

COMPLIANCE WITH STANDARD PRECAUTIONS AND ASSOCIATED FACTORS AMONG CRITICAL CARE NURSES IN PESHAWAR, PAKISTAN AND KUNMING, CHINA: COMPARATIVE CROSS-SECTIONAL STUDY

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INTRODUCTION

Standard precautions (SPs) are the course of action to minimize the risk of spreading blood born and other pathogenic diseases from known and unknown sources of infection. It shrinks the possibility of microbial outbreak from person to person. These require a basic and simple level of precautions during patients care.^{1,2,3}

As per the guideline of the Centers for Disease Control and Prevention (CDC), all Health Care Workers (HCWs) should assume that all the patients are possibly infected or able to transmit infections in a health care setting; therefore, they should apply the SPs, while attending all the patients either infected or not. As stated by SPs, all the HCWs should maintain proper hand hygiene; use PPEs such as gloves and gowns.³ They must also wear face masks and eye shields to prevent high-risk issues and predicted contacts, such as respiratory hygiene and cough etiquette. They also need to do needle stick injury prevention and proper handling of medical equipment, proper disposal of waste and sharps, notice environmental cleaning and adequate

ABSTRACT

OBJECTIVES

To find the level of compliance and the associated factors of compliance with standard precautions among registered nurses.

METHODOLOGY

Cross-sectional study was conducted during March and August 2020 in four hospitals, two from each country; Pakistan and China. Data was gathered through a modified version of the adopted questionnaire from 424 registered nurses, selected by a simple random sampling technique. Data were analyzed by SPSS version 26.

RESULTS

The overall compliance with SPs among registered nurses in Pakistan was 57.1%, and among the respondents from China was 75.2%. Gender, age and working area were associated with the compliance of SPs. Female nurses from China are 1.72 times less compliant, while the increasing age of Pakistani nurses increases the risk for non-compliance with SPs by 1.7 times. Participants working in Emergency Department in Pakistan were 2.07 times less compliant than those working in Intensive Care Unit/Coronary Care Unit (ICU/CCU). Lack of training increases the risk of being 2.9 times more non-compliant. For Chinese Nurses, less knowledge and a lack of resources were associated with non-compliance in both countries nurses.

CONCLUSION

Noteworthy numbers of nurses were found non-compliant with standard precaution practices in both study populations. Therefore, strategies like regular training on standard precautions, availability of Personal Protective Equipment and policymaking may improve compliance with SPs practice.

KEYWORDS: Compliance, Barriers, Standard Precautions

transport and processing of the linen used by patients. One of the primary elements of SPs is Hand hygiene. CDC has observed that HCWs wash their hands less than half the time they need to. For hand hygiene, World Health Organization (WHO) and CDC recommend alcohol-based hand rubs (ABHR) because it's effective against broad-spectrum microorganisms, easily accessible when kept at the patient bedside, and less time consuming.^{4,5} WHO states that each year healthcare-associated infections (HAIs) affect hundreds of millions of patients globally, and During a hospital stay in acute-care hospitals, 7% of patients in high-income countries and 15% of patients in low- and middle-income countries acquire at least one healthcare-associated infection and about 10% affected patients die from their HAIs.^{6,7} A study conducted in China claims that overall, in general hospitals, the prevalence of HAIs was 3.12% (95% CI, 2.94%-3.29%).⁸ HAIs include hospital-acquired Pneumonia (HAP), catheter-associated urinary tract infections (CAUTI), surgical site infections (SSI), Ventilator-associated Pneumonia (VAP), and Clostridium

difficile infections (CDI), central line-associated bloodstream infections (CLABSI).⁹ These infections have been reported to affect hundreds of millions yearly. Seven in developed while 10 in developing countries report at least 1 such infection in every hundred hospitals at any given time.¹⁰ The incidence of HAIs in China was reported to be 3.62 per 1000 patient days, while a multi-centre study conducted in Pakistan found that out of 1,553 patients, 130 (8.4%) had suffered HAIs.^{11,12} Although there have been many advancements in the prevention and control of infection around the globe, poor compliance with SPs results in a high incidence of HAIs.¹³ Previously conducted studies in this field mostly focused on individual countries, and no comparative study had been found between Peshawar, Pakistan and Kunming, China, during the literature review. Notwithstanding, this study population comprises two neighbouring countries, which is the innovation of this study. This study aims to identify the difference in the level of compliance with SPs and similar factors associated with the compliance of SPs among registered nurses working in critical areas of different hospitals in Kunming, China and Peshawar, Pakistan.

METHODOLOGY

This is a comparative cross-sectional study conducted from March to August 2020 in two 4 tertiary care hospitals: two each from Peshawar city of Pakistan, and Kunming, China. All Nurses; 480 from Pakistanis Hospitals; Hayatabad Medical Complex Peshawar and Northwest General Hospital and Research Center Peshawar, and 460 from China's hospitals "two tertiary care hospitals under the banners of first affiliated and second affiliated hospitals of Kunming Medical University in Yunnan Province were the study population. For Pakistani nurses, 214 Sample size was calculated through an online sample size calculator with Confidence Interval=95%, Margin of Error=5%, Population Proportion=50% and Population size=480 while 210 Sample size was calculated for nurses from China with population=460 and the other same parameters. All Registered Nurses who fell within the age range of 50 years or less, had at least 4 months of experience and were directly involved in patient care were included in this study through a simple random sampling technique. While those nurses who were in managerial posts, were on leave, had medico-legal cases, were on a notice period of their resignation, and those not willing to participate were excluded from this study. Approval was obtained from the University's Advanced Studies and Review Board (ASRB) and Ethics Committee before data collection. Furthermore, consent was obtained from each participant, and their

autonomy was in their will regarding with-draw from the study at any stage and time. Confidentiality was maintained. A modified version of an adopted questionnaire was used for data collection. In contrast, the content validity of the revised questionnaire was done by 10 experts, including the Infection Control Chair, Infection Control Manager, Infection Control Nurse, Assistant Dean of Clinical, Senior Clinical Instructor, Associate Professor of Emergency Department (ED), Resident of ED, Assistant Head Nurse ED, Clinical Nurse Specialist Intensive Care Unit and Emergency Department Nurse. The overall relevancy and clarity were 0.98 and 0.99, respectively. A modified questionnaire was piloted, and Cronbach's alpha was calculated for each section that fell within the ranges of 0.56 and 0.85, whereas the Mean Cronbach's alpha was 0.73. Data quality was maintained by checking the questionnaire before applying it to participants and filling in any missing data required. The data was entered twice in the SPSS version 26 for more accurate data to minimize any chances of error. Moreover, data cleaning was done to minimize the chances of error further. Data was analyzed by Statistical Package for Social Sciences (SPSS) package program version 26. For age, experience, participants' views about risk and working hours, the mean and standard deviation were calculated, while for gender, designation, hospital setting, area of speciality, Hepatitis B vaccination, occupational exposure and participants views about risk, compliance and non-compliance with SPs, level of SPs compliance at hospital level as well as designation, frequency and percentage were calculated. Univariate and multivariate logistic regression was performed with a confidence interval of 95% for measuring the association of SPs compliance with demographics, knowledge regarding HIV/AIDS transmission, knowledge regarding SPs, knowledge regarding the proper use of gloves, previously attended SPs training session, organizational factors and reasons for unsafe practices. Simple and multiple linear regression, univariate and multivariate independent variables with non-compliance of SPs were also calculated.

RESULTS

Overall, 424 nurses were included in the study, of which 214 were from Pakistan, and 56.5% were male, while there was a total of 210 nurses from China, of which only 39.5% were male.

Table 1: Demographic

Demographic Characteristics	Pakistan n (%)	China n (%)
Gender		
Male	121 (56.5)	83 (39.5)
Female	93 (43.5)	127 (60.5)
The mean age of the participants in years	28.5± 4.9	27.6±4.4
Mean Working Experience in Years	5.4±4.2	6.4±5.6
Area of Speciality		
Emergency Department	101 (47.2)	53 (25.2)
Intensive Care Unit/ Coronary Care Unit	113 (52.8)	157 (74.8)

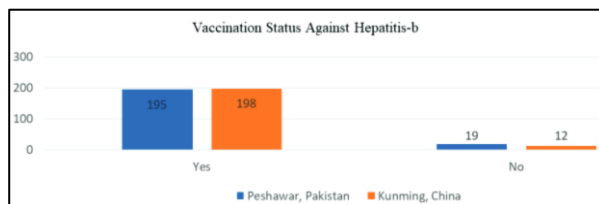


Figure 1: Vaccination Status against Hepatitis-B amongst Critical Care Nurses

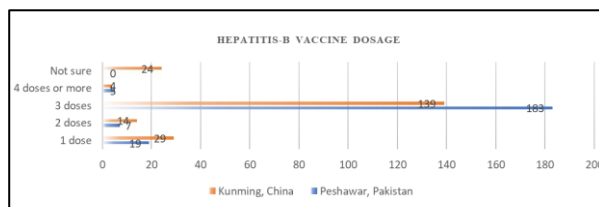


Figure 2: The frequency of Hepatitis dosage among the registered nurses



Figure 3: Level of Compliance to Standard Precautions

Univariate logistic regression of Demographics factors of China indicates that female gender is associated with the non-compliance of SPs; [OR: 1.72 (95%CI: 1.09 - 3.04), P-value: 0.05] while there was no such association found between gender and non-compliance with SPs among Pakistan Nurses. In contrast, age was found non-significant for Chinese Participants, while for Pakistani participants, it was significant with the non-compliance to SPs. The increasing age of the participants increases the risk for non-compliance with SPs 1.7 times. Furthermore, Pakistani participants working in ED were 2.07 times more non-compliant with SPs than those working in ICU/CCU. In contrast, no significant difference was found among the Chinese participants working in ED or ICU/CCU. Univariate logistic regression indicated the association between

non-compliance with SPs and inappropriate knowledge. Chinese participants having inappropriate knowledge of SPs were non-compliant with SPs; they consider the use of the same pair of gloves for many patients [OR: 1.95 (95%CI: 1.01 - 3.88), P-value: 0.05], they think that used needle should be recapped [OR: 2.06 (95%CI: 1.02 - 4.46), P-value: 0.05]. In contrast, Pakistani nurses who were non-compliant with SPs were having the inappropriate knowledge of SPs; they perceived SPs as a nursing barrier [OR: 2.13 (95% CI: 1.12 - 4.05), P-value: 0.02], they do not think of the blood of all patients as potentially infectious [OR: 2.45 (95%CI: 1.20 - 5.00), P-value: 0.01], they think that there is no need of routine checking for the surgical and obstetric patients [OR: 2.75 (95%CI: 1.23 - 6.14), P-value: 0.01], wearing gloves for procedure that involve contact with blood or body fluids [OR: 5.49 (95%CI: 1.26-23.8), P-value: 0.02], consider the use of same pair of gloves for many procedures [OR: 2.22 (95%CI: 1.14 - 4.25), P-value: 0.02], hand washing after removal of gloves [OR: 2.91 (95%CI: 1.00 - 8.46), P-value: 0.05], disposal of needle and sharp separately from other wastes [OR: 4.09 (95%CI: 1.06 - 15.8), P-value: 0.04], and treating the blood of all patients as potentially infectious [OR: 3.98 (95%CI: 1.16 - 13.6), P-value: 0.03]. Multivariate analysis showed factors related to workplace safety statistically significant to non-compliance with SPs, being Pakistani; (adjusted OR 1.855, CI: 1.20-2.86), having more experience; (adjusted OR 1.10, CI: 1.00-1.09), and the Lack of adequate training for the staff regarding their protection from blood-borne viruses; (adjusted OR:2.051, CI: 1.02- 4.11), and lack of infection control committee; (adjusted OR:2.74, CI: 1.30 - 5.76). Univariate logistic regressions for the availability of Personal Protective Equipment indicated the association of non-compliance with SPs with lacking personal protective equipment. Chinese nurses were non-complaint to SPs who had lack of waterproof plastic apron; [OR:2.33, (95% CI: 1.32-4.09), P-value: 0.003], gown; [OR:2.23, (95% CI: 1.27-3.89), P-value: 0.005], sharp container; [OR:3.00, (95% CI: 1.48 - 6.07), P-value: 0.002], and adequate number of basin with soap and hand rubs; [OR:2.54, (95% CI: 1.24 - 5.20), P-value: 0.010]. In contrast, the data from Pakistani nurses shew that the nurses are non-compliant with SPs who lack masks in their workplace; [OR:5.49, (95% CI: 1.26 - 23.79), P-value: 0.023], waterproof plastic apron; [OR:2.55, (95% CI: 1.26 - 5.15), P-value: 0.009], gown; [OR:3.86, (95% CI: 1.93 - 7.72), P-value: 0.001], sharp container; [OR:18.91, (95% CI: 5.17 - 69.04), P-value: 0.001], and adequate number of basin with soap and hand rubs; [OR:3.98, (95% CI: 1.16 - 13.64), P-value: 0.028]. Multivariate analysis showed factors related to the reasons for unsafe practices, and non-compliance with SPs included being

Chinese; (adjusted OR 1.851, CI: 1.19 - 2.85), being female; (adjusted OR 1.520, CI: 1.01 - 2.36), The factors that were found significantly associated with the non-compliance with SPs are not following recommended precautions due to busy working hours; (adjusted OR:1.830, CI: 1.14 - 2.94), do not use recommended precautions because their workmates do not use the recommended precautions; (adjusted OR:1.693, CI: 1.09 - 2.64), and the staff that are not adequately trained for the correct use of protective equipment; (adjusted OR: 3.007, CI: 1.59-5.68).

DISCUSSION

This study found that the overall compliance to the SPs among the registered nurses (n=424) was 66.3%, while the compliance among the registered nurses in Peshawar, Pakistan (n=214) was 57.1%. This is similar to the finding of a study conducted in tertiary care public sector hospitals in Peshawar. According to their study, the compliance among the registered nurses (n=199) was 56.38% (14). Another study in Jordan shows that the mean score of compliant registered nurses with SPs was 49.15 (SD= 12.36).¹⁵ Conversely, among the respondents from Kunming, China (n=210), compliance with SPs was 75.2%. It is comparatively higher than Pakistan, and a study conducted in Ethiopia has almost similar results to Pakistan, reporting overall compliance with SPs was 56.5%.¹⁶ Furthermore, a comparative study on nurses compliance to SPs between nurses in Brazil and Hong Kong shows that the mean compliance of Brazilian nurses was 69.4%, while in Hong Kong, it was 57.4%.¹⁷ The level of compliance with SP of the current study is vividly higher than a study conducted in, Northwest Ethiopia as their compliance level was 12%. The most compliant HCPs were nurses.¹⁸ The result of another study conducted in Ethiopia revealed that 41% of the study participants were compliant with SPs.¹⁹ Moreover, a study conducted in New York highlights that 17.4% of nurses revealed affirmative compliance on all 9 questionnaire items.²⁰ The current study found that gender, age and working area are three important factors that are associated with the compliance of SPs as shown that demographic characteristics in China indicates that female nurses are 1.72 times less compliant to SPs than male, which is similar to finding of a study,⁽¹⁴⁾ as they found out significant association between gender and compliance (P-value 0.006) while for Pakistani participants age was significant; increasing age of the participants increases risk for non-compliance with SPs 1.7 times. Similarly, a study done among Brazil and Hong Kong nurses to assess the difference between their compliance with SPs found that age was significant for the compliance of SPs while there is no

association between Gender and SPs.¹⁷ however, another study illustrates that age is non-significant to compliance with SP.¹⁴ Moreover, it has also been analyzed that participants working in ED in Pakistan are 2.07 times more non-compliant with SPs than nurses working in ICU/CCU. The result of this study shows that knowledge regarding HIV/AIDS transmission, knowledge regarding SPs and knowledge of proper use of gloves is directly proportional to compliance with SPs. It indicates that good knowledge will increase compliance with SPs. It has also been found that the participants who previously attended sessions regarding SPs have better compliance with SPs. For instance, a study revealed that participants who attended training sessions previously were 12 times more likely to be compliant with SPs when compared with the non-trained participants.²¹ The same result found in our study reveals that lack of training sessions in their professional life can increase the risk of nurses being 2.9 times more non-compliant. The importance of training sessions has been proved in a randomized controlled trial with 84 nursing students conducted in a teaching hospital in Hubei, China. The intervention group (n=42) attended three biweekly mixed media education sessions, and the control group learned the same material through self-directed readings. This study concluded that At a 6-week follow-up, performance on Knowledge, Attitude, and Compliance with SPs was significantly improved in the intervention group compared with the control group (P < .01).²² Similarly, in Palestine, the researchers found that previously attended sessions on SPs are significantly associated with a high practice score.²³ In the current study, all the variables were not entertained, but the previously attended session on SPs is statistically significant with the compliance of SPs with the P-value of 0.001. This is similar to a study conducted in Peshawar, Pakistan, which states that a significant association was noted between infection control training and compliance (p-value 0.001).¹⁴ A study shows that the participants who had better knowledge of infection prevention practices were found to be 1.5 times better at infection prevention practices when compared with the participants not having good knowledge of infection prevention practices.²⁴ The Current study also revealed that inappropriate knowledge of nurses regarding the SPs had an association with non-compliance of SPs. Chinese nurses with inappropriate knowledge of SPs regarding gloves usage (OR: 1.95) and needle recapping (OR: 2.06) are two times less compliant with SPs, similar to the finding.²⁵ A study shows that 76.8% correctly defined SPs, but 83.1% thought that "SPs were only for the protection of the health-care team", and 23.2% felt that it should "only be used in patients diagnosed with

infection".²⁶ It has been found in the current study that the non-compliant Pakistani nurses with SPs had inappropriate knowledge of SPs, unlike the study conducted in Pakistan, which shows that 87.5% of the participants had fair knowledge about SP.²⁷ The current study highlights that participants perceived SPs as a nursing barrier [OR: 2.13 (P-value: 0.02)], similar to the findings of a study that states SPs and nursing barriers are the same. They do not think of the blood of all patients as potentially infectious [OR: 2.45 (P-value: 0.01)].²⁶ Our participants thought that there was no need for routine checking for surgical and obstetric patients [OR: 2.75 (P-value: 0.01)]. They do not feel the need to wear gloves for the procedure that involve contact with blood or body fluids [OR: 5.49 (P-value: 0.02)] and consider the same pair of gloves may be used for many procedures [OR: 2.22 (P-value: 0.02)], Hand washing after removal of gloves [OR: 2.91 (P-value: 0.05)] in contrast the findings of a study revealed that 96.5% knew the importance of "hand hygiene while providing care to patients, disposal of needle and sharp separately from other wastes [OR: 4.09 (95%CI: 1.06 – 15.8), P-value: 0.04], and treating the blood of all patients as potentially infectious [OR: 3.98 (95%CI: 1.16 – 13.6), P-value: 0.03].²⁶ The result of the current study shows that workplace safety is statistically significant in both settings with compliance to SPs (P value < 0.05). The lack of an infection control committee; (adjusted OR:2.74) and lack of PPE (waterproof plastic apron, gown, sharp container and an adequate number of basins with soap and hand rubs) were the barriers to compliance to SP in Chinese participants. Similarly, a study reveals that the participants working in a facility with an adequate water supply were 1.6 times better in infection prevention practices when compared with the participants working in a facility with an inadequate water supply.²⁴ Similarly, a study done in Jordan analyzed that the lack of resources/availability of PPE is the main barrier to compliance with SPs.²⁸ On the other hand, the data of Pakistani Participants indicate that the nurses are non-compliant with SPs who lack masks in their workplace; (P-value: 0.023), waterproof plastic aprons (P-value: 0.009), gowns (P-value: 0.001), sharp container (P-value: 0.001), and an adequate number of basins with soap and hand rubs (P-value: 0.028). These findings are similar to the study conducted in Peshawar stated that factors affecting nurses compliance with SPs included the unavailability of resources like PPE by 73.6% and the unavailability and dissemination of infection control policies by 75.8%.¹⁴ Another study found that the participants who were aware of the availability of guidelines and infection prevention standards of practices were two times more likely to have good infection prevention

practices when compared with those who were unaware.²⁴ Therefore, the hospital must be certified by an international organization for better compliance with SPs and their monitoring and evaluation.

LIMITATIONS

Study settings were only 2 hospitals from each country. The result may not be generalized all over the countries. The only Quantitative nature of the study and cross-sectional study design used that does not give an in-depth understanding of the subject matter. A qualitative or mixed-method study is recommended for further elaboration on the subject matter.

CONCLUSIONS

The overall compliance rate among Pakistani nurses was 57.1%, while among the nurses in China, it was 75.2%. Moreover, level of knowledge, training session, and resource availability were significantly associated factors with non-compliance to SPs in both Countries participants. In contrast, the Gender of Chines Participants and Age and Area (ED and ICU/CCU) were significantly associated with non-compliance for Pakistani participants.

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