

Knowledge, attitudes and practices of hospital cleaning services staff towards Coronavirus Disease-2019 (COVID-19) in a Middle Eastern country: A web-based cross-sectional study

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Abstract

Background Hospital cleaners are the unsung heroes in the fight against the COVID-19 pandemic. This study aims to assess the knowledge, attitudes, and practices (KAP) of hospital cleaners towards COVID-19 and to determine factors associated with good practices.

Methods A cross-sectional study was conducted in Lebanon between 1st and 14th November 2020. Data was collected through an online survey that was sent to governmental-run and private hospitals. The questionnaire consisted of socio-demographic characteristics, clinical information, and KAP of hospital cleaners towards Covid-19. The collected data was exported to SPSS for analysis. The relation between nominal variables was tested using the chi-squared test. The variables in bivariate analysis with p -value <0.2 were entered into multivariable logistic regression. Adjusted odds ratio and their 95% confidence intervals were reported. The level of statistical significance was set at a p -value < 0.05 .

Results A total of 453 cleaners completed the survey of which 54.3% were females. Most of the participants had a good level of COVID-19 knowledge (98%) and good preventive practices (89.7%). Regarding attitude, 90.7% had a positive attitude toward health facilities, 78.8% towards cleaning and disinfection, and 73.5% towards health authorities. Sociodemographic characteristics including younger age, higher levels of education, working in private hospitals, and having more than 3 years of experience were positively associated with good preventive practices. Our results also showed that participants with good knowledge about COVID-19, COVID-19 prevention and treatment, cleaning and disinfection process, and COVID-19 risk factors had a higher likelihood of positive preventive practices. Finally, a positive attitude towards health facilities, health authorities, and cleaning and disinfection were positively associated with good practices.

Conclusion Our results indicate that cleaners have a high level of knowledge, expressed positive attitudes towards health facilities and health authorities, and good preventive practices. Understanding the determinants of cleaning performance is critical in tailoring interventions to improve hospital cleaning.

Introduction

The swift worldwide spread of the Coronavirus disease 2019 (COVID-19) with associated mortality and morbidity is worrisome (1). Although person-to-person transmission through close contact with an infected person is the most important driver of COVID-19 widespread, transmission from contaminated surfaces could be also a potential source of infection (2, 3). In general, surfaces become contaminated when virus-containing droplets land on them or when someone with contaminated hands touches these surfaces. Recent studies indicate that COVID-19 can remain viable for between eight hours and several days depending on the type of surface. It can remain on plastic for up to 3 days, stainless steel 2-3 days, and cardboard 24 hours (4). Hence, the vital role of decontamination of the health care environment to reduce indirect transmission of COVID-19 as well as to provide health care workers (HCWs) and patients with decent and clean places to work and get medical care (5).

Decontamination includes cleaning, disinfection, and the safe disposal of waste. However, cleaning is the procedure of eliminating contaminants and disinfection is the process by which any microorganisms that persist after cleaning are reduced to a level at which they are not detrimental (6). Behind this enhanced hygiene are the hospital environmental service workers (ESWs) who play an important role in interrupting the chain of infection (7). Particularly, the cleaners are the unsung heroes in the fight against the COVID-19 pandemic.

Given that the pandemic has had devastating consequences for a wide variety of occupations, housekeepers and cleaning staff have been among the hardest hit. They are responsible for **deep cleaning and disinfecting** the surfaces that host potentially dangerous germs and viruses. However, cleaning hospitals is replete with challenges. The cleaners of coronavirus isolation rooms and intensive care units run a daily gauntlet of infection risks to ensure that hospital spaces run smoothly, and they are responsible to prevent the spread of the disease in hospitals. However, their status as unskilled laborers in a behind-the-scenes role has left them out of the public eye. Medical staffers are lauded worldwide for their lifesaving work during the pandemic, cleaners are rarely mentioned.

Since cleaning staff are usually exposed to occupational hazards including COVID-19, there is a crucial need to improve their knowledge and to monitor closely their practices which minimize the risk of infection. Understanding and targeting their practices may inform strategies to improve environmental cleaning (8).

In Lebanon, there is a lack of data concerning the number of cleaning staff infected by COVID-19 among hospitals but according to the epidemiological surveillance unit data, no deaths were reported among this category. Although those previous studies have evaluated the knowledge and practices of different health care workers toward COVID-19 including physicians (9), dentists (10), pharmacists (11) and nurses (12) no studies have focused on the practices of hospital services staff members, particularly housekeepers.

In the context of the COVID-19 pandemic, it is of great interest to conduct this study to shed light on the level of knowledge, attitudes, and practices of cleaning services staff working in the Lebanese hospitals and to determine factors associated with good practices.

Methodology

Study tool and design

Following the recommendation of the Lebanese government to the public to minimize face-to-face interaction during the pandemic period which hinders the feasibility of performing a field hospital-based survey, potential respondents were electronically invited to participate. A cross-sectional study, using an online survey, was conducted during the rise of COVID-19 cases in Lebanon between 1st and 14th November 2020.

Questionnaire development

For the first stage, a meticulous study of the literature was conducted to discover available resources on KAP, as well as to identify relevant items and scales in existing questionnaires on the prevention of COVID-19. The knowledge section was developed based on the etiology, transmission, risk, prevention of COVID-19 in addition to cleaning and disinfection procedures (13, 14). However, the attitude section of the questionnaire was developed based on the theory of Health Belief Model (HBM) (15), while the practice was based on the cleaning and disinfection at health facility recommended by the World Health Organization (WHO) and the Centre for Disease Control and Prevention (CDC) (14, 16). A panel of experts which consisted of an epidemiologist, a microbiologist, a hygienist, and a medical statistician select the best items for clarity of the questions and accuracy of the knowledge, attitude, and practice domains and its interpretability. This panel also helped in identifying and judging the content validity (relevance, coverage, and representativeness) of the items initially selected for inclusion in the questionnaire. The original draft of the questionnaire was developed in English and then translated to the slang Arabic language which is the official national language in Lebanon based on the standard translation guidelines. It underwent two forward translations by a sworn translator and an epidemiologist. Subsequently, the two sets of translated Arabic questionnaires were subjected to a backward translation into English by another language communication expert as well as an epidemiologist. This process aimed to recognize and harmonize the translated items from the original English version and to produce an accurate Arabic version of the questionnaire (17). Face validity was conducted on 10 cleaners and housekeepers to evaluate the understanding and clarity of the questionnaire. Their various responses and understanding regarding the questions, how it was presented (layout and setting) and lack of vagueness were assessed. A revised and finalized version of the questionnaire was produced from the findings of the face validation for use throughout the rest of the research. The questionnaire is self-administered and consisted of questions that overviewed (1) socio-demographic characteristics; (2) Clinical information; (3) knowledge of Cleaning and disinfecting; (4) attitude towards Covid-19; and (5) prevention practices towards Covid-19 of the hospital cleaning services staff.

1- Socio-demographic characteristics including age, gender, nationality, marital status, level of education, year of experience in cleaning, and the type of hospital where the participant works

2- Clinical information including health status and presence of comorbidities

3- Knowledge section: Five dimensions with a total of 26 items were designed to measure cleaner's knowledge about nature and symptoms COVID-19, the transmission of COVID-19, prevention and treatment, factors amplifying the risk of infection, cleaning, and disinfection. All the items were answered on a true/false basis and an additional "do not know" option. A correct response had a value of '1' and a "wrong" or don't know response had a value of '0'. Each correctly chosen choice had a value of 1, and each wrongly chosen and 'don't know response' had a value of 0. Hence, the aggregate score for all 26 knowledge questions would range from 0 to 26 points. Participants 'overall knowledge was categorized using modified Bloom's cut-off point, as good if the score was between 60 and 100% (16–26 points) and poor if the score was less than 60% (< 16 points)

4- Attitude section: Three dimensions were used to assess cleaners' attitudes: the first focusing on their attitudes toward health facilities, the second concentrating on health authorities, and the last one on cleaning and disinfection. Responses to questions related to attitude were graded on a 3-point Likert scale, an agreement scale ranging from '1' for disagree to '3' for agree. A point of 1 was given to the options "agree" answer while disagree or neutral responses were given a 0 point. The level of attitude in each domain was categorized using the original Bloom's cut-off point, as positive if the score was 60-100% and negative if the score was less than 60%.

5- Practice section: A total of 21 items constitute this section. Each item was answered on 3 points Likert scale: "never", "occasionally", and "all the time". This scale was used to get precise responses about the IPC measures adopted by the cleaners as follows: never if not at all, occasionally if once or more in a while and all the time. The answer "all the time" was assigned 1 point whereas "never" and "occasionally" answers were assigned 0 points. The questionnaire was validated by doing a pre-test on 5% of the sample before the actual data collection period. Survey flow, functionality, and language were based on pre-test feedback. The average time for filling the survey was 8 minutes.

Sample size calculation

The sample size was calculated using the online RAOSOFT sample size calculator web survey software (<http://www.raosoft.com/samplesize.html>). Based on an estimated population of 4000 housekeepers actively practicing at the health facilities level, a 95% confidence level and an absolute error of 5%, the minimum required sample size would be 351 participants.

Data collection: An online questionnaire using a Google doc was emailed to governmental-run and private hospital directors in different parts of the country. Then, designated focal persons working in Lebanese hospitals were contacted via phone call and notified about the survey and its purpose. Upon their agreement to participate, the link of the study was sent through "WhatsApp" to the designated focal person. The survey link was then disseminated by the respective hospitals to the cleaners and housekeepers working in their health facility through social media (mainly WhatsApp). The survey link stated that all cleaners who were working in Lebanese hospitals, able to read and write in Arabic were eligible to take part in the survey. In addition, the link includes also a brief introduction to the background, the objective of the survey, and instructions for filling out the questionnaire. Cleaners who were seriously ill and on annual leave during data collection were excluded.

Ethical approval:

Written informed consent was obtained from each participant. Participation in the survey was entirely voluntary and all information was gathered anonymously and was kept strictly confidential. As individual participants cannot be identified based on the presented material, this study caused no plausible harm or stigma to participants. The study design assured adequate protection of study participants, and neither includes clinical data about patients nor configures itself as a clinical trial. Hence, this study was exempted from ethical approval in the Lebanese Ministry of Public Health.

Data analysis:

The collected data were exported to a Microsoft Excel 2016 for cleaning and coding. The cleaned data were exported and analyzed using the statistical software SPSS (Statistical Package for Social Sciences), version 22.0. Descriptive statistics were reported using frequency with percentages for categorical variables. Single-item knowledge questions were summarized by the percentages of correct responses. To check scale reliability, Cronbach's alpha was conducted on all knowledge, attitudes, and practices scores. Responses to questions relating to the attitudes and role of cleaning were tabulated in terms of the percentages of disagree, agree, and neutral answers. Bivariate analysis was performed to examine factors associated with the dependent variable (good practice) and the independent variables. The relation between nominal variables was tested using the chi-squared test. The variables in bivariate analysis with p-value < 0.2 were entered into multivariable logistic regression. Adjusted odds ratio and their 95% confidence intervals were reported. The final logistic regression model to determine the predictors for vaccination uptake was reached after confirming the adequacy of the data using the Hosmer and Lemeshow test. The level of statistical significance was set at a p-value < 0.05.

Results

1- Baseline characteristics of the study participants

Table 1 shows the baseline characteristics of the participants. A total of 453 cleaners have completed the survey of which 54.3% were females. Around third of them were aged between (21-30) years old and the majority of them were Lebanese (82.34%), married (65.56%), with an educational level of school degree or less (68.65%). They mostly had a good health status (89.95%) and only 27.59% of them suffered from comorbidities. About two-thirds of the participants worked in private hospitals and nearly half of them have experience of 3 years or more in cleaning in health facilities. Almost 80.79% of them have an income of less than 1 Million Lebanese pounds.

2- Cleaners self-reported knowledge

Almost 98% of surveyed cleaners had a good overall knowledge score ($\geq 60\%$). [Figure 1](#) illustrates cleaners' knowledge score by knowledge domains. The majority of respondents were aware and well-informed with more than 90% of them having good knowledge scores in all targeted knowledge domains that comprise nature and symptoms COVID-19, its mode of transmission, its prevention and treatment, factors amplifying the risk of infection, and decontamination procedures. [Table 2](#) describes the cleaner's answers towards COVID-19 and cleaning knowledge items. Despite that most of cleaners (90%) have answered correctly to the big majority of knowledge items, some questions remained less recognized and recorded the lowest rate of correctness such as those related to the transmission of COVID-19 by urine and feces of an infected person where only 46.4% have answered correctly, the availability of specific treatment for COVID-19 (66.9%) and the need to reduce the frequency of cleaning of the room of COVID-19 patient (67.1%). Similarly, items that focused on the requisite to rinse the surface after the application of disinfectant (51.7%) and those related to the amplification of COVID-19 risk of infection such as the

concentration of virus (69.3%) and the time since the infected person left the place (72.8%) were not well known compared to other knowledge items.

3- Cleaners' attitudes:

3.1 Assessment of Cleaners attitudes towards health facility

Table 3 describes cleaners' attitudes towards health facilities and health authorities. The majority of cleaners (87.7%) agreed that patient safety is a priority in the hospital where they work and that hospital cares about their safety (90.7%). In addition, the hospital provided them with the equipment and supplies needed for cleaning and disinfection (90.7%). Similarly, they also considered that IPC measures were well implemented at the hospital level (87.2%) and that the health facility has well played its role in raising awareness about the risk of catching COVID-19 and how to prevent it (90.4%). Around half of cleaners (47%) stated that the hospital where they work is continuously looking to finding new ways to improve hygiene. However, 33.8% of them considered that the hospital does not appreciate any further effort exert on their part, and 29.8% of them declared that even if they do their best, the hospital will not appreciate it. Similarly, around 28% of cleaners pondered that hospital does not take much interest in them and ignores their complaints and requests.

3.2 Cleaners' attitudes towards health authorities

Out of 453, 321(76.9%) cleaners deliberated that Lebanese health authorities have played their role in fighting COVID-19, particularly in a health care setting by providing PPEs and performing training. Besides, the majority of them (66.2%) declared that they have confidence that the government can win the battle against the COVID-19 (Table 3).

3.3. Cleaners' attitudes towards cleaning and disinfection

More than 85% of cleaners considered that regular hand washing, wearing PPEs, cleaning and disinfecting surfaces are effective measures for eliminating COVID-19 and could prevent the infection. Figure 2 displays the cleaner's attitudes scores. The majority of cleaners had a good attitude towards health facilities, health authorities, and IPC precautions.

4. Cleaners' practices:

Table 4 shows cleaners' practices items. The majority of cleaners stated that they always followed the IPC standard precautions such as hand hygiene practices (90.7%), social distancing (75.7%), avoiding the presence in crowded places (85.7%), wearing a face mask at the hospital (91.4%), avoiding touching surfaces then touching eyes or faces (92.5%) and respecting cough and sneeze etiquette (94%) as well. Moreover, 92.4% of them reported compliance with the MOPH recommended prevention measures.

In respect to cleaning and disinfection, 87.6% of surveyed cleaners reported that they always checked the availability of the needed cleaning supplies with their supervisor before starting work. More than 80% of them kept the room aerated and followed permanently the manufacturer's instructions to ensure that

disinfectants are prepared and handled safely. Besides, around 90% of cleaning staff stated that they cleaned and disinfected common areas at hospitals in addition to the frequently touched objects (handles, elevator buttons, handrails, doorknobs ...) all the time. In addition, the majority of surveyed cleaners (94.3%) reported careful and appropriate handling of laundry to mitigate the risk of potential transmission where 89.2% of them put textiles, linens, and clothes in special, marked laundry bags and 83.7% washed laundry in warm cycles (60-90°C) with the usual detergents.

Concerning the use of PPE, 94.7% of cleaners stated that they always wear appropriate PPE when visiting the COVID-19 patient room for cleaning and 91.6% of them reported proper donning and doffing of PPE. Also, more than 90% of cleaners always follow recommended hand hygiene practices before and after putting PPEs or cleaning. The majority of them (87.9%) attended all the times regular training sessions about IPC during COVID-19 as well. Regarding waste management, 93.4% of cleaners reported that they always managed efficiently waste by placing disposable items (hand towels, gloves, medical masks, and tissues) in a container with a lid and followed the hospital action plan and the national regulations related to waste management. However, only 63.6% of them constantly followed COVID-19 news.

5. Sources of information

The most used sources of information cited by cleaners were health care professionals (66.8%), health authorities (66.2%), and social media (61.6%) (figure3). Whereas, the most reliable sources of information as ranked by the cleaners were the MOPH (67.5%) followed by printing materials (55.6%) and trainings (54.7%) (Figure 4).

6. Factors associated with cleaners' good practices

Table 5 represents the multivariable logistic regression of the factors associated with cleaners' good practices. Our results showed that the odds of good practices were not associated with gender, marital status, or suffering from any comorbidity. Age was found to be associated with good practices. Older participants aged more than 40 years were less likely to adopt good practices (aOR=0.051 with 95% CI (0.005 to 0.576) comparing to their counterparts. However, cleaners having an educational level of a secondary degree or more were 2.869 times more likely to take good practices comparing to respondents having the lowest educational level (aOR=2.869 with 95% CI (0.871 to 9.441)). Besides, cleaners working in private hospitals (aOR=10.083 with 95% CI (3.340 to 30.436)) and having more than 3 years of experience in hospital cleaning (aOR=12.942 with 95% CI (4.214 to 39.747)) were positively associated with the adoption of good practices. In respects of knowledge, cleaners showing a good knowledge level about COVID-19 domain (aOR=9.076 with 95% CI (1.895 to 43.463)), prevention and treatment of COVID-19 (aOR=10.717 with 95% CI (1.594 to 22.051)), cleaning and disinfection (aOR=3.934 with 95% CI (1.099 to 14.126)), and factors affecting the risk of COVID-19 (aOR=7.397 with 95% CI (1.569 to 29.463)) were positively associated to good practices. Moreover, cleaners having a positive attitude towards health facilities (aOR=3.939 with 95% CI (1.099 to 14.126)), were 3.939 more likely to have good practices. Similarly, respondents with a positive attitude towards health authorities and government (aOR=3.309 with 95% CI (1.106 to 9.863)) were 3.309 times more likely to have good

practices. Finally, participants with a positive attitude towards cleaning and disinfection were 14.481 more likely to implement good practices during their work.

Discussion

COVID-19 pandemic stressed the utmost importance of hygiene and infection prevention in the fight against emergent disease, particularly at the hospital level. Hence, it shined a rare spotlight on the critical tasks performed by, the often-invisible workforce, represented by the hospital cleaners. To the best of our knowledge, this is the first national Lebanese study aiming to explore environmental cleaning staff knowledge, attitudes, and practices toward cleaning and disinfection during the COVID-19 pandemic. It also reveals cleaners' insights, henceforth allowing us to better understand the gaps and weak aspects in practices to be targeted in future interventions.

The main findings of our study were that the bulk of surveyed cleaners (98%) had a good overall knowledge score and could be qualified as 'aware and abreast' in different knowledge areas related to the nature and symptoms of COVID-19, its mode of transmission, its prevention and treatment in addition to the factors amplifying the risk of infection and decontamination procedures. Our results were consistent with the findings of a study conducted among healthcare workers (HCWs) in Ethiopia where almost 84.7% of them were knowledgeable (18). Similar results were found in a study done in Addis Abeba (19). However, our findings were higher than the knowledge score reported in studies conducted in Palestine (53.9%) and Iran hospital, (57%) (20, 21). This can be due to sampling size, sociodemographic difference, and different indexes used to assess their knowledge. While a lot of studies have focused on various aspects of this topic among other HCWs none of them deal with the cleaner's knowledge and application of infection control principles and cleaning practices of environmental services staff members. They are largely absent in the literature which make comparisons not possible.

However, some information remained not well-recognized by the cleaners such as the transmission of COVID-19 via urine or feces and the availability of specific treatment for COVID-19. However, based on the available evidence, the exposure to feces or wastewater has not been implicated as a transmission vector of COVID-19 despite the presence of the virus in stool and rarely in urines (22). Besides, the availability of specific treatment is time-bounded and under continuous trial. Similarly, not all cleaners were conscious that there is a need to reduce the frequency of the COVID-19 patient room cleaning. Despite that hygiene during the COVID-19 pandemic should be enhanced, yet there is also a need to establish a sense of balance between performing cleaning and reducing the risk of exposure to COVID-19. Comparing to other knowledge items, cleaners were not all aware of the factors related to the amplification of COVID-19 risk of infection. Hence, raising awareness about the factors affecting the risk of COVID-19 infection would help cleaners to better prevent the infection.

Similarly, the vast majority of respondents indicated a high level of agreement to questions concerning the importance of cleaning in mitigating infections for patients and their families. Besides, cleaners were

aware of what is expected from them, and they allocated a high priority for patient safety in their organization.

In respect to attitude, the bulk of cleaners have a positive attitude towards health facilities where the majority of them considered that hospital prioritized patient safety and personal safety. Hospitals provided them with the gear and supplies needed for cleaning and disinfecting, applied the IPC measures, and raised awareness about the risk of catching COVID-19. This positive attitude could be associated with the good knowledge score owned by cleaners which are supported by the study in Iran (23). However, attitudes and beliefs about cleaners' jobs may impact their intent to clean and in turn the effectiveness of their efforts. Hence, the importance of understanding and addressing these attitudes and beliefs used to inform approaches for continuous upgrading of environmental cleaning (7). Similarly, cleaners indicated a high level of agreement to questions about the importance of cleaning in preventing infection, knowing what is expected of them, and indicating a high priority for patient safety in their organization. Our results were in line with the results of studies conducted in Canada and the United States that also acknowledged that environmental services workers (ESW) believed their work was important to keep patients safe and that cleaners take pride in their work and are committed to patients and families (24). Interestingly, in our study, most respondents highlighted the importance of receiving feedback on their performance, despite that most of them stated that regular feedback is absent.

However, our findings reveal that many cleaners do not feel appreciated by the hospital and other HCWs for any further effort exert on their part. More than a fourth of them considered that the hospital does not take much interest in them and ignores their complaints and requests. This perceived lack of appreciation and this absence of recognition of the value of their work may hamper some cleaners from carrying out their responsibilities and impact negatively their performance. Similar results were reported in a study conducted in New York among ESW (24). Thus, there is a perceived lack of organizational support, feedback, and investment in cleaning resources. The attitudes of environmental services staff members should not be ignored, and understanding the determinants of cleaning performance is critical in tailoring interventions to improve hospital cleaning and reduce the risk of infection transmission.

Notably, most of the cleaners had positive attitudes towards Lebanese health authorities and considered that the government has fulfilled their roles in fighting COVID-19, particularly in health care settings. Positive attitudes and high confidence in the control of COVID-19 can be understood by the Lebanese government's response in taking stringent control and precautionary steps including the lockdown, and suspension of all domestic and international flights, and prayer at mosques. Similarly, the vast majority of cleaners have a positive attitude towards IPC including hand washing, wearing PPEs, cleaning and disinfecting surfaces, and considered it as effective measures for preventing the COVID-19 infection.

Based on cleaners' responses, the majority of cleaners always followed the IPC standards such as hand hygiene practices, social distancing, avoiding their presence in crowded places, wearing a face mask at the hospital, avoiding touching surfaces then touching eyes or faces, and respecting cough and sneeze etiquette as well. Moreover, 92.4% of them reported compliance with the MOPH recommended prevention measures. The high score of self-reported compliance is comparable to a previous self-report study

targeting other HCWs (25). However, studies that used observation methods for data collection reported lower compliance rates (26) .

In respect to cleaning and disinfection, the majority of surveyed cleaners followed recommended good practices starting by checking the availability of the needed cleaning supplies and gear before starting work, keeping the room ventilated, and following the manufacturer's instructions to ensure that disinfectants are handled safely. They also cleaned and disinfected common areas at hospitals, the frequently touched objects and carefully handled laundry. Concerning the use of PPE, more than 90% of cleaners declared that they always wear appropriate PPE when visiting the COVID-19 patient room or COVID-19 unit for cleaning accompanied by proper donning and doffing of PPEs combined to hand hygiene practices. Moreover, a large proportion of cleaners implemented efficient waste management and followed the hospital action plan and the national regulations related to waste management. However, such statements could be embellished and influenced by social desirability. Hence the importance of conducting a field study to closely observing adopted practices.

Our findings showed also that the majority of cleaners always attended regular training sessions about IPC during the COVID-19 pandemic. This finding could explain the good knowledge and practice score owned by surveyed cleaners given the fact that training on current guidelines could upgrade the knowledge and skills of cleaners in that they would easily understand basic standards of practice and implement them consistently. Besides this, up-to-date knowledge and skills regarding cleaning and disinfection could also increase the confidence of cleaners in complying with recommended guidelines.

More than half of cleaners stated that they constantly followed COVID-19 news. One peculiar finding that social media was cited as the most used source of information. Although these platforms provide an easy way to get the information, they can also be a source of fake news and panic (27). Thus, it is highly recommended for cleaners to seek information from scientific and authentic platforms. On the other hand, the most reliable sources of information as ranked by the cleaners were the MOPH followed by the printing materials. Hence, government involvement in providing real-time emergency information during an infectious disease outbreak contributes to protective behavior engagement(28).

Gender, marital status, and suffering from any comorbidity were not associated with the adoption of good practices. However, good practices were negatively associated with increasing age practice, cleaners whose age 31 years and above were less likely to adopt good practices infection prevention than their counterparts aged 21–30 years. Inconsistent results were reported in other studies (29-31).

Our results also revealed that the working experience was another strong predictor of good practices. In other words, cleaners who had work experience of more than 3 years were four times more likely to have good practices in cleaning and disinfection compared to their counterparts with less than three years of experience. Thus, as the number of years of practice increases; cleaners are exposed to repeatedly hazards and became more experienced through working with senior staffs.

Regarding educational level, cleaners with increased educational level adopted good practice compared to those with lower educational level. This result is in line with a study conducted in Ethiopia where a higher educational level was associated with IPC activities (32) . The possible reason might be due cleaners having higher educational levels could have better opportunities to access local and international information, and training platforms than their counterparts, hence they may adopt good practices.

Besides, this study revealed that cleaners working in private hospitals were 10 times more likely to adopt good practices. This comes in line with a study conducted in Bangladesh where HCWs working in private hospitals (33). Private hospitals might have ensured regular administrative supervision and monitoring of cleaners in addition to intensive training about cleaning and disinfection, PPEs proper use, and waste management. However, private hospitals can ensure better quality service than government hospitals because they generate their financial resources from patients.

Knowledge is the foundation of everything, and in this study, cleaners who have good COVID-19 knowledge adopted good practices towards COVID-19 infection and prevention. Hence, Knowledge is a prerequisite for promoting preventive measures and enhancing good practices towards the fight against the disease.

Given that attitude has long been recognized as a factor leading people to perform a particular behavior, cleaners having a positive attitude towards health facilities or health authorities were more likely to have good practices. Having a positive attitude towards cleaning and disinfection was the main predictor factor for good practices at work.

Cleaners' attitudes and beliefs about the importance of cleaning and disinfecting may impact their intent to clean and in turn the effectiveness of their efforts. Several studies demonstrated the control of infection following the adoption of enhanced cleaning and disinfection approaches (34).

Limitations of study

Several limitations should be acknowledged in our study. Firstly, the cross-sectional nature of this study will make it unable to form a temporal relationship between the outcome and predictor variables. The study is also prone to social desirability bias which could lead to over/ underestimation of the study found. The questionnaire tool used validated questions; however, some respondents had a first language other than Arabic, and the research team, while conducting the questionnaire, observed some difficulty in Arabic comprehension in some environmental services staff members who originate from outside of the country, and do not express themselves in the local language, thus hampering their participation in the study. The use of verbal surveys may be worth considering in future studies or by hospitals wanting to assess the level of knowledge of environmental services staff members. Questions related to attitudes, roles of cleaning, and perceived organizational support were presented toward the end of the questionnaire, which, as previously stated, comprised other questions used for other purposes. The length and dual purpose of the survey may have affected the responses to these questions. In some hospitals,

environmental services staff members were very skeptical about being asked about their attitudes and perceived organizational support. Despite assurances about confidentiality, some participants expressed concern about their responses being identified by the hospital, especially to questions about perceived organizational support. Conducting a questionnaire on knowledge and practice, separate from attitudes and perceived organizational support, is recommended for future studies.

Conclusion

Cleaning staffs are on the front lines of fighting this global pandemic. Our results indicate that environmental services staff members have a high level of knowledge and expressed positive attitudes towards health facilities and authorities. They are also aware of the importance of their role. However, there is a perceived lack of organizational support, feedback, and investment in cleaning resources. The attitudes of environmental services staff members should not be ignored, and understanding the determinants of cleaning performance is critical in tailoring interventions to improve hospital cleaning and reduce the risk of infection transmission. The findings of this study will benefit future planning if another outbreak wave occurs.

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Tables

Table 1: Baseline information of participants (N= 453)		
	n	%
Gender		
Male	207	45.70%
Female	246	54.30%
Age		
21-30 years	152	33.55%
31-40 years	146	32.23%
41-50 years	125	27.59%
More than 50 years	30	6.62%
Nationality		
Lebanese	373	82.34%
Other	80	17.75%
Marital status		
Married	297	65.56%
Others*	156	34.44%
Educational level		
Middle School degree or less	311	68.65%
Secondary or BT degree or more	142	31.35%
Health status		
Fair	21	4.64%
Average	25	5.52%
Good	407	89.85%
Presence of comorbidities		
No	328	72.41%
Yes	125	27.59%
Type of hospital		
Private	347	76.60%
Public	106	23.40%
Income		
Less than 1 Million L.L	366	80.79%
1-2 Millions L.L	84	18.54%
More than 2 Millions L.L	3	0.66%
Years of experience in hospital cleaning		
Less than 3 years	217	47.90%
3 years or more	236	52.10%
Total	453	100%
<i>Others* includes single, divorced and widowed</i>		

Knowledge items (N= 453)

	Correct n(%)	Incorrect n(%)
1: Knowledge regarding COVID-19 symptoms and signs		
main clinical symptoms of COVID-19 are fever, fatigue, cough and myalgia	421(92.9%)	32(7.1%)
persons with COVID-19 will develop severe cases and die	309(68.2%)	144(31.8%)
elderly and those having chronic illnesses are more likely to develop severe cases	422(93.2%)	31(6.9%)
2: Knowledge of COVID-19 mode of transmission		
COVID-19 can be transmitted from person to person via cough and sneezes	438(96.7%)	15(3.3%)
COVID-19 can be transmitted by urine and feces of an infected person	210(46.4%)	173(53.7%)
COVID-19 can be transmitted by kissing, hugging, shaking hands with an infected person	421(92.9%)	32(7.1%)
An infected person with COVID-19 can be asymptomatic and still transmit the infection to others	419(92.5%)	34(7.5%)
3: Knowledge of Novel Coronavirus prevention and treatment		
COVID-19 can be prevented by regular washing hands with soap and water and also by using sanitizers	438(96.7%)	15(3.3%)
COVID-19 can be prevented by using a mask	435(96%)	18(4%)
Currently, there is no specific treatment for COVID-19	303(66.9%)	150(33.1%)
COVID-19 exposure should be immediately reported to the hospital call center	422(93.2%)	31(6.9%)
Number of people visiting the patient room (in contact with the patient) should be minimized	416(91.8%)	37(8.2%)
Time spent by the cleaner in the room of the COVID-19 patient should be reduced	387(85.4%)	66(14.6%)
4: Knowledge regarding cleaning and disinfection		
Surfaces that have been in contact with the ill person(s), such as toilet, handwashing basins, and baths, should be cleaned, then disinfected	434(95.8%)	19(4.2%)
Cleaning should always be performed first, followed by disinfection for surfaces and items touched by COVID-19 case.	408(90.1%)	45(9.9%)
Use of bleach is not suitable, or potentially damaging to surfaces (on devices like telephones and remote-control devices), 70% alcohol could be used.	326(72%)	127(28%)
In preparing bleach solution, concentration should be reduced	422(93.2%)	31(6.9%)
Final cleaning of the surface is required after the application of disinfectant	254(56.1%)	199(43.9%)
Cleaning, using disposable cleaning materials whenever possible	399(88.1%)	54(11.9%)
Waste should be bagged before being removed from the room and does not require special laundering	435(96%)	18(3.9%)
Frequency of cleaning of the room of COVID-19 patient should be reduced	304(67.1%)	149(32.8%)
Cleaning staff should wear PPEs when visiting the room of COVID-19 patient	418(92.3%)	35(7.7%)
5: Knowledge regarding the risk of getting COVID-19		
Risk of COVID-19 infection depends on the type of surface where the virus is present	353(77.9%)	100(22.1%)
Risk of COVID-19 infection depends on the concentration of the virus	314(69.3%)	139(30.7%)
Risk of COVID-19 infection depends on time since the infected person left the place	330(72.8%)	123(27.2%)

k of COVID-19 infection depends time spend by the d person in this place	386(85.2%)	67(14.8%)
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3: Attitudes of housekeepers and cleaners towards health facility, health authorities leaning

	Disagree n(%)	Neutral n(%)	Agree n(%)
it safety is a priority in this hospital	18(3.9%)	24(5.4%)	411(87.7%)
ospital is always trying to find new ways to ve hygiene	50(11.1%)	190(41.9%)	213(47%)
ospital provides me by all the equipment d for cleaning and sterilization	15(3.3%)	27(6%)	411(90.7%)
ospital does not appreciate any further xert from my part	242(53.4%)	58(12.8%)	153(33.8%)
ospital ignores any complaints or requests my part	287(63.4%)	63(13.9%)	103(22.8%)
ospital really cares about my safety and ealth	21(4.65%)	21(4.65%)	411(90.7%)
if you do my best, the hospital will not eciate it	252(55.6%)	66(14.6%)	135(29.8%)
ospital takes care of my general action at work	72(13.6%)	82(18.1%)	309(68.2%)
ospital does not take much interest in me	253(55.9%)	77(17%)	123(27.1%)
it easy to ask my supervisor if help or e are needed	13(2.9%)	17(3.8%)	423(93.3%)
x infection prevention measures are well mented at hospital	21(4.6%)	37(8.2%)	395(87.2%)
x the hospital has done its part in raising eness about the risk of catching COVID-19 ow to prevent it	18(4%)	30(6.6%)	405(90.4%)
des toward cleaning and disinfection			
ve that cleaning and disinfecting surfaces ective for eliminating COVID-19	3(0.7%)	61(13.5%)	389(85.8%)
x that PPEs can protect me from catching D-19	18(4%)	39(8.6%)	396(87.4%)
ve that regular hand washing could nt the COVID-19 infection	14(3.1%)	39(8.6%)	400(88.3%)
des towards health authorities			
x that MOPH has played her preventive n the hospital (providing PPEs...)	50(11.1%)	82(18.1%)	321(76.9%)
e confidence that Lebanon can win the against the COVID-19	74(16.4%)	79(17.4%)	300(66.2%)

Practices items

	Never	Occasionally	All the times
	n(%)	n(%)	n(%)
Washing hands with soap and water, and also using disinfectants regularly	6(1.3%)	35(1.3%)	412(90.9%)
Maintaining social distance with everyone in the ward (1.5 m)	3(0.7%)	107(23.6%)	343(75.7%)
Wearing a face mask all the time at the hospital	12(2.6%)	27(6%)	414(91.4%)
Avoiding the presence in crowded places	9(2%)	56(12.4%)	388(85.7%)
Avoiding touching surfaces than touching eyes or nose	9(2%)	25(5.5%)	419(92.5%)
Compliance to the prevention measures requested by the hospital	6(1.3%)	29(6.4%)	418(92.3%)
Following cough and sneeze etiquette	3(0.7%)	24(5.3%)	426(94%)
Checking the availability of the needed cleaning materials with my supervisor before starting work	3(0.7%)	53(11.7%)	397(87.6%)
Cleaning and disinfecting common areas at the ward (such as rest rooms, halls, reception, waiting areas and lifts)	3(0.7%)	46(10.2%)	404(89.2%)
Cleaning and disinfecting surfaces and objects frequently touched, such as handles, door handles, buttons, handrails, doorknobs and switches	3(0.7%)	34(7.5%)	416(91.8%)
Ensuring that the room where disinfectant solution is used is well aerated and Labelling the prepared containers of disinfectant	12(2.6%)	61(14.1%)	377(83.2%)
Following the manufacturer's instructions to ensure that disinfectants are prepared and used safely.	9(2%)	31(6.8%)	413(91.2%)
Wearing appropriate PPE when visiting COVID-19 patient room	3(0.7%)	21(4.6%)	429(94.7%)
Putting on and doffing PPEs appropriately	5(1.1%)	33(7.3%)	415(91.6%)
Receiving regular training on IPC including PPEs use, cleaning and doffing	11(2.4%)	44(9.7%)	398(87.9%)
Washing hands before and after wearing PPEs	3(0.7%)	26(5.7%)	424(93.6%)
Washing laundry carefully to mitigate the risk of nosocomial transmission.	3(0.7%)	23(5%)	427(94.3%)
Washing textiles, linens, and clothes in special, designated laundry bags	21(4.6%)	28(6.2%)	404(89.2%)
Washing laundry in warm cycles (60-90°C) with appropriate detergents.	21(4.6%)	53(11.7%)	379(83.7%)
Disposing disposable items (hand towels, gloves, masks, tissues) in a container with a lid following hospital action plan and national protocols for waste management.	6(1.3%)	24(5.3%)	423(93.4%)
Following up on COVID-29 news	30(6.6%)	135(29.8%)	288(63.6%)

Table 5: Multivariable logistic regression of the factors associated with Cleaners good practices

	Poor practices	Good practices	P-value	aOR	95% C.I.for aOR	
	n(%)	n(%)			Lower	Upper
Gender			0.18			
Male	19(9.2%)	188(90.8%)				
Female	28(11.4%)	218(88.6%)				
Age			<0.001			
1-10 years	1(0.7%)	151(99.3%)		1.000		
11-20 years	8(5.5%)	138(94.5%)	0.016	0.051	0.005	0.576
21 years and more	38(24.5%)	117(75.5%)	<0.001	0.005	0.002	0.051
Marital status			0.608			
Married	5(4.5%)	106(95.5%)				
Single, separated or widowed	15(9.7%)	141(90.3%)				
Educational level			0.023			
High School degree or more	39(12.5%)	272(87.5%)		1.000		
Below High School degree	8(5.7%)	134(94.3%)	0.019	2.869	0.871	9.445
Presence of comorbidities			0.251			
None	37(11.3%)	291(88.7%)				
One or more	10(8%)	115(92%)				
Length of hospital stay			<0.001			
1-3 days	27(25.5%)	79(74.5%)		1.000		
4 days and more	20(5.8%)	327(94.2%)	<0.002	10.083	3.340	30.436
Length of experience in hospital cleaning			<0.001			
Less than 3 years	40(18.43%)	177(81.57%)		1		
4 years and more	7(3%)	229(97%)	0.001	12.942	4.214	39.747
Knowledge regarding COVID-19 symptoms			0.006			
Correct	10(43.5%)	13(56.5%)				
Incorrect	37(8.6%)	393(91.4%)	0.006	9.076	1.895	43.463
Knowledge of COVID-19 mode of transmission			0.833			
Correct	6(14%)	37(86%)				
Incorrect	41(10%)	369(90%)				
Knowledge of COVID-19 prevention and treatment			0.019			
Correct	6(37.5%)	10(62.5%)		1.000		
Incorrect	41(9.4%)	396(90.6%)	0.015	10.717	1.594	22.051
Knowledge of cleaning and disinfection			0.031			
Correct	6(27.3%)	16(72.7%)				
Incorrect	41(9.5%)	390(90.5%)	0.035	3.939	1.099	14.126
Knowledge about the risk factors of getting COVID-19			0.004			
Correct	10(26.3%)	28(73.7%)		1		
Incorrect	37(8.9%)	378(91.1%)	0.012	7.937	1.569	40.150
Attitudes of Housekeepers towards health facility			<0.001			
Positive	16(35.6%)	29(64.4%)		1		
Negative	31(7.6%)	377(92.4%)	<0.001	14.481	3.591	58.388
Attitudes of Housekeepers towards cleaning and disinfection			<0.001			
Positive	23(26.1%)	65(73.9%)		1		
Negative	24(6.6%)	341(93.4%)	0.035	3.939	1.099	14.126
Attitudes of Housekeepers towards health authorities			0.021			
Positive	27(32.1%)	57(67.9%)		1		
Negative	20(5.4%)	349(94.6%)	0.032	3.303	1.106	9.863

***p-value<0.05** is considered significant

Declarations

Ethics approval and consent to participate:

Research was performed in line with the principles of the Declaration of the Helsinki as revised in 2008. Written informed consent was obtained from all the participants at recruitment. Participants were informed that all information would be gathered anonymously and handled confidentially. Participation was voluntary, and the questionnaire was collected only in subjects who expressed consent for study participation. As individual participants cannot be identified based on the presented material, this study caused no plausible harm or stigma to participants. The study design assured adequate protection of study participants, and neither includes clinical data about patients nor configures itself as a clinical trial

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Availability of data and materials

The datasets used and analyzed during the current study will not be made publically available but will be available from the corresponding author on reasonable request.

Consent for publication

Not applicable.

Competing interests

The author(s) declare that they have no competing interests.

Authors' contributions

DY developed the project idea. DY, HH and LAA formulated the questionnaire, organized and analyzed the survey. DY, LAA, HH drafted and critically reviewed the paper. All authors read and agreed on the final version.

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Supplement file

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Figures

Knowledge domains:

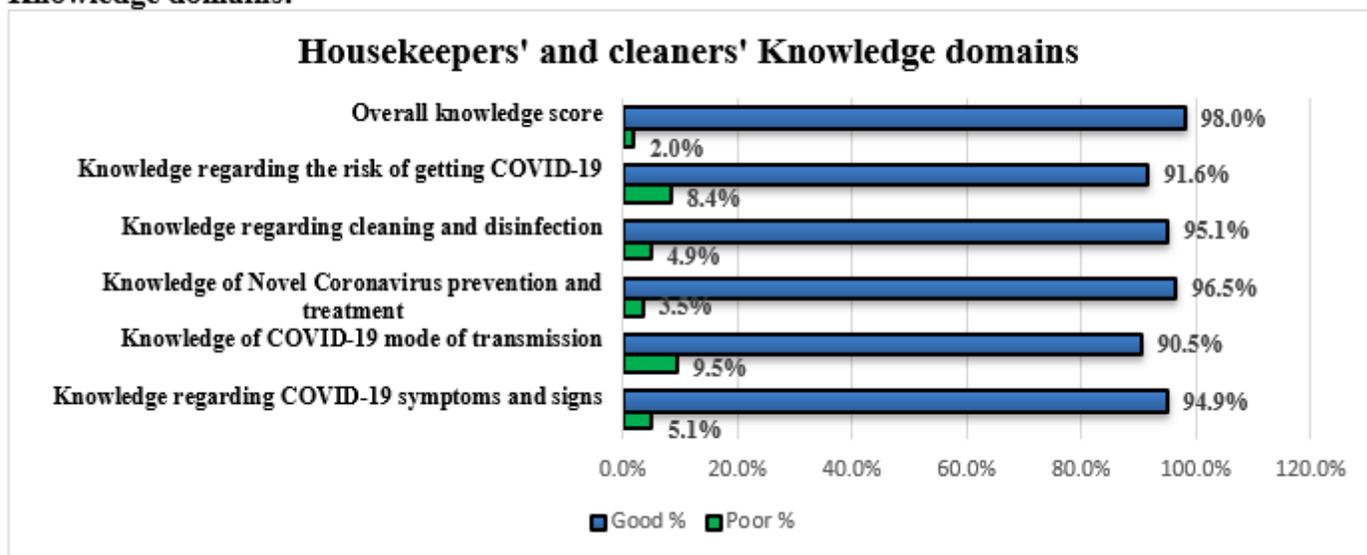


Figure 1

Housekeepers and cleaners knowledge domains

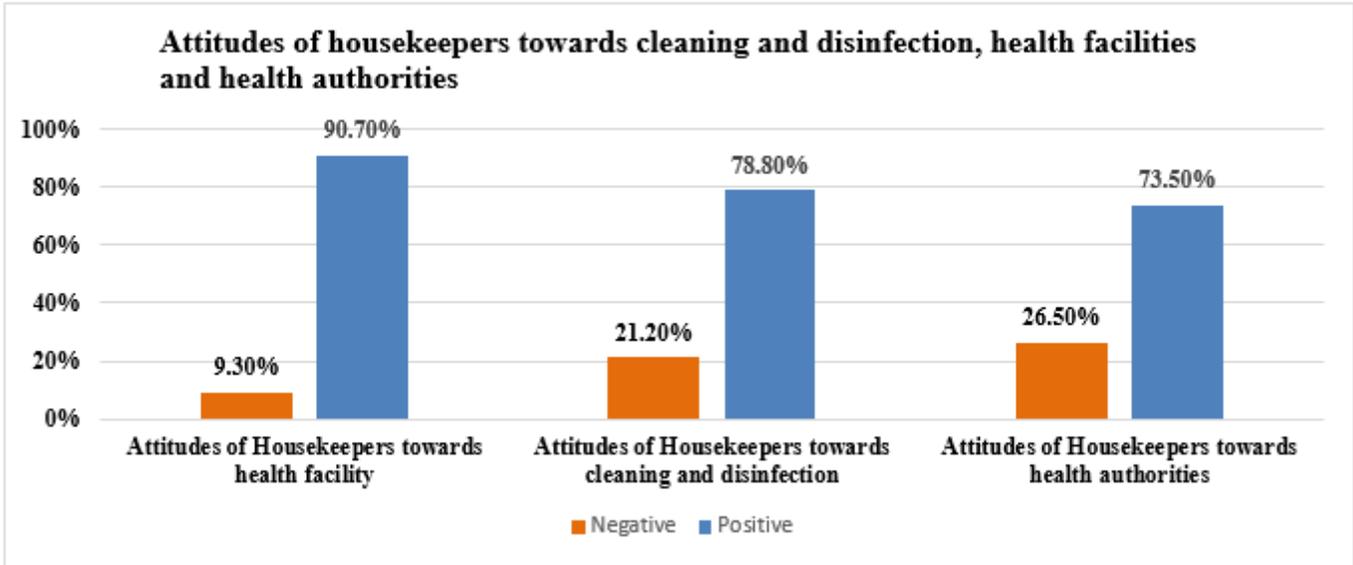


Figure 2

Attitudes of Cleaners towards health facility, health authorities and cleaning procedures

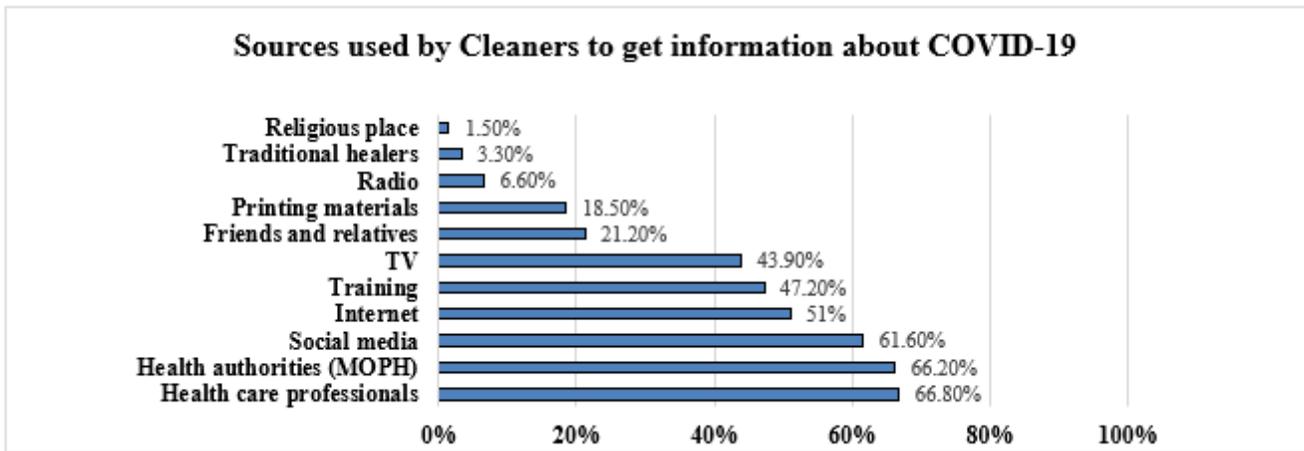


Figure 3

Sources of information used by Cleaners

Reliability of used sources of information as perceived by Cleaners

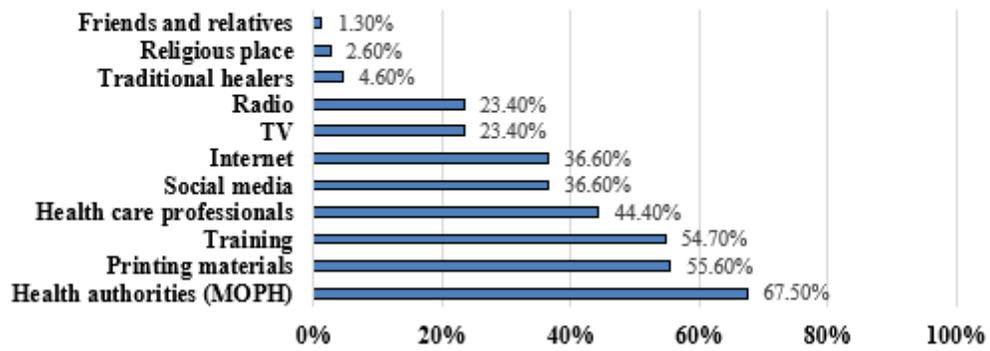


Figure 4

Reliability of sources of information as perceived by Cleaners