Awareness of basic knowledge of hand hygiene practices among Chinese healthcare workers: a questionnaire-based survey

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Short report

Keywords: China, hand hygiene, basic knowledge, awareness rate

Posted Date: December 4th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-119059/v1>

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Abstract

Objectives

Hand hygiene is a key measure for the prevention and control of healthcare-associated infection. We investigated the level of awareness of the basic concepts surrounding hand hygiene among healthcare workers in China to inform future targeted hand hygiene promotion activities.

Methods

An online questionnaire survey comprising 10 single/multiple-choice questions was conducted from April to June 2018 in 30 provinces and municipalities in three regions of China. Logistic analysis was performed to identify differences between regions, types of hospitals, healthcare workers categories, clinical departments, and gender.

Results

A total of 52,286 responses were received. Among these, 45,455 (86.94%) were included in the final analysis. The overall correct response rate was 26.53%. Eastern China demonstrated a better knowledge than other regions. Respondents in primary care facilities had a higher correct response rate than other types of hospitals and logistics staff had the highest correct response rate than other professional groups. Among clinical departments, staff in the outpatient/emergency room had the highest rate of correct responses.

Conclusion

Large differences exist in the basic knowledge of hand hygiene across different regions in China and knowledge levels need to be specifically strengthened among secondary care facilities, nurse professionals, gynaecology/obstetrics/paediatric departments and infection control units.

Background

Hand hygiene is recognized worldwide as an important element of hospital infection control [1,2]. As early as 2009, the Ministry of Health of the People's Republic of China issued the document "Standards for hand hygiene for healthcare workers in healthcare settings" for strict enforcement and implementation nationwide [3]. However, no formal assessment of their uptake has been undertaken, apart from one study of secondary and tertiary hospitals in 14 provinces, mainly focused on knowledge of the WHO "My 5 moments for hand hygiene" concept [4]. Our study aimed 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 focused on the basic knowledge of hand hygiene among healthcare workers in primary, secondary and tertiary hospitals in the three main regions of Mainland China [5], i.e., East (Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Hainan, and Guangdong), Central (Shanxi, Henan, Heilongjiang, Jilin, Anhui, Jiangxi, Hubei, and Hunan) and West (Inner Mongolia, Chongqing, Guangxi, Guizhou, Sichuan, Yunnan, Xizang, Gansu, Ningxia, Qinghai, Shaanxi, and Xinjiang). Ethics approval was granted by the ethics committee of the Third Central Hospital of Tianjin (no.: 2018-032). The anonymity of respondents was optional.

The survey comprised 10 single-/multiple-choice questions based on the 2009 governmental guidelines on the following topics: knowledge of individual awareness of the concept of hand hygiene and transmission of pathogens by hands; the relationship between hand hygiene and healthcare-associated infection; appropriate hand hygiene materials; the WHO "My 5 moments for hand

hygiene” concept; indications and knowledge of other aspects of hand hygiene practices, such as glove use; and the effectiveness of alcohol-based handrub for the rapid elimination of transient skin flora and the reduction of resident flora (Figure; Additional file 1).

Questionnaire distribution and data collection

Healthcare workers were recruited to participate in the online survey using the snowball sampling method. A social media platform (BlueDragon Network) was used for data collection [6]. 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 was used more than once, only the first questionnaire was retained.

Statistical analysis

Data were digitally stored and analyzed using SPSS, version 17 (SAS Institute Inc., Cary, NC, USA). 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. AP -value > 0.05 was considered statistically significant for all analyses.

Results

A total of 52,286 questionnaires were returned. 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 (4,415 [9.71%]), administrative staff (1,785 [3.93%]) and logistics personnel (612 [1.35%]); 37,490 (82.84%) were female. Workplace locations included paediatric units, gynaecology/obstetric departments, surgical units, internal medicine, outpatient/emergency room departments, medical-technical departments, administration-logistics, as well as infection prevention and control units (Table 1).

Table 1
Characteristics of responding participants.

	Non- registeredhospital (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)	2637(17.34)	4986(17.87)	7965(17.52)
- Physician	83(26.10)	119(28.61)	1826(43.12)	3293(44.60)	5321(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)	1433(32.46)
- Logistical 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)	4840(31.83)	10,435(37.39)	15,947(35.08)
- Surgery	165(13.58)	87(7.72)	3179(20.90)	6934(24.85)	10,365(22.80)
- Gynaecology-obstetrics	211(17.37)	61(5.41)	1766(11.61)	1870(6.70)	3908(8.60)
- Paediatric unit	129(10.62)	12(1.06)	1168(7.68)	1704(6.11)	3013(6.63)
- Outpatient-emergency	91(7.49)	75(6.65)	1028(6.76)	1999(7.16)	3193(7.02)
- Medical-technical units	154(12.67)	217(19.25)	2076(13.65)	3679(13.18)	6126(13.48)
- Administration- logistics	199(16.38)	213(18.90)	725(4.77)	926(3.32)	2063(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)	4202(27.63)	11,640(41.71)	17,261(37.97)
- Central China	370(30.45)	90(7.99)	5605(36.86)	9313(33.37)	15,378(33.83)
- Western China	413(33.99)	50(4.44)	5400(35.51)	6953(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%) concerned the relationship between hand hygiene and healthcare-associated infection, closely followed by transmission of pathogens by hands [96.35%]). The correct response rate regarding the “My 5moments for hand hygiene” concept, glove use and hand hygiene, and knowledge of hand hygiene materials was relatively satisfactory (91.61%, 90.53%, and 89.28%, respectively) and generally average for knowledge of the transmission of pathogens by hands and the effect of alcohol-based handrub on the total number of bacterial colonies present (84.60% and 81.21%, respectively). By contrast, the correct response rate regarding indications and knowledge of other aspects of hand hygiene practices and the concept of hand hygiene was less than average (71.00% and 65.20%, respectively) and correct responses concerning the effectiveness of alcohol-based handrub on transient skin flora were generally poor (48.04%). The 10/10 correct rate was 26.53% ($P < 0.05$) (Fig. 1).

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., not registered in the Enquiry System); and located in Eastern and Central China (Table 2). Results of the multivariate logistic regression analysis also confirmed these results (Table 2).

Table 2
Factors associated with 10/10 knowledge scores of hand hygiene.

	Responses with a 10/10 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	4095(25.68)	1.40(1.27,1.54)	1.33(1.20,1.47)
- Surgery	2733(26.37)	1.45(1.31,1.60)	1.44(1.30,1.60)
- Medical-technical units	1980(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)		

Discussion

In the context of the current coronavirus pandemic situation, hand hygiene is a key infection prevention measure to help combat transmission both in the healthcare setting and in the community [7]. Since the legal requirement concerning hand hygiene standards in China was instituted in 2009, compliance with appropriate hand hygiene practices in medical facilities has gradually increased [8], but still remains suboptimal [9,10], similar to other countries worldwide [11].

We consider that our findings can be considered as a true representative sample of the awareness of hand hygiene basic knowledge across the main three regions of China. 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%. The correct response rate to the question related to the knowledge and understanding of the WHO "My 5 moments for hand hygiene" concept revealed an accuracy rate above 91.96%, although the results of an earlier national hand hygiene survey reported by Xu and colleagues were slightly lower for this specific hand hygiene knowledge point [4]. The misunderstanding related to this question may be that many healthcare workers in China believe that wearing gloves can replace hand hygiene, as highlighted in a recent review [12], and this erroneous notion must be corrected rapidly. The correct response rate was poor for several other notions and suggests that a more in-depth evaluation is needed to understand and address the barriers to an awareness of these concepts.

The correct response rate was higher in Eastern and Central China than Western regions. Based on these data, differences of awareness of the importance of hand hygiene may help to trigger improvement at the hospital administrative level, particularly in the Western region. Staff awareness was best in primary care hospitals and showed that they have been attentive to the importance of hand hygiene in recent years, followed by non-registered and tertiary care hospitals, while awareness in secondary facilities was poor. This is unexpected and inconsistent with the research by Shen and colleagues [10] and slightly different from the results of Xu and colleagues and Qin and colleagues [4,9]. This finding is important and reveals that 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. This must be the key target for hand hygiene education in the future in China.

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 and particularly poor among nursing staff [13]. This was unexpected and did not correlate with previous reports [14]. Healthcare workers in the outpatient/emergency room performed best among the different departments, while those in gynaecology/obstetrics, paediatrics and infection control units performed poorly. It is difficult to accept that infection control personnel were less knowledgeable, but this has already been documented elsewhere [15]. 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. Of note, the 2019 updated recommendations of the Ministry of Health address the shelf life duration of handrub/gel and other awareness points raised in our questionnaire [16]. WHO has proposed "Clean Care is Safer Care" as a priority initiative to improve medical quality in the 21st century, but this cannot be achieved if major efforts are not made to continue to improve the compliance of medical staff with optimal practices.

Our study has some limitations. First, the number of participants in the different regions, as well as the types of hospital, healthcare worker categories, gender and clinical departments, are not homogenous. Second, there is a lack of investigation of some other aspects of hand hygiene, e.g. surgical hand antisepsis and knowledge of multimodal intervention strategies. Third, there was heterogeneity across the different regions regarding the types of hospital and staff categories, with less primary care hospitals involved, particularly in Central and Western China.

In summary, large differences exist in the basic knowledge of hand hygiene in healthcare facilities in different regions in China and basic knowledge needs to be more extensively promoted in secondary hospitals and particularly in infection prevention and control units.

Abbreviations

WHO
World Health Organization

Declarations

Acknowledgements

We thank Rosemary Sudan for providing editorial assistance with earlier drafts of the document and her indispensable support.

Authors' contributions

LL, JY, FZ and TJ were involved in the study design and implementation. LL, LG, YY, JL and JZ undertook data collection. LL, SF, WS and BG performed the data analysis and designed the figures and tables. SF, WS and BG were involved in data interpretation and study coordination. JY and LL wrote the manuscript. BG reviewed the manuscript. All authors have read and approved the final version for publication.

Funding

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

Availability of supporting data

All the research data are reliable and available upon request to the corresponding author.

Ethics approval and consent to participate

The study was approved by the ethics committee of the Third Central Hospital of Tianjin (IRB2018-032).

Consent for publication

The material is original and has not been published. All authors have seen and agreed to submit the final version of the paper.

Competing interests

The authors declare that they have no conflict of interest.

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Figures

Figure 1

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

Supplementary Files

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- [ARICQuestionnaire.pdf](#)