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Assessment of Knowledge, Perception, and Compliance with Hand Hygiene Practice among Health Care Workers at National Liver Institute, Menoufia University

Amira Mohammed Ahmed Yousef [1], Azza Mohammed Abd-ElAziz [2], Laila Shehata Dorgham [1], Inas Maged Moaz [1]

[1] Epidemiology and Preventive Medicine Department, National Liver Institute, Menoufia University, Menoufia, Egypt.
[2] Clinical Microbiology and Immunology Department, National Liver Institute, Menoufia University, Menoufia, Egypt.

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ABSTRACT

Background: Healthcare-associated infections (HAIs) are a significant concern in healthcare services due to their association with extended hospital stays and the potential for morbidity or fatality. Ensuring proper hand hygiene (HH) is the foremost measure in HAIs. **Objective:** To evaluate HH perception, knowledge, and compliance among healthcare workers (HCWs), at the National Liver Institute (NLI), Menoufia University. **Method:** In this descriptive cross-sectional work, 100 HCWs at NLI Menoufia University departments were investigated using standardized World Health Organization's (WHO) knowledge and perception questionnaires. HH compliance was evaluated using the WHO Five Moments HH Observation form as the reference. **Results:** Of 100 HCWs at NLI (35 doctors, 65 nurses), half of the HCWs were females (51%) aged between 21 and 35 years. The overall knowledge level showed that only 16% of studied HCWs had a good level of HH-related knowledge and over half of them (58%) had a moderate level while 26% of the HCWs had poor knowledge. Regarding perception survey, more than half of the HCWs (53%) had moderate perception, 32% of HCWs had good perception, and only 15% of HCWs had poor perception. The overall HH compliance was 38.1% out of 672 total HH opportunities. Nurses had a higher compliance rate than doctors (43.5% vs. 24.5% respectively). **Conclusions:** The study highlights notable disparities in HH knowledge and practices, with nurses demonstrating better awareness and adherence compared to doctors. Despite the high perception of HH's importance, overall compliance was suboptimal, particularly in certain departments and moments recommended by WHO.

INTRODUCTION

Hand hygiene (HH) refers to the act of cleaning hands using soap and water or an antiseptic hand rub. Its purpose is to eliminate temporary microbes from the hands and preserve the skin's condition. It is a highly significant global health concern in reducing the occurrence of health-related illnesses.[1] Appropriate HH prevents up to 50% of HAIs.[2] A study conducted in Saudi Arabia showed a significant increase of HH compliance from 38% in 2006 to 83% in 2011 leading to a Significant reduction of MRSA infections.[3]

Infections are frequently linked to insufficient HH practices among healthcare workers (HCWs).[4] Globally, out of every 100 patients, 7 in developed and 15 in developing countries acquire at least one HAI in acute care hospitals. One million of the 4.1 million maternal and neonatal deaths annually worldwide may be related to unhygienic birthing practices, including lack of HH.[2]

These infections can result in extended hospital admissions, long-term impairment, increased resistance of microbes to antimicrobial drugs, and substantial financial burdens.[5]

Therefore, The Egyptian Ministry of Health has identified the establishment of a cost-effective

Corresponding Author: Amira Mohammed Ahmed Yousef, Department of in Epidemiology and Preventive Medicine Department National Liver Institute, Menoufia University, Egypt. Email: amirayousef20200@gmail.com

infection control program as a top priority for enhancing the quality of healthcare in the country. [4] National Liver Institute (NLI) is a location where the highest likelihood of transmitting HAIs to patients or HCWs who provide care to them exists. A study conducted in the NLI reported that there was good knowledge and attitude, but poor practice regarding standard precautions for HAI among HCWs in the NLI. [6] The objective of this study was to evaluate HH perception, knowledge, and compliance among HCWs at the NLI, Menoufia University.

METHODS

A cross-sectional work was performed in NLI, Menoufia University. The study participants were 100 medical staff working at NLI, Menoufia University. Only medical doctors and nurses working at different departments of NLI were incorporated in this work. The exclusion criteria were individuals who are not employed in the department, and those who are not involved in the medical field. The participants were involved after obtaining informed oral consent for study participation.

Data collection tools: Throughout the work, data was gathered utilizing the HH observation form and HH Knowledge and perception questionnaires adapted from WHO HH assessment tools. The observation form included all five HH opportunities as designated by the WHO. The WHO HH knowledge questionnaire consisted of 21 primary items about HH knowledge, while the WHO HH perception questionnaire had 24 main questions related to HH perception. [7, 8]

Data were gathered from May to October 2023 at Hepatology and gastroenterology, Pediatric Hepatology and Hepato-Pancreato-Biliary Surgery departments including (outpatients, inpatients, and ICU), NLI, Menoufia University.

Observations were conducted from May to July 2023 over a monitoring period of 90 days. A total of 672 direct observations related to HH opportunities were recruited. Observations were conducted for each of the 5 HH moments, as defined by the WHO, utilizing the HH standardized observation method. These observations focused on identifying opportunities and practices related to HH among HCWs. The form documented the quantity of HH opportunities and the quantity of actual HH activities that HCWs performed. Compliance was determined by dividing the number of observed HH practices by the overall amount of HH opportunities observed. [9]

Regarding HH knowledge and perception questionnaires, both questionnaires include socio-demographic information that includes age, gender, level of education, occupation, residential area, and work experiences. The knowledge section covers topics such as training courses, the usage of alcoholic handrub, the source of germs that cause HAIs, transmission pathways of these germs, HH methods and conditions, and the recommended duration for effective handrub or hand wash. The perception survey focused on assessing the estimation of the rate of HAIs, the impact of hand hygiene on preventing HAIs and improving patient outcomes, the level of importance given to HH in the center, the influence of staff training, and other related factors. In terms of the knowledge score, each correct response was awarded 1 point, while each incorrect response received a score of 0. The total score range for the knowledge score is from 0 to 25. The overall knowledge score was determined by dividing the number of correct answers by the overall number of questions and expressing it as a percentage. Subsequently, the knowledge score was classified into three categories: good (scoring ≥80%), moderate (score 60% - 79%), and poor (score <60%). Regarding the perception score, it was assessed with participants response to 12 question items (a seven-point (1–7) Likert-type scale) as, 1 Likert-scale was given 1 point as negative response, and 7 Likert-scale was given 7 points as positive response) with an overall score range of 12-84. The total perceptions score was computed and was classified into good (80 to 100% score), moderate (60–79%), and poor (score <60%). [10]

Sampling: The study's participants were chosen through the simple random sampling method for both observations and questionnaires. Observation of HH practices was done on 100 HCWs over a monitoring period of 90 days. A total of 100 HCWs (65 Nurses and 35 Doctors) were recruited for the knowledge and perception questionnaires.

To ensure the statistical validity and reliability of our study aimed at detecting a knowledge score of 66.5 with a standard deviation of 9.4, we conducted a comprehensive sample size calculation based on standard statistical methodologies. We determined that a sample size of 85 participants would be sufficient to achieve a power of 80% and a significance level (alpha) of 5% from Manshadi, et al study. [8]

Table 1: Socio-demographic data of HCWs at NLI, Menoufia university

Demographic characteristics	Profession		HCWs (n=100)
	Doctors (n=35)	Nurses (n=65)	
Gender			
Male	19 (54.3%)	30 (46.2%)	49 (49%)
Female	16 (45.7%)	35(53.8%)	51 (51%)
Age (years)			
Min-max	26-34	21-35	21-35
Mean+-SD	30(±2.86)	25.3(±2.75)	26.59(±3.26)
Department			
Hepatology	15 (42.9%)	25 (38.5%)	40 (40%)
H.B. Surgery	10 (28.6%)	20 (30.8%)	30 (30%)
Pediatric Hepatology	10 (28.6%)	20 (30.8%)	30 (30%)
Formal HH training			
Yes	21 (60%)	57 (87.7%)	78 (78%)
No	14 (40%)	8 (12.3%)	22 (22%)
Routine handrub			
Yes	25(71.4%)	61(93.8%)	86(86%)
No	10(28.6%)	4(6.2%)	14(14%)

Data are presented as Mean ± SD or number (%). HCWs: healthcare workers. NLI: National Liver Institute.

The total sample size needed to assess the knowledge and perception about HH for the medical team working at NLI was 100 using the Epi website ("Open-Source Statistics for Public Health,")

Statistical analysis: The data was inputted and analyzed utilizing SPSS version 26, which is a statistical software application designed for social science research. The graphics were created utilizing the Excel software and SPSS. The quantitative parameters are represented by the mean and standard deviation (mean ± SD) in the generated findings. Quantitative parameters are compared using a t-test. If the parameters don't have a normal distribution, a Mann-Whitney U test is used instead. The comparison of qualitative parameters has been conducted using either the chi-square test or Fisher's exact test. If any of the expected cells were less than five, Fischer's exact test was used if 2×2 table otherwise Likelihood ratio was used. The correlation between the quantitative parameters has been analyzed using the Pearson correlation coefficient and the Spearman rank correlation. The significance level was considered less than 0.05($P < 0.05$).

RESULTS

Regarding the socio-demographic characteristics of 100 HCWs at NLI. Both genders were equally represented as half of HCWs were females (51%). The age of studied HCWs ranged between 21 and 35 years, with a mean of 30±2.86 years for medical doctors and 25.3±2.75 for nurses. About one-third (30%) of medical doctors and nurses were working at hepatobiliary surgical and pediatric hepatology departments (28.6% and 30.8% each respectively). While 40% of HCWs were working at the hepatology department including 42.9% were medical doctors and 38.5% nurses. Most studied nurses (87.7%) started receiving formal training in HH. While 60% of medical doctors received similar training. Table (1)

Regarding hand hygiene knowledge of HCWs at NLI, Menoufia university, about 67.7% of the nurses reported that the primary means of transmitting infections between patients occur when their hands are not properly sanitized which was significantly higher than medical doctors (42.9%, $p<0.05$). Similarly, about 61.5% of nurses shared that Performing HH before a clean/aseptic procedure does not effectively prevent the spread of microorganisms to HCWs compared only to 34.3% of medical doctors with high significant difference ($p<0.001$). Less than half of the respondents were aware that hand rubbing is the HH method needed before giving an injection (49%). Additionally, majority of the participants (93%), said that avoiding harmed skin and artificial fingernails is recommended due to the increased risk of hazardous germ colonization on the hands. Overall, HCWs provided 37 to 98% correct responses.

Table 2: Association between HCWs' gender, professional status, departments and HH training and their HH (knowledge and perception) levels

Socio-demographic characters	HH knowledge levels			Test of significance x^2	p-value
	Poor (<60%)	moderate (60-79%)	Good (80-100%)		
Gender					
Male(n=49)	12 (24.5%)	29 (59.2%)	8 (16.3%)	0.11	0.95
Female(n=51)	14 (27.5%)	29 (56.9%)	8 (15.7%)		
Profession					
Medical doctor(n=35)	8 (22.9%)	23 (65.7%)	4 (11.4%)	1.5	0.5
Nurse (n=65)	18 (27.7%)	35 (53.8%)	12 (18.5%)		
Department					
Hepatology (n=40)	16 (40%)	17 (42.5%)	7 (17.5%)		
H.B. Surgery (n=30)	4 (13.3%)	20 (66.7%)	6 (20%)	8.8*	0.06
Pediatric Hepatology (n=30)	6 (20%)	21 (70%)	3 (10%)		
HH Training					
No (n=22)	6 (27.3%)	12 (54.5%)	4 (18.2%)	0.32*	0.9
Yes (n=78)	20 (25.6%)	46 (59%)	12 (15.4%)		
HH perception levels					
Gender					
Male(n=49)	10 (20.4%)	26 (53.1%)	13 (26.5%)	2.8	0.2
Female(n=51)	5 (9.8%)	27 (52.9%)	19 (37.3%)		
Profession					
Medical doctor(n=35)	10 (28.6%)	22 (62.9%)	3 (8.6%)	16.8	**<0.001*** **
Nurse (n=65)	5 (7.7%)	31 (47.7%)	29 (44.6%)		
Department					
Hepatology (n=40)	8 (20%)	19 (47.5%)	13 (32.2%)		
H.B. Surgery (n=30)	4 (13.3%)	19 (63.3%)	7 (23.3%)	3.3*	0.5
Pediatric Hepatology (n=30)	3 (10%)	15 (50%)	12 (40%)		
HH Training					
No (n=22)	5 (22.7%)	12 (54.5%)	5 (22.7%)	1.9*	0.4
Yes (n=78)	10 (12.8%)	41 (52.6%)	27 (34.6%)		

*Data are presented as number (%). *LH R likelihood ratio test. **Statistical significance, P< 0.05. *** Highly statistical significance, P< 0.001. HH: hand hygiene. HCWs: healthcare workers.*

Table 3: Correlation between total score of HH knowledge and perception among studied HCWs

Variables	knowledge	
	r (spearman)	p-value
Perception	**0.06**	**0.552**

**Statistical significance, P< 0.05. ** Highly statistical significance, P< 0.001. HCWs: healthcare workers.*

The overall knowledge level showed that only 16% of studied HCWs had a good level of HH related knowledge and more than half of them (58%) had a moderate level while 26% of the HCWs had poor knowledge. There was no substantial disparity observed in the overall knowledge degree and total knowledge score among the nurses and doctors that were studied (p <0.05 for each). (Table 1 in supplementary file)

Upon examining factors that affecting the knowledge levels of HCWs, no significant association was found between knowledge level of HCWs and other studied factors namely their gender, profession, department or receiving a formal training on hand hygiene. Table (2)

Perception Survey: According to the HCWs viewpoint about hand hygiene perception, they estimated 60% of patients were affected by HAIs. Around 66% of respondents indicated the substantial effect of HAIs on patients' clinical outcomes, whereas just 18% indicated a low impact. The disparity between doctors and nurses was found to be highly statistically significant (p <0.001). To achieve a lasting improvement in HH at health facilities, it is necessary to take certain steps. These efforts include leaders and senior managers providing support and emphasizing the need for HH,

that has been reported by HCWs as very effective (50%), with just a small percentage (3%) perceiving it as ineffective. Regarding the availability of alcohol-based hand-rub at every point of care in healthcare institutions, 52% of HCWs considered it to be a highly effective measure, while just 2% of them considered it to be ineffective.

Table 4: HH compliance by profession category within NLI departments

Departments	Profession	HH opportunity	HH action			HH compliance %
			Hand wash	Hand rub	Total	
Hepatology	Doctors	64	2	14	16	25%
	Nurses	160	30	31	61	38.1%
	HCWs	224	32	45	77	34.4%
H.B. surgery	Doctors	64	2	15	17	26.7%
	Nurses	160	36	36	72	45%
	HCWs	224	37	52	89	39.7%
Pediatric Hepatology	Doctors	64	2	12	14	21.9%
	Nurses	160	37	39	76	47.5%
	HCWs	224	39	51	90	40.2%
Overall HH compliance	Doctors	192	6	41	47	24.5%
	Nurses	480	103	106	209	43.5%
	HCWs	672	108	148	256	38.1%

NLI: National Liver Institute; HH: hand hygiene; H.B. surgery, Hepato-Pancreato-Biliary Surgery

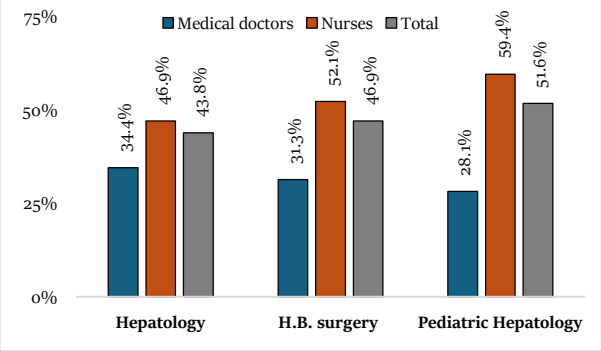

Figure 1: Hand hygiene (HH) compliance by profession category at different NLI departments

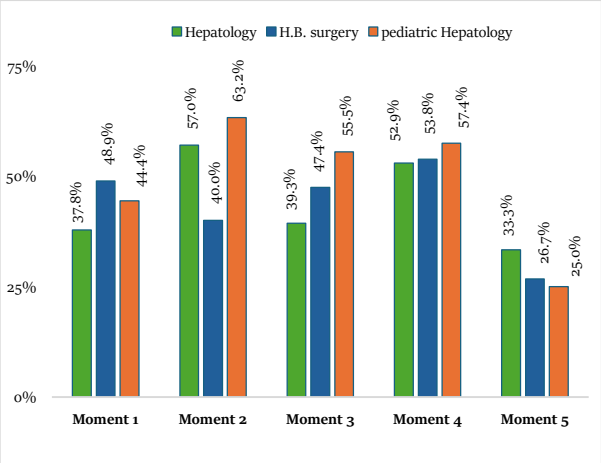

Figure 2: Hand Hygiene (HH) compliance by World Health Organization HH moments at different NLI departments

According to the HCWs' opinion about the self-performance of HH in required situations, doctors assumed that they performed proper HH by 70%, while nurses claimed significantly higher levels (95%, p <0.001). Most of the HCWs (53%) had moderate perception, 32% HCWs had good perception, while only 15% of HCWs had poor perception. a highly statistically substantial variation existed among studied doctors and nurses regarding their mean total perception score and perception levels (p <0.001). (Table 2 in supplementary file)

The HH perception levels of the HCWs were significantly associated with their professional status (P< 0.001), but not significantly associated with their gender, departments, or previous hand hygiene training (p>0.05 for each). Table (2)

No significant correlation between total score of HH knowledge and perception among HCWs within NLI. Table (3)

HH Compliance: Analysis of HH observations showed that the overall HH compliance at NLI was 38.1% of 672 total HH opportunities. In examining the compliance per professional category, nurses had a higher compliance rate than doctors (43.5% vs. 24.5% respectively) as shown in Table (4).

Comparing HH compliance at different NLI departments, it was the highest among HCWs of

pediatric hepatology department (40.2%) compared to the Hepatobiliary surgery department (39.7%), while it was the lowest at the hepatology department (34.4%). Table (4)

While at different NLI ICU types, HH compliance was the highest among HCWs of pediatric hepatology ICU (51.6%) compared to Hepatobiliary surgery (46.9%) and hepatology ICU (43.75%). (Figure 1 in supplementary file)

Based on the five moments of HH recommended by the WHO, all outpatients showed that the highest compliance was at moment 4 while the lowest compliance was at moment 1. This suggested the importance of HH after patient contact. Maximum compliance was seen for moment 2 at pediatric hepatology and hepatology ICU and for moment 4 at Hepatobiliary surgery ICU while the lowest hand hygiene compliance was for moment 5 across all ICU types. (Figure 2 in supplementary file)

DISCUSSION

Our work aimed to evaluate HH knowledge, perception, and compliance among HCWs at NLI, Menoufia University. The study findings revealed that only 16% of studied HCWs had good level of HH related knowledge and over than half of them (58%) had a moderate level while 26% of the HCWs had poor knowledge. The reported moderate levels of knowledge in this study were in the same line with Abalkhail, Mahmud et al.[10] and Zakeri, Ahmadi et al.[11] studies and higher than Sowar Sr, Acunin et al.[12] study**.** The primary obstacle to maintaining proper HH practice in the workplace is the clear lack of sufficient information among healthcare workers. Therefore, it is advisable to regularly promote additional training courses and foster a culture that emphasizes the importance of practicing excellent HH.[10]

The survey participants also suggested that the presence of fingernails, artificial jewelry, and compromised skin could serve as potential vectors for the transmission of germs in hospital environments. Suen et al.[13] in Hong Kong[14] and Maheshwari et al.[15] in India also reported a comparable outcome.

Most of the HCWs (53%) had moderate perception, 32% HCWs had good perception, while only 15% of HCWs had poor perception. In contrast, Abalkhail, Mahmud et al.[10] and Sowar Sr, Acunin et al.[12] studies reported higher levels of good perception. According to the HCWs perception of the self-performance of HH in required situations, doctors assumed that they perform proper hand hygiene by 70%, while nurses claimed significantly higher levels (95%, p <0.001). Nurses' overestimation of their actual performance in HH might be attributed to various factors, such as motivation, the presence of a peer or higher-ranking staff member during HH procedures, and the nurses' anxious attitude towards being observed by senior staff or management.[16]

In our study, no significant correlation was found between knowledge and perception which was also reported by Goodarzi, Haghani et al.[17]

The overall HH compliance at NLI was 38.1% which was reduced contrasted to a work performed in primary health care facilities in Qalyubia Governorate, Egypt.[16] In this study, nurses were more compliant than doctors. This came by, Elia, Calzavarini et al.[18] and disagreed with Abalkhail, Mahmud et al.[10] and Elseesy, Al-Zahrani et al.[19] who reported that the nurses had lower overall compliance levels in comparison to the doctors. The factors contributing to the lower HH compliance among physicians, as opposed to nurses, are not well comprehended. Physicians identified "remembering to maintain HH" and "high workload or feeling too rushed" as the primary obstacles to complying with hand hygiene protocols. There are also deficiencies in infection control training among physicians. Nevertheless, the efficacy of measures in enhancing infection control practices among HCWs is having a considerably lesser influence on physicians.[20]

Based on the WHO research agenda for HH in healthcare from 2023 to 2030, the average compliance levels for HH in ICUs are approximately 60%. However, there are notable differences between high-income and low-income nations, with compliance rates of 64% and 9% respectively.[21] So, in our study the low level of hand hygiene compliance at NLI ICUs compared to WHO average levels could be explained as HCWs prioritized the efficiency of performing patient care tasks over the time-consuming process of HH, according to their perception.[22]

Considering the five HH moments recommended by the WHO, our results came by Anwar and Elareed [23] who reported that moment 1 had the lowest hand hygiene compliance rates.

There is currently no universally accepted criterion for quantifying compliance with HH practices. The most common method employed in most studies is direct observation of HH adherence. WHO guidelines advocate the utilization of direct

observation to monitor compliance with HH. However, subsequent research debates the effectiveness of direct observation methods.[24]

CONCLUSIONS

The study highlights notable disparities in HH knowledge and practices among HCWs at NLI, Menoufia University, with nurses demonstrating better awareness and adherence compared to doctors. Despite the high perception of HH's importance, overall compliance was suboptimal, particularly in certain departments and moments recommended by WHO. The findings suggest that while some HCWs are well-informed and proactive, there is a significant need for targeted educational interventions and improved support to enhance HH practices across all professional categories and departments. Strengthening these areas is crucial for reducing HAIs and improving patient outcomes.

Ethical Approval

The study got approval from the Ethical Committee at NLI, Menoufia University (NLI IRP protocol number 00550/2023). Informal consent was granted from each participant.

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