventions targeted at all levels to foster greater awareness and knowledge that can translate into transformed attitudes and enhanced practices for addressing the issue of water contamination.

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