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The Knowledge and Perception of Hand Hygiene Among Health Care Workers in Clinical Settings in Khartoum State - Sudan

Ragda M. BaderAldeen[1], Salah I. Kheder[2,*]

[1]Al Hammadi Hospital – Saudi Arabia

[2]Faculty of Clinical and Industrial Pharmacy -National University – Sudan.

Abstract:

Objective: This study conducted to assess health care practitioners' knowledge and perceptions of hand hygiene among health professional working in clinical settings in Khartoum State - Sudan. with the specific objective of determining the association between their stance on hand hygiene and the general demographic characteristics of these health-care professionals.

Methodology: This is a cross-sectional study conducted between July and November 2017 using a modified form of WHO questionnaire for knowledge and perception that was included 22 items was sent online to health care workers via social media. The data obtained entered and analyzed by SPSS version 24. Chi-square and test of independence were used as a test of significance. A p-value of < 0.05 was considered statistically significant for all purposes.

Result: 437 hospital staff were responded to the questionnaire. (99.3%) was found to have good knowledge. 197(45.2%) had good perception and 239(54.8%) had fair perception. Formal hand hygiene training was found to have no association with knowledge levels of hand hygiene, but the fair perception was higher in the respondents who didn't receive formal training.

Conclusion: The present study highlights the hand hygiene knowledge and perception. Most health care workers were found to have good knowledge, and the majority was found to have a fair perception. Formal hand hygiene training courses were found to have no association with knowledge but it may be reflected in practice. The importance of training sessions regarding hand hygiene was noticed in the perception level.

Corresponding Author: Salah I. Kheder, Faculty of Clinical and Industrial Pharmacy, National University, Sudan. +249912358223.

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Introduction

Healthcare-associated infections are a serious problem in health care services as they may cause prolonged hospital stays, high mortality, long-term disability, and excess health care costs. Most healthcare-associated infections can be transmitted from patient to patient via the hands of health care workers. In other words, health care workers' hands due to poor hand hygiene are the most usual type of vehicle for the transmission of healthcare-associated infections [1].

Effective hand hygiene is the simplest proven method to reduce the prevalence of healthcare-associated infections. Unfortunately, the prevalence of these infections continues to rise, and it is estimated that annually about hundreds of millions of patients suffer from healthcare-associated infections the world over. Therefore, infection control is necessary to reduce the high levels of healthcare-associated infections, and the importance of hand hygiene in the control of infection cannot be overemphasized [1, 2].

Hand hygiene is a general term referring to any action of hand cleansing by using water and detergent and/or the use of alcohol-based hand sanitizers for the removal of transient microorganisms from hands [3]. Despite the relative simplicity of this procedure, compliance with hand hygiene among health care providers is as low as 40% [4, 5, 6]. To address this problem, continuous efforts are being made to identify effective and sustainable strategies. One such effort is the introduction of an evidence-based concept of "My five moments for hand hygiene" by the World Health Organization. These five moments that call for the use of hand hygiene include the moment before touching a patient, before performing aseptic and clean procedures, after being at risk of exposure to body fluids, after touching a patient, and after touching patient surroundings. This concept has been aptly used to improve understanding, training, monitoring, and reporting hand hygiene among healthcare workers [6].

The risk of healthcare workers associated infections can be reduced by creating awareness, providing proper hand hygiene education, and training [7, 8]. The World Health Organization (WHO) has introduced an evidence-based concept and guidelines on hand hygiene in healthcare to improve understanding, training, monitoring, and reporting of hand hygiene among healthcare workers [7].

Although the WHO guidelines and tools were designed in a way that would be of use in any setting regardless of the resources available and the cultural background, it was recognized that adaptation according to local needs, resources, and settings would be necessary [9]. Especially in developing countries, hand hygiene improvement requires a different approach than in developed countries [10]. Hospitals are still facing problems that typically occur in a developing country, such as overcrowding of wards and shortage of certain supplies [11, 12]. It is unknown which of the elements of the WHO multi-modal approach would have the greatest impact on the improvement of hand hygiene in such a setting [13].

There is a need to explore the concept of hand hygiene knowledge and perception among the cross-disciplinary healthcare workers, this kind of information is necessary to redesign the approach into a suitable and feasible program for Sudan and similar countries. Worldwide various studies have been conducted regarding hand hygiene knowledge and perception among HCWs, reported that health practitioners have a low level of knowledge of infection control and poor application of such knowledge to their clinical practice [14-18]. Low knowledge, understanding, and skills regarding hand hygiene were reported to have a negative effect on the HCWs' compliance with hand hygiene practice. Hand hygiene practices also vary depending on the individual, institution, culture, and many other factors. There are limited number of studies conducted in Sudan, measuring awareness, attitudes and adherence to hand–hygiene [19-21]. These studies show that prevention and control of health care associated infections (HCAIs) is given low priority due to a lack of trained manpower, infrastructure and surveillance systems; overcrowded and understaffed hospitals; poor sanitation; lack of clean water; lack of legislation mandating hospital accreditation; and generally poor awareness, attitudes and compliance towards basic infection control procedures amongst healthcare providers. With this background, the present study was undertaken to assess the level of knowledge and perception regarding hand hygiene practices among health care practitioners working in some Sudanese

hospitals and to identify gaps in knowledge and poor attitudes regarding hand hygiene practice. Also to determine the association between the knowledge, attitude and self-reported practices of health care workers and professional category, years of clinical experience, clinical discipline/ward and previous hand hygiene training. Data generated from this study may be useful to determine the knowledge, attitudes and therefore provide useful baseline data to inform infection prevention and control (IPC) programmes and guide interventions to reduce HCAIs and the findings will inform education and training of HCWs on hand hygiene and improve compliance. To the best of our knowledge, no online hand hygiene surveys has been conducted before in Sudan. Therefore, a cross-sectional study was undertaken to determine the knowledge, perception and practices of HCWs on hand hygiene in Khartoum State hospitals.

Methodology

Research Design

This cross-sectional study for hand hygiene knowledge and perception among HCWs (physicians, nurses, pharmacists and others) in Khartoum State hospitals and clinics was conducted between July and December 2017. This design was chosen because it enables the collection of quantitative data on multiple variables at a single point in time. Advantages of using cross-sectional study design enables the study of multiple outcomes which can be studied with ease while facilitating the description of population characteristics and identifying associations among variables. The use of this design is considerably inexpensive and less time consuming because there is no loss to be followed-up on. Prevalence of outcome of interest can be estimated because samples are usually taken from the whole population. Additionally, due to the assessable outcomes and factors, this study design becomes convenient for public health planning. The primary limitation of a cross sectional design is the inability to establish causal inference and the situation may provide differing results in another timeframe.

Sample Selection

HCWs who were shared in different social media were invited voluntary to participate and fill study questionnaire during the given period of the study. Questionnaire distributed via a Facebook group that contains 32,657 Sudanese medical members asked to participate in the study, in addition about 2500 members of whatsapp groups members working in infection control units, nurses, pharmacists, and medical directors in different hospitals who asked to fill and distribute the questionnaire with their medical colleagues in social network groups using an access link to google drive to get access to questionnaire. Using a table for determining sample size from a given population [22], a minimum sample size was 380 participants.

Data Collection Procedures

A self-administered structured closed-ended questionnaire was developed using the available literature of WHO hand hygiene knowledge and perception questionnaires and was distributed and analyzed between August, and September 2017. The questionnaire was administered using Google Forms, and its link was spread through Social media to HCWs in Khartoum hospitals and clinics. The hand hygiene questionnaire instrument consisted of three parts, part one is demographic specification including gender, age, educational level, specialization, name, type, and nature of the hospital, the department of working and experience. Part two consists of 8 questions were formulated as a list of options with the ability of multi-selection to test the knowledge of hand hygiene, and part three is consisting of 4 questions with a list of options to assess perception. The adapted questionnaire was not pretested and did not go through the validation process before network distribution. The source instrument was being prepared in English to ensure readability.

Data Analysis

Since the questionnaire was conducted online, data was automatically captured in a spreadsheet with no opportunity for errors in the data capturing process. The data then was downloaded as an Excel spreadsheet. Data analysis was done using the Statistical Package for Social Sciences SPSS version 24 (IBM) to analyze the study data and Microsoft office excel program. All data were expressed as text, illustrated tables, and figures. To describe demographic attributes for variables of knowledge and perception; descriptive statistical tests of frequency and percentage

of frequency, mean, and standard deviation were utilized. Qualitative data were summarized as percentages and then nonparametric tests of significance (Chi-square test) were applied to nominal scales. Test of independence were employed for study on relationships in fields of knowledge and perception with demographic specifications. The confidence interval was 95% and the significance level of P-value was considered smaller than 0.05 (significant).

The second part measured knowledge of participants about hand hygiene based on giving answers to 8 items. In which they answered yes and no to them, or choose the right answer from multiple choices. The false answer is given (0) score and score (1) to the right answer. Participant's responses to individual items along with participants' summated totals for all scales were analyzed using descriptive statistics. The total scores of all correct answers was 34. The method of evaluation of the knowledge variable was to give score (17- 26) as bad, and (27 – 34) scores to assess a good level. The method of evaluation of the perception in healthcare workers was the same as for knowing where it was considered by the score. The perception total score of all correct answers was 14, which divided into two categories: "fair perception" (< 7), "and "good perception" (8–14)

Ethical Considerations

Approval was taken from National University-Faculty of pharmacy, and agreement on written consent had been taken from all participants.

Budgets

The study was self-financed. The budget included transportation and printing out the research

Result

Demographic of the Responded Samples

There was a total of 437 hospitals staff participated in the study and filled online survey questionnaire. Most of response from medical doctors (275), remaining were pharmacists (72), technicians (39), nurses (26), dentists (18), physiotherapists (4), radiologist (1), dietitian (1), student (1) and anesthetist (1). They are working in 21 different departments (internal medicine, surgery, emergency, and others) from 82 different hospitals and clinics in Khartoum state. Most of the participants 325(74.4%) were working in public hospitals and 112 (25.6%) working in private hospitals. According to type of hospital most of the respondents 172(39.4%) were working in general hospitals, then 159(36.4%) in teaching hospitals and, 106 (24.3%) in specialized hospitals and clinics. The most six frequent respondents' hospitals were shown as figure (1).

The majority of respondents (80) were working in Internal medicine departments, followed by surgery departments (60), emergency departments (45) and Obstetrics and Gynecology (40), remaining were working in 15 different departments. Figure (2) shows the details of working departments

The age range of participants was between 20-51 years and their mean age was 27 years (SD = 4.74). Most of the participant 428 (97.9%) had working experience average 3.3 (SD 3.5) and only 9 (2.1%) had no working experience. The females' participants were the majority of 316 (72.3%) while males were 121 (27.7%). 229 (52.4%) of participants had bachelor degrees and 205 (46.9%) have postgraduate's studies. Table (1).

Knowledge about Hand Hygiene

A total of 437 study participants were assessed using multiple-choice questions with a response rate of 100%. Overall participant knowledge scores ranged from (21-34) to (34 -34).70 .7% of respondents were aware of the main route of transmission of the health-care associated infections, but only 28.6% select the right answer regarding better hand washing or hand disinfection (table 2). In other words, the level of knowledge among respondents was good 434(99.3%) and only 3(0.69%) had a bad knowledge Figure (3). Association between the knowledge of respondents regarding hand hygiene and the aforementioned general demographic variables co-related. A negative significant association can be seen between the knowledge about hand hygiene and gender (P = 0.187), age (P = 0.107), type of hospital (P = 0. 464) and nature of hospital (P = *1.0),*

Perception about Hand Hygiene

Figure 4 shows that, 197(45.2%) had good perception and 239(54.8%) had a fair perception about hand hygiene (P-value of goodness of fit using

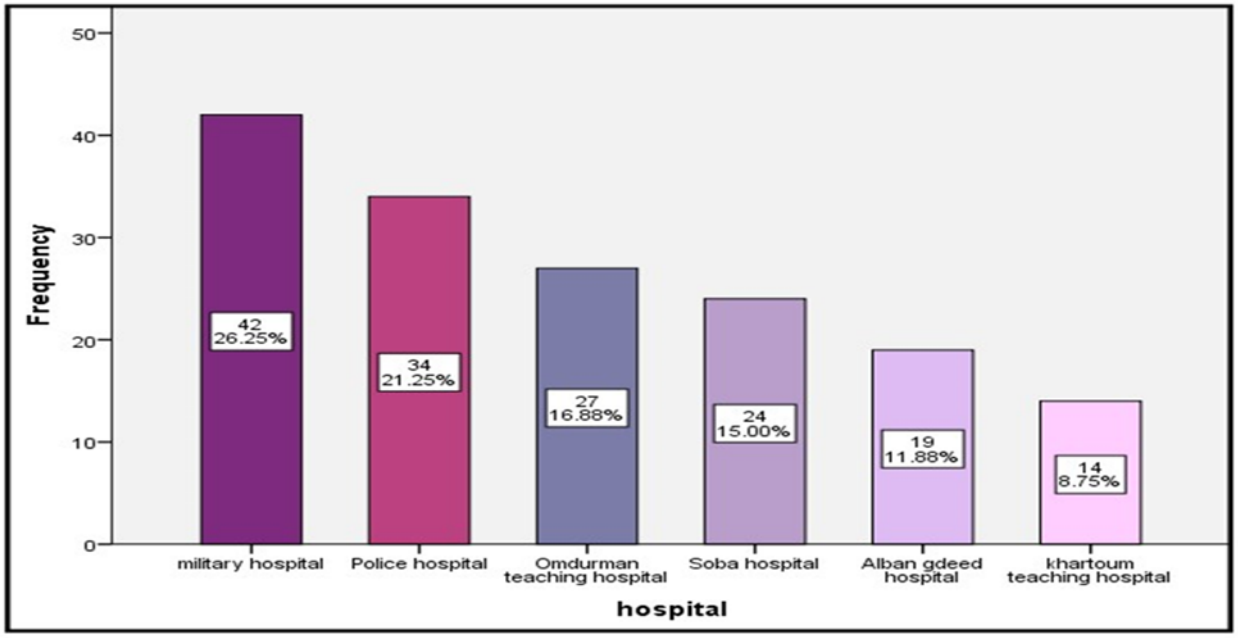

Figure 1. The six most frequent hospitals respond to the online questionnaire.

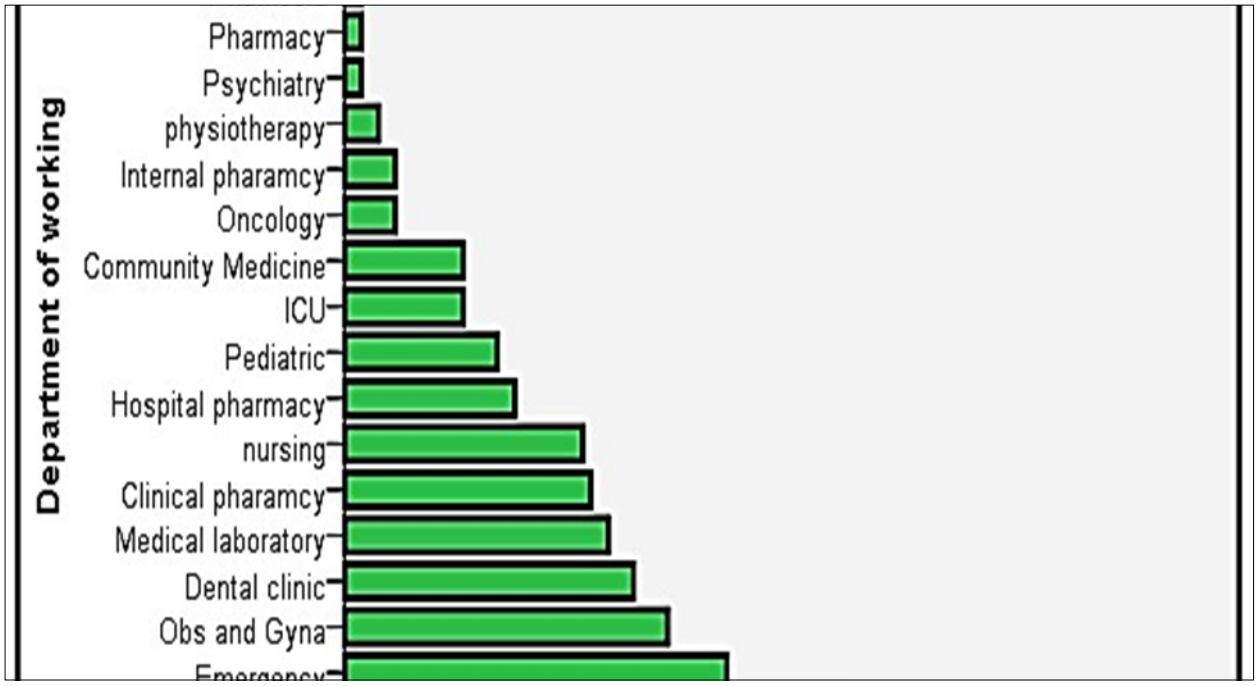

Figure 2. Details of working departments according to the frequency of respondents

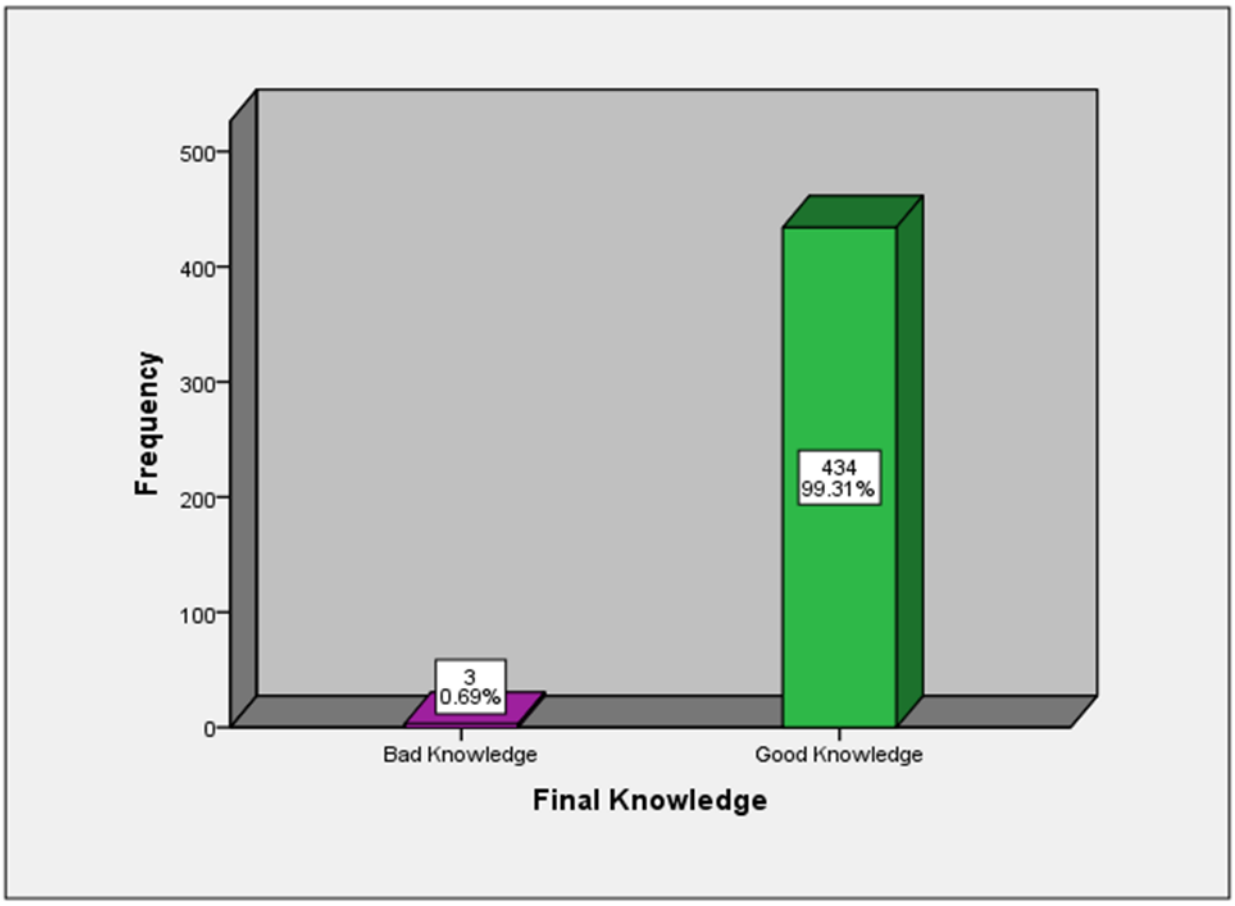

Figure 3. The general level of knowledge among respondents regarding hand hygiene

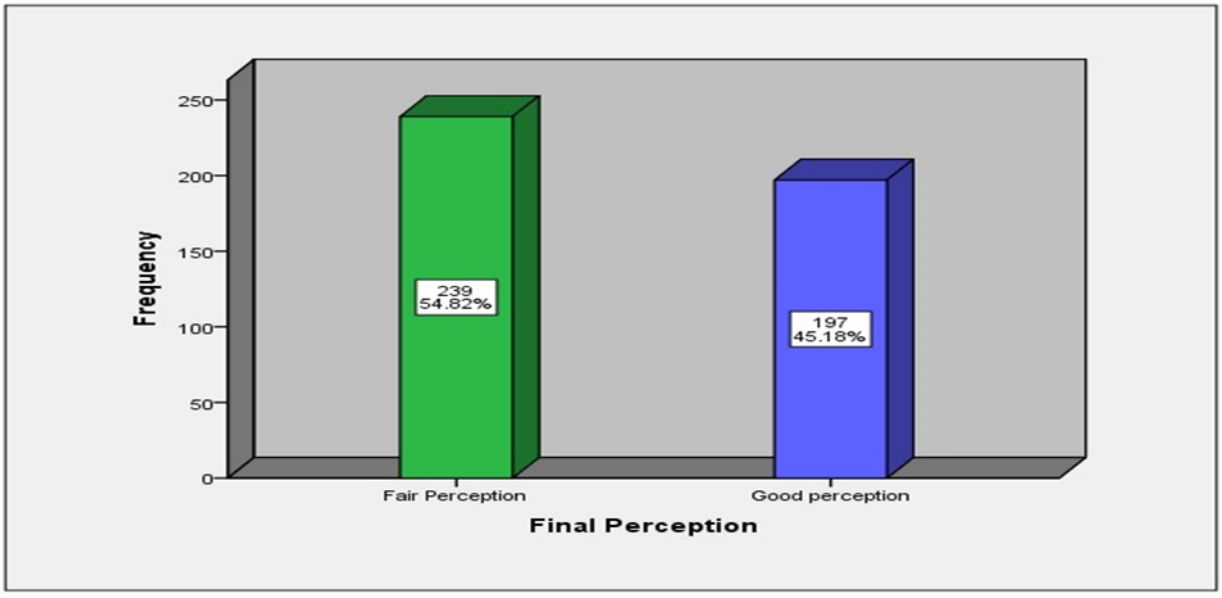

Figure 4. Frequency and percentage of hand hygiene perception

Table 1. Descriptive statistics of demographic data

Characteristic		**No**	**N %**
Gender	Female	316	72.3%
	Male	121	27.7%
Age in groups	20 -30	370	84%
	30 - 40	58	13.3%
	40 - 51	9	2.1%
Type of hospital	Public	325	74.4%
	Private	112	25.6%
Classification of hospital	General	172	39.4%
	Teaching	159	36.4%
	Specialized	106	24.3%
Educational level	Bachelors	229	52.4%
	Diploma	2	0.5%
	Post graduated	205	46.9%
	Student	1	0.2%
Specialization	Medical	275	62.9%
	Pharmacist	72	16.5%
	Technician	39	8.9%
	Dentist	18	4.1%
	Nurse	26	5.9%
	Physiotherapist	4	0.9%
	Dietitian	1	0.2%
	Anesthetist	1	0.2%
	Radiologist	1	0.2%
Experience	Yes	428	97.9%
	No	9	2.1 %

Table 2. Frequency and percentages of respondents answer knowledge questions

Question	Correct statement choice	Number (%)	P-value
What is the main route of transmission of the health-care associated infections?	By contact when hands are not clean	309(70.7%)	.000
Which is better, hand washing or disinfecting hands?	The choice depends on hand contamination visible or not visible	125(28.6%)	.000
When must hand cleansing be performed?	Before and after touching a patient	442(96.6%)	
	Before performing a clean / aseptic procedure	402(92.0%)	
	After risk of contact with body fluids	419(95.9%)	
	After contact with the patient's surroundings	395(90.4%)	.000
What are the right steps for hand washing?	Wetting hands and apply soap	381(87.2%)	.000
	Rub hands palm to palm with finger interlaced	394(90.2%)	
	Rub the right palm over left dorsum with finger interlaced and vice versa	404(92.4)	
	Rub fingertips around thumbs and around wrist	369(84.4%)	
	Rinse hand with water and dry	362(82.8%)	
How long does it take to wash your hands?	More than one minute	263(54.0%)	.000
How long does it take to rub your hands with alcohol based?	Only 15 seconds	253(57.9%)	.000
Can wearing Gloves be a substitute for hand hygiene?	No	249(57.0%)	.004
What would you do if there is a risk of contact of patient with *Clostridium difficile*?	Wash your hands	195(44.9%)	.035

Chi-square test =0.044). Most of the respondents 233 (51.1%) believe hand hygiene had "High importance" in preventing infections, 161(36.8%), believe that it had "High priority" to the directorate of their institution, also most of the respondents believe that it's "important" 228 (52.2%) to their colleagues to perform handwashing Table (3). There was a significant difference between Age groups, type of hospital, and the nature of hospital and perception ($P < 0.05$), but there was no significance difference between perception and gender ($P = 0.719$) The fair perception was found in public hospitals and age groups (20-30) years while good perception was found in specialized and private hospitals.

Training Effect

According to the analysis, only 148 out of 437 (33.9%) of the participants had received formal training in hand hygiene ($P=0.001$). There was no significant difference in knowledge levels between participants who had receiving formal training and who had not receiving formal training course on hand washing (P =0.575), but there was a significant difference in those who perceived training and the perception ($P-= 0.027$). The fair perception was higher in the respondents who didn't receive formal training.

Discussion

This paper was ready just around the time period when the coronavirus pandemic (COVID-19) took place worldwide. It is undoubtedly that the time has come to seriously revise and improve the education and practice of hand hygiene for current and future health-care professionals. The timing of the current study was perfect to assess the concept of hand hygiene among healthcare professionals in Sudan.

Knowledge on Hand Hygiene

The overall knowledge of hand hygiene was high which was a positive finding. Table (2) shows that respondents have good knowledge on basic hand hygiene where about 70.0% answered 5.5 out of 8 questions correctly. This was perhaps due to their usual understanding on personal and hand hygiene, obtained from formal and informal training processes. Figure (3) revealed that that only 0.7% of participants (3 out of

Table 3. perception of importance of hand hygiene

Perception Statement		No.	No%	P-value
What is the effectiveness of hand hygiene in preventing infections?	Very Low	5	1.1%	.000
	Low	16	3.7%	
	High	223	51.1%	
	Very High	192	44.0%	
Among patient safety issue, how important is hand hygiene for the directorate of your institution?	high priority	161	36.8%	.000
	Low priority	58	13.3%	
	moderate priority	127	29.1%	
	very high priority	91	20.8%	
What importance does the head of your department look at hand hygiene?	Highly important	141	32.3%	.000
	Important	232	53.1%	
	Not important	64	14.6%	
What importance do your colleagues look at hand hygiene?	Highly important	149	34.1%	.000
	Important	228	52.2%	
	Not important	60	13.7%	

434) had low knowledge level regarding hand hygiene and 99.31% of participants had good levels of knowledge of hand hygiene. The proportions of knowledge level in our study is higher compared to similar study for hand hygiene knowledge among healthcare workers [14] and similar survives for residents, nurses and students where the knowledge levels were found to be moderate [15-17]. Despite the lack of hand hygiene resources in Sudan hospitals, this finding is higher than that reported in other studies this is maybe due to that the knowledge guidelines are simple to learn, but translating them into skill in practice environment is a challenge. A more detailed view of knowledge scores in table 3, (70.7%) respondents answered correctly when asked about the main route of transmission of potentially harmful germs. Our results are comparable with other studies [18] which reported 72% of participants knew that the unhygienic hands of health care workers were the main route of transmission. Although participants in this current study had high knowledge of hand hygiene and achieved a satisfactory score on the knowledge questionnaire, the results showed deficits in their knowledge, most notably in the area of when to perform alcohol hand rub or handwashing, and time length to perform both hand wash and hand rub. Our findings were similar to a study carried out by Khaled M. Abdelaziz [23] at Ain Shams University, Cairo, where in 23.2% of observed candidates showed inappropriate hand washing time length (less than 30 seconds). Also this finding in line with the study done by Maheshwari et al, [15] where participants had answered below satisfaction level regarding the type of hand hygiene method required for decontaminant hands in the different clinical situations. Also, an important observation in this study (43%) of the participants answer that they can wear gloves as a substitute for hand hygiene and that was similar to study done by Wilcox et al, [24] for nurses showed that many nurses prefer to wear gloves instead of washing hands and to dispose it after using glove without washing hands and/or they use the same glove for different patients. This was in line with other studies describe that gloves may mistakenly be taken as a substitute for hand hygiene or as protection of the professional only [25]. Also a previous study by Jang et al, [26] indicated that various health professionals have admitted to using the same pair of gloves, for long periods and in various activities, because they felt to be protected. Non removal of gloves between patients contributes to the transmission of pathogens and cross-infection [27]. However, in our study the knowledge about 5 moments of hand hygiene by WHO, and handwashing right steps were good. But the poor knowledge about the time length for hand hygiene affects the quality of hand hygiene practices.

The results of the current study showed a negative significant association between the knowledge about the hand hygiene of respondents and gender ($P = 0.187$), similar to other studies [28, 29] found that no significant difference between male and female health-care workers in terms of their knowledge about hand hygiene. The result of this study showed there is no significant difference in knowledge levels between the healthcare workers who had formal training of hand hygiene and who had not (P = 0.575). Also this consistent with a study in South Sudan [30] refute the association between and hygiene training and knowledge levels.

Perception towards Hand Hygiene

Our results showed that the perception finding was 197 of 437 participants (45.2%) had a good awareness of the importance of hand hygiene (positive perception), and 239 of participants (54.8%) had fair awareness of hand hygiene importance (negative perception).This supports other studies in the extanal literature, such as the investigation in Korea by Kim *et al.*,[31] which found that the perception toward hand hygiene among health-care workers is poor. In contrast, in a study among health-care workers in Switzerland, Pessoa-Silva *et al.* [32,33] reported that 64% of the respondents have a positive perception of hand hygiene.

The age, the type and nature of the hospital, and the formal training courses was significantly affecting the perception of hand hygiene. Higher perception was found in participants who are working in private hospitals and specialized hospitals. The HCWs who get formal training courses of hand hygiene were found to have better perception than those who didn't. The training courses of hand hygiene were significant factor affect the perception of hand hygiene importance among HCWs. The higher perception of HCWs upon

hand hygiene importance that assessed in the private and specialized hospitals may be due to better resource availability than public, general, and teaching hospitals. We suggest to encourage the positive hand hygiene environment, that can be led by management to guarantee continues presentation of role model and the feedback response to support the good practice of hand hygiene. Also the instructional papers of hand washing, hand disinfecting and training courses may be useful in reminding staff with the need to perform hand hygiene and that is similar to suggestions by Birks *et al.* [34]. These findings are supported by the findings of some studies, [31 & 35] and conflicting with other. [36].

Generally; the results obtained from this study confirmed that there is an improvement in Sudanese HCWs awareness compared to a previous study done in 2009 assess the awareness to use alcoholic formulations among ICU workers in 3 Sudanese tertiary hospitals which show that it was very low (2.8%). [19] Also compared to another study there was improvement regarding the time to perform hand disinfection in this study with a similar study done in specialized Sudanese hospital in 2010; wherein this study the perception in performing hand disinfection before and after touching the patient was high (96.6%), while in 2010 study hand disinfection was more after (68.1%) than before (39.1%) touching the patient and thus aware to protect themselves rather than to protect patients at that time [20]. This may indicate that good effort in educating and training HCWs was done since 7-8 years ago. So our findings implied that full compliance with hand hygiene guidelines may be unrealistic and difficult, but continuous interventions in educating and training HCWs that aimed at improving hand hygiene attitudes and habits may be effective in increasing knowledge and perception which accordingly would lead to better compliance and adherence to hand hygiene practice.

The major limitations of this study that the data about hand hygiene evaluated based on information provided by health care workers through self-administered questionnaires instead of observing hand hygiene practices as well as individual opportunities and observations. Usually; data regarding personal practices and behaviors are subjected to informant bias. In addition, the data presented in this study are self-reported and partly dependent on the participants' honesty and recall ability; thus, they may be subject to recall bias. The other limitation is that data collection was done as online survey through social media rather than personal interviews or focus groups. In-person interviews allow you to not only ask the network planned questions but to probe more deeply into an individual's response. Focus group; which are essentially guided conservation, can help in eliciting information underlying complex behavior and motivation.

Conclusion

The strength of the present study was assessing the knowledge and perception levels of different occupations from different hospitals with different education levels to get a more representative sample. Most of heath care workers were found to have good knowledge, and the majority was found to have fair perception. Formal hand hygiene training courses was found to have no association with knowledge but it may be reflected in practice. The importance of training sessions regarding hand hygiene was noticed in perception level. The most recent outbreak of COVID-19 is a stark reminder to health-care institutions and providers about the significance of hand hygiene and other protective and preventive measures against killer viruses and pathogens. It is now more than ever that the issue of hand hygiene is taken seriously not only in hospitals but also in the larger community. It is the simplest action with other measures but considered as the first line and most critical intervention that could fight the spread of emerging COVID-19 infection and protect us from death.

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