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## Original Article

# Knowledge and Compliance Regarding Central Line Associated Blood Stream Infections (CLABSIs) Prevention among Public and Private Hospital Intensive Care Unit Nurses.

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## ABSTRACT

CLABSIs are some of the utmost fatal hospital-acquired infections. CLABSIs cost up to \$45,000 per infection around the world. CDC reported that in U.S. hospitals around 41,000 preventable CLABSIs occur every year, so the magnitude of the problem could be worse in Pakistan where there are still gaps in documenting the hospital data. **Objective:** To identify the nurses' knowledge and compliance and their association regarding prevention of CLABSI in public and private sector hospitals of Peshawar. **Methods:** An analytical cross-sectional study was carried out among 140 Nurses working in Intensive Care Units of (LRH & RMI) who had at least one year of experience. Enumerative or census sampling method was used to take the entire eligible ICU nurses as a sample. Data was collected through a validated and pre pilot tested questionnaire and checklist. **Results:** Around 30% of the nurses had poor knowledge, 43.6% had an average knowledge, 22.1% good knowledge and only 3.6% had an excellent knowledge regarding CLABSIs. The compliance level was found as 83.6%. Very weak positive association was found between knowledge and compliance level of nurses regarding CLABSIs on Pearson Correlation test (*r*). **Conclusions:** The results of this study concluded that nurses were not well equipped with the knowledge regarding CLABSIs, while there was a weak positive relationship between knowledge and compliance level among nurses. Therefore, the findings suggest that nurses need to be updated with standard guidelines and training to prevent CLABSIs.

## INTRODUCTION

Central line blood stream infections (CLABSIs) are one of the major concerns among the hospitals. According to the reports of Centre for Disease Control and Prevention (CDC), CLABSI is the main contributor to the burden of Hospital Acquired Infections (HAIs) [1]. Criteria are used to verify the specific source of the infection which may or may not be attained to the central venous catheter. Among all the hospital acquired infections, CLABSIs are the most cost consuming infections, costing for around 46,000 dollars per case [2]. CLABSIs are a very prevalent issue in critical

care settings and accounts for 28,000 thousand deaths annually [3]. Each year around 80 thousands cases are reported with CLABSIs in patients admitted in the intensive care unit, the actual rate would be tripled for CLABSI if include the non-ICU setting and is associated with high mortality up to 25% [4]. CDC reported that each year about 41,000 preventable CLABSIs occur in U.S, if CLABSI preventive measures taken timely so can prevent CLABSIs cases and will decrease mortality, morbidity and decrease length of hospital stay and cost [5]. Another study reported

an estimate of approximately 250,000 CLABSIs occur each year in patients having central lines in-place and the CLASBI rate is reported higher in children as compare to adult, such as 7.4/1,000 catheter days [6]. Central Venous Catheters (CVC) is a major initiative to treat patients with acute illness, it has pros and cons. It provides one of the most effective methods for blood sampling than painful venepuncture. CLABSI can be defined as a blood stream infection confirmed by a laboratory at CVC site within initial 48 hours' placement of CVC. Majority of CLABSIs occur due to practice of central venous catheter (CVC) [7, 8]. Study showed decline in CLABSI rate while implementing CLABSI "bundles" [9]. A number of reported complications caused by CLABSIs in the literature included World Health Organization (WHO) report that CLABSI was the most common cause of HCAs [10]. Mortality due to CLABSI specifically in ICUs patients, ranges from 14% to 45.7% [11]. Length of hospital stay due to CLABSIs has been reported to be increased by an average of 7.5 to 25 days [12]. In Pakistan, a study conducted regarding CLABSI at NICU by developing a protocol in the forms of bundles that proven to decrease CLABSI rates. NICU was a high CLABSI rate (9/1000 central line days) before the study. Thus, through study by introducing evidence-based CLABSI prevention package (CPP) in the practice to decrease CLABSI rates in the NICU within limited resources [13]. A recent systemic review and meta-analysis reported reduction in CLABSI incidence from 6.4 per 1000 catheter days to 2.5 per 1000 catheter days after implementation of insertion and maintenance bundles [14]. A study was direly needed in Pakistan to identify the adherence and knowledge of nurses regarding CLABSI guidelines.

## METHODS

A cross-sectional study design was utilized for the study. Intensive/Critical care nursing is the specialized field of nursing with a focus on the utmost care of the critically ill or in very serious conditions. The study focused on the intensive care unit's nurses both working in the public and private hospitals and recorded their responses of knowledge and compliance related CLABSI. The study was conducted in the Intensive Care Units of Lady Reading Hospital Peshawar and Rehman Medical Institute Peshawar during May 2019 to July, 2019. All the Nurses were sampled who worked in Intensive care units of both hospitals LRH/MTI and RMI Hospital were included, having had one year of experience in intensive care unit. The total number of nurses who worked in the intensive care units was 140. Out of these 140, 90 nurses worked in the various critical units of LRH, while the remaining 50 worked in the RMI intensive care units by total population sampling/ total enumeration sampling/ universal sampling or census

method of sampling technique. Nurses unwilling to participate, intern, head nurses/managers, and reliever were excluded. Demographic data section and research instruments of knowledge and compliance regarding CLABSIs were formed by the researcher from the CDC guidelines and validity and reliability were measured by piloting on 10 % of the sample which were not included in the data collection. After the face validity from the field experts, the derived content validity was 0.87, and the calculated Cronbach's Alpha was 0.70. Knowledge was operationalized on obtaining mean score on a standardized, pilot tested and validated questionnaire with the following parameters:

- Excellent Knowledge: More than 80% ( $\geq 20$  Correct Answers on 25 Items Scale)
- Good Knowledge: 65-80% ( $\geq 16-20$  Correct Answers on 25 Items Scale)
- Average Knowledge: 50 to 64% (13-16 Correct Answers on 25 Items Scale)
- Poor Knowledge: Less than 50% ( $\leq 13$  Correct Answers on 25 Items Scale)

Compliance was operationalized with a questionnaire with 3 choices per item: "done completely and accurately" was given 2 marks, "done but not completely or accurately" was given one mark, and "not done" was given no marks. Nurses' compliance scores  $< 10$  was considered as "Insufficient Compliance"; while scores equal to or higher than  $\geq 10$  was classified as "Sufficient Compliance." Data was analysed by SPSS Version 22.0 and descriptive statistics were derived for variables. Comparative analyses between the two hospitals nurses were made with the utilization of Chi-square test for association and independent t test for comparison. Pearson correlation test was used to determine association between means score of knowledge and compliance. Approval was taken from ASRB, ERB, Hospital's Departments, and Participants. Participants' rights of refusal/withdrawal, anonymity and confidentiality were also ensured.

## RESULTS

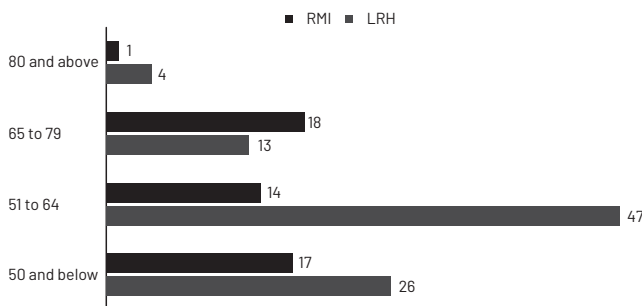
In current study female gender (53.6%), diploma nursing qualification (52.9%), single in marital status (60%), LRH staff (64%), age group 26-30 years (49.3%) were in majority comparing to their other categories (table 1).

Variable		n (%)
Gender	Male	65 (46.4%)
	Female	75 (53.6%)
Qualification	Diploma in Nursing	74 (52.9%)
	Post RN BSN/BSN	66 (47.1%)
Marital status	Single	84 (60%)
	Married	56 (40%)
Data Collection Centre	LRH Peshawar	90 (28.6%)

	RMI Peshawar	50 (21.9%)
Participants' Age (Years)	16 to 20	01 (0.7%)
	21 to 25	52 (37.1%)
	26 to 30	69 (49.3%)
	31 to 35	16 (11.4%)
	36 to 40	2 (1.4%)
	Total	140 (100.0%)
Experience in Years	0 to 3 years	75 (53.6%)
	4 to 6 years	38 (27.1%)
	7 and above years	27 (19.3%)
	Total	140 (100.0%)
ICU Experience in Years	0 to 3 years	97 (69.3%)
	4 to 6 years	29 (20.7%)
	7 years and above	14 (10.0%)
	Total	140 (100.0%)
Training regarding CLABSI	Yes	14 (10.0%)
	No	126 (90.0%)

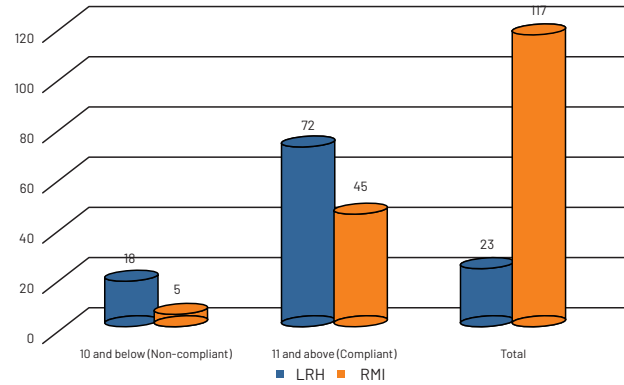
**Table 1:** Demographic characteristic of the participants

The comparative analysis of the one public sector hospital (LRH) intensive care unit nurses' knowledge level regarding CLABSI with the private sector (RMI) intensive care unit nurses showed significant differences in the four categories of knowledge related to CLABSI. The RMI intensive care nurses scored significantly better in the CLABSI knowledge related categories like "good knowledge" as compared to the LRH intensive care nurses illustrated in the Figure 1 below. This difference also depicts statistically significant on Chi-square test as (Confidence level 95%,  $p < 0.008$ ).



**Figure 1:** Comparison of LRH & RMI Nurses regarding CLABSI Knowledge

The comparative analysis of the both hospitals ICU nurses' compliance level regarding CLABSI also significantly differs. Likewise, the knowledge regarding CLABSI, the compliance level of the RMI intensive care unit nurses showed 90% compliance as compare to LRH nurses who accounted for almost 80% compliance as shown in Figure 2. This difference is although not very much but appear statistically significant (Confidence Interval (LL -1.92137 & UL -.11863),  $p < 0.027$ ) on independent t test for both institutions equal variances assumed.



**Figure 2:** Comparison of LRH & RMI Nurses regarding CLABSI Compliance

Finally, the association among the ICU nurses' knowledge level and their compliance level regarding CLABSI appeared statistically significant through Pearson correlation  $r = 0.211$  ( $p < 0.012$ ). It means that ICU nurses knowledge level mean score is positively associated with their compliance level mean score in a linear fashion but very weak in strength.

## DISCUSSION

While assessing the knowledge level of participants in the current study showed that majority of the nurses (43.6%) had an average level of knowledge regarding the prevention of CLABSI and only 5 (3.6%) of the participants represented excellent knowledge regarding CLABSI prevention. Similarly, another study conducted with small sample size (50 nurses) to assess the knowledge and practice of nurses regarding the prevention of central line infection reported that nurses possess very low level of knowledge regarding the prevention guidelines of central line associated infections [15]. In the current study, when the compliance categories were compared against the training received regarding CLABSI among nurses, the results showed that among those participants who had received training regarding CLABSI have (92.8%) compliance. The study findings that those nurses who have received training regarding CLABSI represents more compliance than those who have not received any training have been supported by a study in Italy, which showed compliance level of (83.6%) because of training [16]. A longitudinal cohort design conducted in Saudi Arabia has also supported this concept of our study by concluding that in their study 81.1% of nurses were compliant with the guidelines of central line infections control because of the training [17]. A weak association between the knowledge and compliance level regarding prevention of CLABSI among ICU nurses has been found in the current study results. In contrast, a study conducted by Aloush & Alsaraireh (2018) in Jordan has shown positive and strong association of knowledge and compliance regarding the prevention of CLABSI. this

difference could be explained by the variation in the education level, trends, practices and training of nurses in the hospitals of Jordan [18]. Another study conducted on the knowledge and practices regarding the prevention of central venous catheter-related infections among health care workers has reported that low level of knowledge regarding the prevention of catheter related infections is consistent with low compliance of infection control guidelines and bundles among overall health care professionals [19]. Similarly, a study of observational cohort in nature conducted in a single private sector hospital in Turkey has notified that adherence to all bundles related to the prevention of CLABSI is consistent with maintaining zero rate of CLABSI in intensive care units, which highlights the positive correlation between compliance with the CLABSI bundles and CLABSI preventions [20]. Furthermore, a study conducted in Lahore Pakistan has also supported this fact that those nurses who have less knowledge regarding the prevention of central line associated infections have less compliance and practice of guidelines regarding central line associated infections [21]. Discrepancy with the similar and contrast findings are due to multiple factors like limited number of studies on both the variables knowledge and compliance in studies, lack of standardized valid and reliable tools, and scarce RCTs or systematic review studies.

## CONCLUSIONS

Intensive care nurses deal with the critical care patients which along with other obligatory tasks cope frequently with central line catheters. Infection control measures are cardinal and core practices of intensive care units; thus, this study made an attempt to measure the knowledge and compliance level of critical care nurses regarding CLABSIs. Like other studies, this study also establishes a positive association between nurses' knowledge and compliance, although this association is very weak, but it provides a base for other studies to find out such association. A comparison was made between the private and public hospitals nurses in which, significant differences were found which shows that a number of factors influence nurses' knowledge and compliance level regarding CLABSI. Continuous professional development is the focus and play key role for the desirable behaviour and source of modification in cognitive and psychomotor domains. In that instance, this study identified that most of these nurses remain deprived of the formal continuous and up-to-date training and highlighted this problem for the policy maker to act accordingly.

## Conflicts of Interest

The authors declare no conflict of interest

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