ISSN: 2690-0726

Research Article

Journal of Educational and Psychological Research

Awareness of Basic Knowledge of Hand Hygiene in Chinese Medical Facilities: A Questionnaire-Based Survey

Li Long[1, 2#], Jing Yang[3#], Shu Feng[4], Wei Sun[5], Lifang Gao[3], Yamin Yang[3], Jie Liu[3], Junqing Zhou[3], Fuyu Zhang[1, 2], Jie Tian[1, 2] and *Bin Gao[5, 6]

[1]*Department of Hospital-Associated Infection Management, Third Central Hospital of Tianjin, Tianjin 300170, China*

[2]*Tianjin Key Laboratory of Extracorporeal Life Support for Critical Diseases, Artificial Cell Engineering Technology Research Center, Tianjin Key Laboratory of Artificial Cell, Tianjin Institute of Hepatobiliary Diseases, Third Central Hospital of Tianjin, Tianjin 300170, China*

[3]*Department of Infectious Diseases, Third Central Hospital of Tianjin, Tianjin 300170, China*

[4]*Infection Control Unit, First People's Hospital of Zunyi and 3rd Affiliated Hospital of Zunyi Medical University, Zunyi, Guizhou Province 563000, China*

[5]*Graduate Faculty, Tianjin Medical University, Tianjin 300070, China*

[6]*Infectious Diseases Unit, Tianjin Fourth Central Hospital, Tianjin 300140, Tianjin, China*

***Corresponding author**

Bin Gao, MD, Department of Infectious Diseases, Tianjin Fourth Central Hospital affiliated to Tianjin Medical University and Nankai University, No.1 Zhong-shan-lu, Hebei District, Tianjin 300140 / China.

Submitted: 22 Dec 2021; **Accepted:** 04 Jan 2022; **Published:** 22 Jan 2022

Citation: *Li Long, Jing Yang, Shu Feng, Wei Sun, Lifang Gao. et al. (2022). Awareness of Basic Knowledge of Hand Hygiene in Chinese Medical Facilities: A Questionnaire-Based Survey, J Edu Psyc Res, 4(1), 286 -292.*

Abstract

The aim of this study was to evaluate the level of awareness of the basic concepts of hand hygiene among healthcare staff in China. An online questionnaire survey was used to obtain data from 30 provinces and municipalities in three regions of China. A total of 45,455 valid questionnaires were received. The overall correct response rate was 26.53%. The highest correct response rates concerned the relationship between hand hygiene and healthcare-associated infection (97.71%) and the characteristics of microbiota and resident flora on hands (96.35%), followed by awareness of the World Health Organization's "My 5 moments for hand hygiene" concept (91.61%), knowledge of glove use (90.53%), hand hygiene materials (89.28%), and characteristics of microbiota and transient flora on hands (84.60%). Other indications for hand hygiene, including the basic concept of hand hygiene, and the effectiveness of alcohol-based handrub on the hand microbiome had lower rates. Eastern China demonstrated a better knowledge than other regions (adjusted odds ratio [aOR]: 4.08; 95% CI:3.84-4.32). Respondents in primary care facilities had a higher correct response rate than other types of hospitals (aOR:2.33; 95% CI: 2.05-2.66); logistics staff had the highest correct response rate compared to other professional groups (aOR: 1.84; 95% CI: 1.53-2.29). Among clinical departments, outpatient/emergency room staff had the highest rate of correct responses (aOR: 1.51; 95% CI: 1.34-1.71). The authors observed large differences in the basic knowledge of hand hygiene across different regions in China. Notably, knowledge levels need to be strengthened among secondary care facilities, nursing staff, and infection prevention and control units.

Keywords: China, Hand Hygiene, Basic Knowledge, Awareness Rate, Compliance

Abbreviations:

Covid-19	Coronavirus Diseases 2019
AOR	Adjusted Odds Ratio
95% ci	95% Confidence Interval

Introduction

The coronavirus disease 2019 (COVID-19) pandemic has left an indelible mark on the world. Healthcare workers have been particularly affected through not only exposure to infection, but also inadequate protective measures during the first waves due to lack of supplies [1, 2]. Advances and actions to control the disease, driven by global collaboration and data sharing, have been

unprecedented. However, these have also amplified deficiencies in infection control and beyond and provide important lessons for the future. It is the responsibility of policymakers and all stakeholders in the healthcare arena to reflect upon the lessons of 2020 and to use these as building blocks to ensure preparedness for future health threats.

Hand hygiene is recognized worldwide as an important element of hospital infection control [3, 4], but there are many challenges associated with compliance with optimal practices. For example, it has been documented that individuals who engage in risk behavior are less likely to practice good hand hygiene, despite the fact that they are aware of a high risk of infection [5]. In addition, the global antimicrobial drug resistance situation remains extremely preoccupying and transmission by the hands of healthcare workers has been identified as a major cause of the rapid increase of multidrug-resistant organisms. Improving the hand hygiene compliance rate has been proven to effectively reduce the incidence of healthcare-associated infection. However, it may be overly optimistic to believe that the transient success (mainly by lockdown at the beginning, followed by vaccination) to contain COVID-19 resulted also in benefits to tackle multidrug-resistant organisms. Indeed, we observed that methicillin-resistant *Staphylococcus aureus* rates in a tertiary hospital soared to 42.4% during the first half of 2020 of the COVID-19 pandemic compared to an average of 23.6% before that since the second half of 2016 [6].

In 2009, following the severe acute respiratory syndrome epidemic in 2003/2004, the Ministry of Health of the People's Republic of China issued "Standards for hand hygiene for healthcare workers in healthcare settings (CSHH/WS/T 131–2009)" to be strictly enforced and implemented nationwide [7]. Knowledge of appropriate practices and the science behind the evidence is one factor to facilitate the improvement of hand hygiene. However, a bibliometric analysis of documents published from 2013 to 2018 with a focus on hand hygiene in healthcare settings in China showed that knowledge awareness was not addressed [8]. In 2016, a stratified, retrospective two-point investigation (when and how to hand rub) using a hand hygiene knowledge awareness survey was conducted in 200 hospitals across 14 provinces [9], but no formal assessment of the document has been undertaken.

The aim of this study was to investigate the current level of basic knowledge of hand hygiene across a wide range of healthcare facilities and regions in China in order to help inform a national strategy to promote hand hygiene.

Methods

Survey Recipients

We conducted a questionnaire-based survey between April and June 2018 with a specific focus on the basic knowledge of hand hygiene among healthcare workers in primary, secondary and tertiary hospitals in the three main regions of Mainland China, as defined by the Almanac of Health Statistics of China [10]. The survey was approved by the ethics committee of the Third Central Hospital of Tianjin (no.: IRB2018-032). The anonymity of respondents was optional.

The survey comprised 10 single/multiple-choice questions based on the CSHH and concerning knowledge of the following aspects: awareness of the concept of hand hygiene and the role of hands in the transmission of pathogens; the relationship between hand hygiene and healthcare-associated infection; appropriate hand hygiene materials; the WHO's "My 5 moments for hand hygiene" concept; indications and knowledge of other aspects of hand hygiene practices, e.g. glove use; and the effectiveness of alcohol-based hand rub for the rapid elimination of transient skin flora and reduction of resident flora (appendix: survey questionnaire).

Questionnaire Distribution and Data Collection

Questionnaires were distributed to healthcare workers using the snowball sampling method. A social media platform (Blue Dragon Network) was used for data collection. This platform is an online survey application (app) that facilitates the distribution of questionnaires by e-mail or smart phones by using messaging apps, such as WeChat and WhatsApp. It allows participants to access the questionnaire easily and has the capacity to analyze and export results after responses have been collected. Data on respondents' hospital location and type of facility, gender and professional status were also collected. Hospitals were classified according to the Chinese National Healthcare Institutes' Enquiry System (http://zgcx.nhc.gov.cn:9090/unit/index) or their site homepage if not registered in the Enquiry System. Participation did not involve any financial compensation. No confidential data were collected and no reminders to participate were sent. Questionnaires without accurate hospital names were excluded, as well as those with incomplete data. When the user name and workplace were used more than once, only the first questionnaire was retained.

Statistical Analysis

Survey responses were downloaded in Excel format. Categorical and continuous variables were described as numbers (%). Descriptive statistics were used as appropriate. Univariate and multivariate binary logistic regression analyses were performed for each independent variable associated with an awareness of hand hygiene. Data were digitally stored and analyzed using SPSS, version 17 (SAS Institute Inc, Cary, NC, USA). A P-value of less than 0.05 was considered statistically significant for all analyses.

Results

Demographic Characteristics of Respondents

A total of 52,286 questionnaires were returned. Of these, 6305 duplicates were deleted. A further 526 were excluded as the workplace was unable to be ascertained; the location and type of facility were rectified in 5445. The final analysis included 45,455 eligible questionnaires from 961 hospitals across 30 provinces/municipalities. Respondents were physicians (12,353 [27.18%]), nurses (26,290 [57.84%]), medical technicians (4415 [9.71%]), administrative staff (1785 [3.93%]) and logistics personnel (612 [1.35%]); 37,490 (82.84%) were female. Workplace locations included pediatric units, gynecology and obstetrics departments, surgical units, internal medicine, outpatient/emergency room departments, medical-technical departments, administration-logistics, as well as infection control units.

Table 1: Characteristics of Responding Participants.

	Non-registered hospital (N=82)	Primary hospital (N=82)	Secondary hospital (N=498)	Tertiary hospital (N=299)	Total (N=961)
Male gender n (%)					
- Total	148 (12.18)	194 (17.21)	2,637 (17.34)	4,986 (17.87)	7,965 (17.52)
- Physician	83(26.10)	119 (28.61)	1,826 (43.12)	3,293 (44.60)	5,321 (43.07)
- Nurse	8 (1.43)	0 (0.00)	139 (1.64)	561 (3.32)	708 (2.69)
- Administrative staff	21 (13.13)	22 (15.49)	100 (13.21)	121 (16.67)	264 (14.79)
- Medical-technical staff	28 (20.14)	47 (25.13)	482 (31.75)	876 (34.07)	1,433 (32.46)
- Logistic personnel	8 (20.51)	6 (30.00)	90 (44.78)	135 (38.35)	239 (39.05)
Work unit n (%)					
- Medicine	232 (19.09)	440 (39.04)	4,840 (31.83)	10,435 (37.39)	15,947 (35.08)
- Surgery	165 (13.58)	87 (7.72)	3,179 (20.90)	6,934 (24.85)	10,365 (22.80)
- Gynaecology-obstetrics	211 (17.37)	61 (5.41)	1,766 (11.61)	1,870 (6.70)	3,908 (8.60)
- Paediatric unit	129 (10.62)	12 (1.06)	1,168 (7.68)	1,704 (6.11)	3,013 (6.63)
- Outpatient-emergency	91 (7.49)	75 (6.65)	1,028 (6.76)	1,999 (7.16)	3,193 (7.02)
- Medical-technical units	154 (12.67)	217 (19.25)	2,076 (13.65)	3,679 (13.18)	6,126 (13.48)
- Administration-logistics	199 (16.38)	213 (18.90)	725 (4.77)	926 (3.32)	2,063 (4.54)
- Infection control unit	34 (2.80)	22 (1.95)	425 (2.79)	359 (1.29)	840 (1.85)
Geographic region (%)					
- Eastern China	432 (35.56)	987 (87.58)	4,202 (27.63)	11,640 (41.71)	17,261 (37.97)
- Central China	370 (30.45)	90 (7.99)	5,605 (36,86)	9,313 (33.37)	15,378 (33.83)
- Western China	413 (33.99)	50 (4.44)	5,400 (35.51)	6,953 (24.92)	12,816 (28.19)

Awareness Level of the Concept of Hand Hygiene

The average accuracy rate of all questions was 81.55%. Overall, the highest correct response rate (97.71%) was to question 4 (relationship between hand hygiene and healthcare-associated infection), closely followed by question 1 (transmission of pathogens by hands [96.35%]). The correct response rate to questions10, 8 and 7 ("My 5 moments for hand hygiene" concept, glove use and hand hygiene, and knowledge of hand hygiene materials) were relatively good (91.61%, 90.53%, and 89.28%, respectively). The correct response rate to questions 6 and 2 (transmission of pathogens by hands and the effect of alcohol-based hand rub on the total number of bacterial colonies present) were generally average (84.60% and 81.21%, respectively). The correct response rate to questions 9 and 5 (indications and knowledge of other aspects of hand hygiene practices and the concept of hand hygiene) were less than average (71.00% and 65.20%, respectively). The correct response rate to question 3 (effectiveness of alcohol-based hand rub on transient skin flora) was generally poor (48.04%). The 10/10 correct rate was 26.53% (p<0.05)

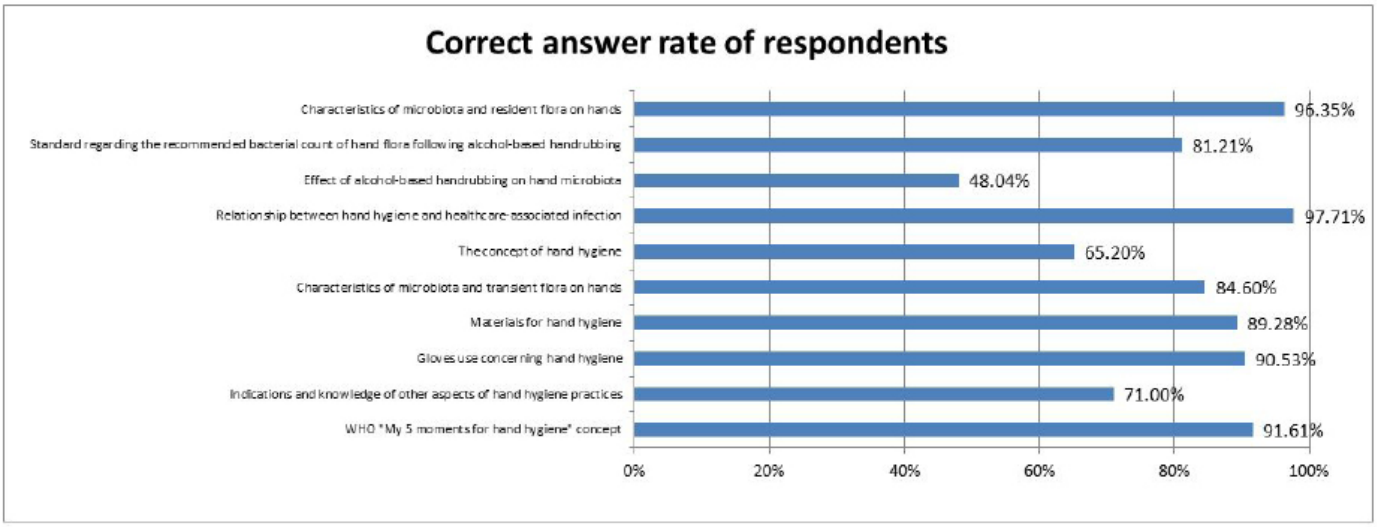

Figure 1: Correct answer rate of respondents (n= 45,455) according to the questionnaire themes.

Awareness Level of the Basic Knowledge of Hand Hygiene by Type of Healthcare Worker and Hospital Facility

The linear regression model showed that the following healthcare worker characteristics were associated with a statistically significant overall accuracy of responses: male gender; professional status related to logistics/administration or a medical technician/physician; working in an outpatient/emergency unit, surgical or medical technical unit, internal medicine service, and administration/logistics; located in a primary, secondary or tertiary care hospital or a non-classified hospital (i.e., medical facility not registered in the Chinese National Healthcare Institute's Enquiry System); and located in Eastern and Central China.

Table 2: Factors Associated With 10/10 knowledge Scores of Hand Hygiene.

	Responses with a10/10 score (n [%])	Univariate analysis (OR [95% CI])	Multivariate analysis (adjusted OR [95% CI])
Hospital rating			
-Non-registered hospital	398 (32.76%)	1.89 (1.66,2.14)	1.75 (1.53,1.99)
-Primary hospital	635 (56.34%)	5.00 (4.41,5.66)	2.33 (2.05,2.66)
-Secondary hospital	3,122 (20.54%)	1.00	1.00
-Tertiary hospital	7,902 (28.32%)	1.53 (1.46,1.60)	1.28 (1.22,1.34)
Geographic region			
-Eastern China	7,356 (42.62%)	4.36 (4.11,4.62)	4.08 (3.84,4.32)
-Central China	2,835 (18.44%)	1.33 (1.24,1.41)	1.36 (1.27,1.45)
-Western China	1,866 (14.56%)	1.00	1.00
Gender			
-Female	9,757 (26.03%)	1.00	1.00
-Male	2,300 (28.88%)	1.15 (1.09,1.22)	0.96 (0.90,1.02)
Professional status			
- Physician	3,427 (27.74%)	1.23 (1.17,1.29)	1.22 (1.15,1.29)
- Nurse	6,248 (23.77%)	1.00	1.00
- Administrative staff	569 (31.88%)	1.50 (1.35,1.67)	1.65 (1.41,1.94)
- Medical-technical staff	1,544 (34.97%)	1.73 (1.61,1.85)	1.61 (1.46,1.78)
- Logistics staff	269 (43.95%)	2.52 (2.14,2.96)	1.84 (1.53,2.29)
Work unit			
- Paediatric unit	597 (19.81%)	1.00	1.00
- Gynaecology-obstetrics	822 (21.03%)	1.08 (0.96,1.21)	1.07 (0.95,1.21)
- Infection control unit	186 (22.14%)	1.15 (0.96,1.39)	0.86 (0.69,1.11)
- Outpatient-emergency	886 (27.75%)	1.55 (1.38,1.75)	1.51 (1.34,1.71)
- Medicine	4,095 (25.68%)	1.40 (1.27,1.54)	1.33 (1.20,1.47)
- Surgery	2,733 (26.37%)	1.45 (1.31,1.60)	1.44 (1.30,1.60)
- Medical-technical units	1,980 (32.32%)	1.93 (1.74,2.15)	1.40 (1.23,1.58)
- Administration-logistics	758 (36.74%)	2.35 (2.07,2.67)	1.28 (1.08,1.51)
Total	12,057 (26.53%)		

Results of the multivariate logistic regression analysis with the outcome variable of full-score marks (10/10) also confirmed that the odds of an appropriate awareness of hand hygiene were higher among the following categories: individuals working in logistics (adjusted odds ratio [aOR]: 1.84; 95% confidence interval [CI]: 1.53-2.29); administration (aOR:1.65; 95% CI:1.41-1.94); medical technicians (aOR:1.61;95% CI: 1.46-1.78); and physicians (aOR: 1.22; 95% CI: 1.15-1.29). The overall accuracy of respondents was also more likely if healthcare workers worked in an outpatient/emergency unit (aOR:1.51; 95% CI: 1.34-1.71), surgical department (aOR:1.44; 95% CI: 1.30–1.60), medical-technical unit (aOR:1.40; 95% CI: 1.23-1.58), internal medicine department (aOR:1.33; 95% CI: 1.20-1.47) and administration-logistics (aOR:1.28; 95% CI: 1.08–1.51). Similarly, working in a primary care hospital (aOR:2.33; 95% CI: 2.05–2.66), non-registered hospital (aOR: 1.75; 95% CI: 1.53-1.99) and a tertiary care hospital (aOR: 1.28; 95% CI: 1.22-1.34) located in Eastern and Central China (aOR:4.08; 95% CI: 3.84–4.32 and aOR:1.36; 95% CI: 1.27-1.45, respectively) were all associated with a higher rate of accurate responses.

Discussion

Our survey results comprising 45,455 healthcare workers in the main three regions of China can be considered as a true reflection of the awareness of hand hygiene basic knowledge in the country to a large extent. The overall correct response rate to all 10 questions was 81.55%. However, the overall accuracy of respondents to all 10 questions was only 26.53% and probably corresponds to the tip of the iceberg. These findings also provide national health authorities with valuable scientific data for the development of further targeted training on hand hygiene to improve the implementation rate of recommendations within facilities.

We observed some notable inconsistencies in awareness. The highest correct response rate (97.71%) concerned the relationship between hand hygiene and the acquisition of healthcare-associated infection, whereas the response investigating awareness of the actual concept of hand hygiene was only 65.20%. The correct response to the question on the characteristics of resident flora on hands was high (96.35%). However, the correct response concerning the characteristics of transient flora on hands was only 84.60%, and the response concerning the effectiveness of alcohol-based hand rub on transient flora was even lower (81.21%). Only a mere 48.04% of participants responded correctly to the question on the effect of hand rubbing on the number of microbiotas on hands. It is very possible that knowledge gaps are due to a lack of reference made to these issues in the national standard document, rather than evidence-based guidelines or guidance that are key technical tools to support the implementation of targets laid out in the national health policy [11]. Importantly, there are several consensus documents/guidelines in the context of COVID-19 where hand hygiene has not been systematically referenced [12]. Evidence-based guidelines from international expert panels should be considered as additional sources, such as the WHO guidelines on hand hygiene in health care and/or interim guidance [3, 13]. In addition, it is not mandatory to implement the standard in healthcare settings affiliated to the national standardization system. Interestingly, the actual document, rather than other national technical standards not mandatorily implemented, is not even well referred to in key guidelines issued by the central administration since the declaration of the COVID-19 pandemic in China, which would endow it with a mandatory attribute [14, 15].

A major misunderstanding was that 10% of healthcare workers believed that wearing gloves can replace hand hygiene. Indeed, Sun and Gao highlighted in a review that several documents revealed that appropriate hand hygiene practices had been replaced by glove use in China and this erroneous notion must be corrected rapidly [14, 16]. Of note, glove donning was required as one of the level I precaution measures during the COVID-19 pandemic [17]. It is therefore crucial that an updated and evidence-based hand hygiene document be issued in China, as well as corresponding legislation or regulations.

Logistic analysis showed that the correct response rate was higher in Eastern and Central China than Western regions and best in primary care hospitals. The weakest link lies in secondary hospitals where training is not in place and the emphasis on prevention measures for healthcare-associated infection is insufficient. A crucial issue to be considered for hand hygiene education in the future in China must be to cover all key framework domains of primary care responses in order to improve the equivalency, safety and quality control of healthcare delivery [18].

Knowledge of hand hygiene was poorest among nurses. Interestingly, the awareness level of logistics personnel was greatly improved than previously observed, thus indicating that medical facilities have carried out effective strategies across all categories of healthcare workers to improve the weak medical knowledge of certain professions. Although nurses and physicians have the most clinical interaction with patients, some aspects of their knowledge of the basic concepts surrounding hand hygiene were sadly lacking. Surprisingly, infection prevention and control was not integrated in an expert consensus document regarding holistic care for patients with severe COVID-19 [19]. However, the inclusion of concepts related to hand hygiene in professional education across a variety of specialties could perhaps have an active effect on hand hygiene improvement, such as medical school undergraduate curricula.

Healthcare workers in the outpatient/emergency room performed best, while those in gynecology/obstetrics, pediatrics and infection control units performed poorly. For the gynecology/obstetric departments where more clinical procedures occur, hand hygiene should be the focus of a specific intervention and awareness-raising strategy. Our data suggest that it is necessary to continue to strengthen hand hygiene training for infection prevention and control staff by developing an occupational license or a professional development programmed integrated into the regular educational activities of the various departments, notably for clinical frontline medical staff. In particular, infection prevention and control services in hospitals need to heighten their profile with the full and visible support of the directorate in order to make all staff aware of the importance of their work and its translation into real practice. WHO has proposed "Clean Care is Safer Care" as a priority initiative to improve medical quality in the 21st century. However, this cannot be achieved if major efforts are not made to continue to improve the compliance of medical staff with optimal practices. Finally, the specific issue related to the limited duration of the shelf life of hand rub/gel has been updated in the new edition of the CSHH (WS/T 313-2019), with the inclusion also of all other awareness points mentioned in our questionnaire [20].

Our study has some limitations. First, the number of participants in the different regions, types of hospital, healthcare worker categories, gender and clinical departments was not homogenous with less primary care hospitals involved, particularly in Central and Western China. Second, there are some limitations related to the study design, such as a lack of investigation of some aspects of hand hygiene, e.g. surgical hand antisepsis and knowledge of multimodal intervention strategies for hand hygiene. Third, the survey was conducted in 2018 and only now reported as the authors were involved in the early emergency response to COVID-19. However, a search of the Chinese Wan fang Med Online using the keywords “hand hygiene” and “knowledge” retrieved 7546 reports, representing 1393 published manuscripts

since 2018. Among these, no cross-regional hand hygiene knowledge awareness surveys were identified.

Large differences exist in the basic knowledge of hand hygiene in healthcare facilities in different regions in China and it is especially important to strengthen knowledge in medical facilities of some Western provinces. Basic knowledge also needs to be more extensively promoted in secondary hospitals and among nurses and staff working in gynecology/obstetrics, pediatric departments, and particularly in infection prevention and control units.

Acknowledgment

We thank Rosemary Sudan for providing editorial assistance with earlier drafts of the document and her indispensable support. We are also grateful to Wenti Xu for her valuable statistical analysis to test the validity and reliability of the questionnaire.

Ethics

This study did not involve human beings, intervention or experiments and participation was entirely voluntary. Anonymity and confidentiality were guaranteed and maintained. The study was approved by the ethics committee of the Third Central Hospital of Tianjin (IRB2018-032).

Authorship Statement

LL: conceptualization, design of study and investigation, data curation, writing and original draft preparation. JY: data curation, writing and original draft preparation. SF: data analysis, interpretation, design of the figures and tables, software. WS: data analysis, interpretation, design of the figures and tables. LG, YY, JZ: data collection. FZ: design of study and implementation. JT: supervision. BG: conceptualization, study coordination, data analysis, interpretation, design of the figures and tables, text revision. All authors have read and approved the final version for publication.

Conflicts of interest

None.

Funding

Supported by the Tianjin Municipal Health Planning Commission Fund Project (2014KZ012).

References

1. Wang, D., Hu, B., Hu, C., Zhu, F., Liu, X., Zhang, J., ... & Peng, Z. (2020). Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus–infected pneumonia in Wuhan, China. JAMA, 323(11), 1061-1069.
2. Tartari, E., Hopman, J., Allegranzi, B., Gao, B., Widmer, A., Cheng, V. C. C., ... & Voss, A. (2020). Perceived challenges of COVID-19 infection prevention and control preparedness: A multinational survey. Journal of Global Antimicrobial Resistance, 22(9), 779-781.
3. World Health Organization. (2009). WHO guidelines on hand hygiene in health care. In WHO guidelines on hand hygiene in health care. Geneva: WHO.
4. Lotfinejad, N., Peters, A., & Pittet, D. (2020). Hand hygiene and the novel coronavirus pandemic: the role of healthcare workers. The Journal of hospital infection, 105(4), 776-777.
5. Wong, S. C., AuYeung, C. Y., Lam, G. M., Leung, E. L., Chan, V. M., Yuen, K. Y., & Cheng, V. C. (2020). Is it possible to achieve 100 percent hand hygiene compliance during the coronavirus disease 2019 (COVID-19) pandemic? Journal of Hospital Infection, 105(4), 779-781.
6. Gao, B., Sun, W., Zhao, L., Lv, W., Chen, C., Su, W., ... & Fu, Q. (2020). Five-year retrospective review of the prevalence of Staphylococcus aureus isolated from patients with identified or suspected infection in a tertiary teaching hospital in China. FIS/HIS International Conference. Edinburgh, UK, 9-11 November: abstract no. 238.
7. National Health Commission of the People's Republic of China. (2009) Standards for hand hygiene for healthcare workers in hospital settings. WS/T 313-2009. http://www.nhc.gov.cn/wjw/s9496/200904/40118/files/5fe4afce5b874512a9780c724a4d5be0.pdf.
8. Wang, L., Hu, X. (2019). Bibliometric analysis of hand hygiene related research of medical staff in China. Journal Nurses Training, 34(16), 1453-1460
9. Yao, X., Xu, D., Li, L., Hou, T., Li, W. Liu, Y. ... & Liu, W. (2019). Analysis on the hand hygiene practice trend in Chinese hospitals. Chinese Nursing Management 19(7), 1050-1053.
10. National Health Commission of the People's Republic of China. (2019). China health statistics almanac. Beijing, Peking Union Medical College Press.
11. Zhou, Y., Zhang, D., Chen, Y., Zhou, S., Pan, S., Huang, Y., & Ba-Thein, W. (2014). Healthcare-associated infections and Shanghai clinicians: A multicenter cross-sectional study. PLoS One, 9(8), e105838.
12. Li, C., Huang, X., Cai, M., Chen, P., Chen, W., Chen, X. … & Wu, A. (2020). Expert consensus on personal protection in different regional posts of medical institutions during COVID-19 epidemic period. Chinese Journal of Infection Control 19, 200-213.
13. World Health Organization. (2020). Infection prevention and control during health care when coronavirus disease (COVID-19)" is suspected or confirmed: interim guidance, 29 June 2020 (No. WHO/2019-nCoV/IPC/2020.4). World Health Organization.
14. National Health Commission of the People's Republic of China. (2009). Technical standard for isolation in hospitals. http://hbba.sacinfo.org.cn/stdDetail/19f4de29810c72257041c6c1fe3fd4fe.
15. National Health Commission of the People's Republic of China. (2020). Guideline of infection prevention and control in healthcare settings during the COVID-19 pandemic. http://www.nhc.gov.cn/xcs/yqfkdt/202001/b91fdab7c304431eb082d67847d27e14.shtml. 2020.
16. Sun, Y., & Gao, B. (2018). Existing problems and countermeasures in clinical application of medical gloves. Chinese Journal of Infection Control, 17(10), 940-944".
17. TTao, K., Zhang, B., Zhang, P., Zhu, P., Wang, G., & Chen, X. (2020). Recommendations for general surgery clinical practice in 2019 coronavirus disease situation. Zhonghua wai ke za zhi [Chinese Journal of Surgery], 58(3), 170-177.
18. Haldane, V., Zhang, Z., Abbas, R. F., Dodd, W., Lau, L. L., Kidd, M. R., ... & Wei, X. (2020). National primary care re-

sponses to COVID-19: a rapid review of the literature. BMJ open, 10(12), e041622.
19. Wang, H., Zeng, T., Wu, X., & Sun, H.(2020). Holistic care for patients with severe coronavirus disease 2019: An expert consensus. International Journal of Nursing Sciences, 7(2), 128-134.
20. National Health Commission of the People's Republic of China. (2020) Specification of hand hygiene for healthcare workers. http://www.nhc.gov.cn/wjw/s9496/202002/dbd-143c44abd4de8b59a235feef7d75e/files/6a3e2bf3d82b4ee-8a718dbfc3cde8338.pdf.