

Performance of Neonatal Intensive Care Unit Nurses in Blood Culture Procedure in Tabriz Hospitals in 2016

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ABSTRACT

Background: Blood culture is a method in neonatal intensive care unit (NICU) and a gold standard for the diagnosis of infection that is essential for proper newborn management. The aim of this study was to compare the performance of nurses in the NICUs of Tabriz University of Medical Sciences using a standard sampling method.

Methods: This descriptive cross-sectional study was performed on 90 nurses working in Al-Zahra and Taleghani Educational and Medical Centers, and Tabriz Children Hospital using the convenience sampling method. The study tool included a two-part questionnaire in which the first part contained demographic characteristics of the infants and nurses and the service area. The second part included a checklist of the nurses' performance before and during the blood culture procedure. Data analysis was performed using SPSS statistical software (version 21), as well as descriptive and analytical statistics.

Results: Most nurses did not attend training courses for blood culture. The total performance scores before and during blood culture sampling were 13.20 ± 2.57 and 12.48 ± 2.14 , respectively.

Conclusion: Nurses are responsible for the correct sampling of blood culture and this procedure requires sufficient skill. Therefore, organizations must adapt their system to the standards in order to determine the benefits and disadvantages of the standards.

Keywords: Blood culture, Infants, Intensive care, Nurses

Introduction

One of the blood tests for all newborns in neonatal intensive care unit (NICU) admission is sampling blood culture (1). Blood culture is usually the basis for the diagnosis of bacterial infection and an essential component in detecting threatening organisms. Blood culture is considered a definitive laboratory culture for starting antibiotics administration and appropriate treatment (2-4). The first criterion for sepsis diagnosis is positive blood culture (4).

According to a study carried out by Ghoreyshi et al., out of 270 blood samples provided for the laboratory, 140 samples were from neonatal departments (5). This number accounts for more than 50% of the samples sent to laboratories

indicating a large number of neonatal blood samples. Many factors can affect the results of neonatal blood culture and show the results as false positive or negative. The procedure of blood culture smears in hospitals is performed by nurses providing care for infants. If this technique is carried out in the correct and standard way, it will distort the wrong results and give the correct results and reduce the probable gap (6-8).

At the same time, this procedure is painful and stressful for infants, and the cerebral cortex of neonates cannot take care of them and the infant require the nurses' care, which necessitates proper blood culture procedure (1, 8). The contamination of blood cultures can lead to

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various consequences. It may take a long time to repeat blood cultures and the correct diagnosis may be confusing and difficult to delay (9).

In a study conducted by Moieeni et al. in Arak intensive care unit in 2011, they concluded that there is a long gap between standard and well-established standards of care (10). Different studies have been done in adult fields of blood culture and emphasize the use of sterile technique (i.e., sterile gloves and chlorhexidine antiseptic) that reduces the contamination to below 3% and closer to the standard level. In addition, the aforementioned study emphasizes to carry out further studies in other areas and on children (11).

Since this procedure is done by nurses, a study regarding the performance of nurses in conducting blood culture procedure in the neonatal areas is not performed and is not specified to the field of infants until it is measured and adapted to the standards. On the other hand, the elaboration and implementation of standards in the intensive care units will lead to more patient's survival and cost savings, which is limited by the resources in Iran, and will lead to the proper use of equipment and resources and cost management (12, 13).

Due to the centrality of the province, the frequency of hospitalization, and frequency of patients referred from other cities, Tabriz has selected for this study. Most neonates at the time of admission are exposed to blood culture sampling and no studies have been conducted on the correctness of the procedure according to the standards. This procedure is also carried out by the nurses of neonatal intensive care unit, which necessitates paying attention to the topic of blood culture and justifies the necessity of conducting studies in this regard. This study showed the benefits of using the standards.

Methods

This descriptive cross-sectional study was performed on 90 nurses with BSc or MSc degrees in direct contact with included newborns working in Al-Zahra and Taleghani Educational and Medical Centers and Tabriz Children Hospital using convenience sampling method. The number of samples according to a study carried out by Cinder Susan et al. (14) was calculated 168 samples. The data collection tool used in this study was a questionnaire with two parts. The first part included the demographic characteristics of the newborns (e.g., gender, newborn age, birth weight, prescription of antibiotic prophylaxis to the

neonate or mother, postnatal age, several hospitalization, and gestational age).

The first part of the questionnaire also contains of nurses before the procedure by 8 three-item questions and during the procedure by 7 three-item questions.

The scoring method was in such a way that the scores of 2, 1, and 0 were assigned to each of the "Satisfactory", "Unsatisfactory", and "No Operation" options, respectively. However, if each of the cases had no problem in this regard, the relevant variable would be eliminated from the total score and finally, the average score was considered as the final score. In this questionnaire, the the information on demographic characteristics of the nurses (e.g., gender, marital status, work experience, level of education, type of workplace, working background, and training courses). The second part of the questionnaire included a checklist to investigate the nurses' performance in blood culture procedure, which was adapted from Mosby skills website (15). The checklist measured the performance scores before and during the sampling ranged from 0-16 and 0-14, respectively.

The validity of the tool was evaluated through a survey conducted among 10 nursing instructors and neonatal specialists. The reliability of the scale was determined by two observers at the same time for 10 samples and then approved since the consistency coefficient exceeded 0.7. After obtaining the invitation letters from the Vice Chancellor of Research, Faculty of Nursing and Midwifery, Tabriz University of Medical Sciences, and the permission of the Ethics Committee (IR.TBZMED.REC.1396.123) of the same university with the coordination of the hospital authorities, the researcher introduced himself to the research environment.

The research environment included the NICUs of Al-Zahra and Taleghani Educational and Medical Centers, as well as Tabriz Children Hospital. Furthermore, the author spent several days in these units in order to normalize his presence in the environment. Subsequently, by studying the patients' records the cases with blood culture order were selected and then included in the study through convenience sampling method.

The demographic data were completed by studying the information in the patients' records and the given checklists were completed. Furthermore, for ethical considerations, the participants were informed about observing their performance. Data collection was done in all

shifts, namely morning, evening, and night working shifts. Once the questionnaires were completed, the cases who were in contrast with the standards were identified; if necessary, the essential items were presented to the staff as practical training at the end of the project. Finally, the collected data were analyzed using SPSS software (version 21) and descriptive indices (i.e., frequency, frequency percentage, mean, and standard deviation).

Results

The results of the present study showed that the majority of the infants were male with first-time admission (Table 1). Furthermore, most of the nurses were female and married with BSc

degree who were officially employed by the hospital working at rotational shifts with no training courses for sampling and blood culture (Table 1). Investigating the performance status before blood culture sampling showed that the highest mean score was related to the item "Verified the prescribing practitioner's order".

However, the lowest mean score was related to the item "Expiration date of the culture media is controlled" indicating that nearly half of the nurses paid no attention to the expiration date of the culture media (Table 2). Investigating the performance status during blood culture sampling showed that the highest mean score was related to the item "For sampling, every single needle should be used only once" and "The appropriate amount

Table 1. Socio-demographic and job-related characteristics of neonatal intensive care unit nurses and infants (n=180)

Variables		Neonatal intensive care unit
Socio-demographic characteristics of nurses		n (%)
Gender	Male	2 (1.1)
	Female	173 (98.9)
Marital status	Single	49 (27.5)
	Married/Other	129 (72.5)
Level of education	Bachelor	173 (97.8)
	Master of Science	4 (2.3)
Participation in moral training workshop during work time	No	127 (72.6)
	Yes	48 (27.4)
Job-related characteristics		
Workplace type	Fixed	15 (8.6)
	Shift	160 (91.4)
Employment status	Official	76 (42.9)
	Non-official	101 (57.1)
Socio-demographic characteristics of neonates		
Gender	Female	64 (35.8)
	Male	115 (64.2)
Prescription of antibiotic prophylaxis for neonate or mother	No	65 (41.9)
	Yes	90 (68.1)
Hospitalizations	First time	173 (96.1)
	Many time	7 (3.9)
		(Mean±Standard deviation)
Gestational age (week)		32.98±4.32
Newborn age (days)		18.89 ±13.99
Birth weight (gram)		2159.91±1187.82

Table 2. Mean and standard deviation of check status before performing blood culture sampling

Variable	Mean	Standard deviation	Percentage of performance score
The prescribing practitioner's order is verified.	1.98	0.13	99%
The appropriate venous site is evaluated before sampling.	1.96	0.18	98%
The necessary equipment is completely prepared before the newborn is sampled (culture medium, suitable needle, blood culture kit, appropriate disinfectant solution, and sterile gloves).	1.95	0.19	97.5%
Hand hygiene before newborn contact is performed.	1.88	0.64	94%
The correct newborn is verified using two identifiers.	1.80	1.54	90%
The newborn's medication history and tests are reviewed (e.g., coagulant disorders and platelet)	1.73	1.01	86.5%
With the assistance of the staff or a family member, the newborn is positioned and supported.	1.61	1.04	80.5%
The expiration date of the cultivation environment was controlled.	1.10	0.83	55%
Average total score	1.65	0.32	82.5%

Table 3. Mean and standard deviation of the checklist for evaluating functional status during blood culture sampling

Variable	Mean	Standard deviation	Percentage of performance score
For sampling, every single needle should be used only once.	1.97	0.16	98.50
The appropriate amount (half to one cc) of blood was collected.	1.97	0.16	98.50
A suitable solution according to the routine of the hospital is used to disinfect the skin of the baby.	1.96	0.18	98
Take note of the sterility tips.	1.19	0.40	89.50
Before doing blood culture sampling hands are washed.	1.63	0.64	81.50
Relaxation of the baby is done during sampling by a second person.	1.58	0.73	79
Blood gloves are covered with sterile gloves prior to sampling.	1.55	0.74	77.50
Average total score	1.69	0.43	84.5

(i.e., half to one cc) of blood is collected". The lowest mean score was related to the item "The sterile gloves are covered prior to sampling" (Table 3).

Discussion

Improving the performance of nurses by monitoring and bringing functions closer to the standards is possible. In the present study, it was shown that the mean score of total performance before and during blood culture sampling were equal to 13.20 ± 2.57 and 12.48 ± 2.14 , respectively. The results of a study carried out by Duke et al. in 2000 showed that caring interventions standards and their follow-up in neonatal department reduce the infant mortality to about 44%. The interventions included the use of devices, staff training, and adequate monitoring (16).

The results of a study conducted by Youssef et al. in 2012 showed the contamination rate of cultivars was 2.6% due to incorrect nurses' sampling method. Their results showed that training the correct sampling method reduced the rate of contamination by about 1.5% (17). The results of a review study performed by Garcia et al. in 2015 showed that complex and diverse techniques for blood sampling have been developed to increase false positives findings.

Educational interventions and interventions to optimize blood collection management in the related departments can be effective in this regard (8). The results of a study carried out by Chitsaz et al. (2005) in Iran showed that bacterial contamination of blood culture samples in Tehran Medical Center is higher than the standard norms (11). It seems that high rate of contamination of blood culture samples is due to non-compliance with the standards in the sampling and preparation of blood culture that is not consistent with the results of the present study.

Also, the results of Darvishpour et al. (2010) showed that observance of nurses personal hygiene, as well as the observation of sterile and hand sanitization during contact with neonates in sampling and collecting procedure, can be effective

in controlling and preventing hospital infection (18). The results of the aforementioned study were not consistent with the findings of Al Hamad et al study in Ghana (2016) about nurses' performance in terms of handwashing and infection control in NICU because their participants' performance was reported to be poor (19)

This study was done in the teaching hospitals of Tabriz and it is one of the limitations of this study and could not be generalized to all nurses.

Conclusion

Based on the obtained findings of the present study, it seems that the nurses worked carefully in blood sampling procedure; however, organizations must adapt their system with the standards, try to upgrade them, and provide training courses for nurses.

Therefore, considering the results of previous studies, which have shown the effect of *Satureja hortensis* in prevention and treatment of oral damages, as well as the findings of the present study, it seems that applying the extract of this herb was effective in the treatment of oral mucositis induced pain.

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Conflicts of interest

The authors declare that there is no conflict of interest.

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