ORIGINAL ARTICLE

The Impact of Systemic Inflammatory Response Syndrome (SIRS) and Sepsis Training on Pediatric Nurses

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ABSTRACT

Introduction: Research demonstrates the importance of key interventions in reducing mortality rates of pediatric patients with sepsis. Of health care practitioners, nurses typically spend the most time with patients, and they must be knowledgeable in recognizing the SIRS and sepsis while also being aware of the importance of prompt intervention. **Aims:** The purpose of this study is to assess the knowledge of pediatric nurses of SIRS and reassess their knowledge after a sepsis training program. **Methods:** This time-series design study from February 2017 to February 2019 included 24 nursing staff involved in taking care of pediatric patients. The nurses were divided into two groups and they underwent a one-day training on sepsis. They were the evaluated periodically on their knowledge on pediatric sepsis at four different time points. The retention of knowledge was calculated based on the change in scores, as per mean numeric scores, immediately after the training compared to 12 and 24 months after the training. **Results**: In the thematic area 'Early recognition of signs/symptoms of SIRS' and 'Assessment of application of knowledge', there was a significant change (<0.001) from baseline in the mean scores once the nurses underwent training. The KAP assessment revealed a low total score of 14.5 out of 25 prior to the SIRS/Sepsis training There was a significant change (<0.001) in the mean knowledge score after the one-day training, 14.5 compared to 22.3, and the knowledge was retained 12 months after the training 19.2, whereas after 24 months post-training was 15.9. **Conclusion**: There is an urgent need to train and constantly re-train our nursing staff to ensure their ability of to accurately and efficiently recognize sepsis and hence help prevent pediatric morbidity and mortality.

***Keywords*:** Knowledge, Pediatric Nurses, SIRS, Sepsis

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INTRODUCTION

Sepsis among pediatric patients is often associated with multi-organ dysfunction from dysregulated systemic host immune response to infection[1] and can yield high rates of mortality and morbidity. The resolution on sepsis by the United Nations World Health Assembly 2017 recognizes sepsis as a global threat in children and is a priority for the World Health Organization to address during the next decade.[2,3] Despite the declining trend of pediatric severe sepsis and septic shock case-fatality rates (CFRs), the disparity between developing and developed countries persists.[4,5] Evidence suggests that early diagnosis, the timely initiation of appropriate antibiotics, and resuscitation to hemodynamic goals improve clinical outcomes.[6] Hospitals have been slow to adopt the recommended protocols because of implementation challenges, financial concerns, and hierarchical systems of care. The Surviving Sepsis Campaign (SSC) 2002 guidelines consist of time-sensitive therapeutic interventions, divided into two major bundles, namely fluid resuscitation and vasopressor usage.[7] Of health care practitioners, nurses spend the most time with patients, and they must be knowledgeable in recognizing SIRS and sepsis while also being aware of the importance of prompt intervention. Even though severe sepsis requires treatment in the Intensive Care Unit (ICU), the assessment of sepsis is not solely the domain of physicians, critical care nurses or Emergency Department (ED) nurses. Improving outcomes in patients with sepsis depends on every nurse involved in their care.[8] The aim of this study is to help identify and evaluate the impact of a multi-faceted training on SIRS/Sepsis on change and retention of knowledge in pediatric nurses.

METHODS

We conducted this study in Kathmandu Medical College and

Teaching Hospital (KMCTH), Sinamangal, Kathmandu, Nepal from February 2017 to February 2019. The study received approval from the Hospital's Institutional Review Committee (Ref. No. 17032017). The aim of this study is to help identify and evaluate the impact of a multi-faceted training on SIRS/ Sepsis on change and retention of knowledge in pediatric nurses. Using a convenience and purposive sampling method 24 nursing staff involved in taking care of pediatric patients at the bedside, namely pediatric ward nurses, Neonatal Intensive Care Unit (NICU), Pediatric Intensive Care Unit (PICU) nurses and ED nurses were included in the study. Participants were briefed about the purpose of the study and participation was voluntary. Informed written consent was obtained from each nurse participating in the study. We conducted a preliminary Knowledge, Attitude and Practice (KAP) survey on sepsis amongst these nursing staffs of KMCTH. For the KAP, a questionnaire with 25 multiple-choice questions, partially adapted from a tool developed to measure nurses' knowledge of SIRS/sepsis[9], was used to assess the knowledge of nurses on the current sepsis protocol. The pediatricians involved in designing the tool included clinicians involved in pediatric critical care, educators and researchers. This ensured provision of content and face validity to the study tool.

This time-series design study included 24 pediatric nurses and they were evaluated periodically on their knowledge on pediatric sepsis at four different time points (Table I). Participants completed an original questionnaire with questions that focused on early recognition of signs/symptoms indicating that a child is experiencing SIRS/Sepsis, ability to triage a septic child, assessment of application of knowledge (e.g.: Starting fluid resuscitation, sending appropriate laboratory tests, Starting early IV antibiotics) and counselling of parents.

Thematic Area	Tools	Evaluation Design
Early recognition of signs/symptoms of SIRS	10 multiple choice questions	Before training, immediately after training, 12 months and 24 months after training
Ability to triage a septic child	5 multiple choice questions	Before training, immediately after training and 12 months and 24 months after training
Assessment of application of knowledge	5 multiple choice questions	Before training, immediately after training and 12 months and 24 months after training
Counselling of parents	5 multiple choice questions	Before training, immediately after training and 12 months and 24 months after training
Group Work	Problem Solving	Immediately after training

Table I: Evaluation of Sepsis Knowledge on Pediatric Patients.

A one-day training was designed and the nurses were divided into two different groups according to their work obligations. The training took place in two consecutive days, the 24th and 25th of February 2017. The first day had 11 nurses, whereas the second day had 13. The nurses underwent lecture sessions by critical care experts from USA through live video conference, lectures by pediatric faculty and group work (Table II). The nurses re-took the test immediately after being trained and after 12 and 24 months of the training (February 2018, February 2019). We thus wanted to see the impact of SIRS and sepsis training on the knowledge of pediatric nurses and the long-term retention of knowledge.

The mean number of correct responses in the pretest and posttest will be analyzed. The retention of knowledge was calculated based on the change in scores, as per mean numeric scores, immediately after the training compared to 12 and 24 months after the training.

Topic	Training Methodology	Facilitator	Time Allotted (in minutes)
Sepsis: "Sepsis kills": early intervention saves lives	Lecture & Discussion	Head of Nepal Sepsis Foundation	30
Role of nurses in reducing the mortality and morbidity	Lecture	Professor of Pediatrics	15
Basis of septic shock	Lecture	Associate Professor, Pediatrics	15
Emergency care responsibility	Video Conference	Sepsis Expert,....., USA	30
Critical care responsibility	Video Conference	Emergency Emdicine Expert, ..., USA	30
Diagnosis of sepsis	Lecture	Lecturer, Pediatrics	15
Fluid resuscitation	Lecture	Lecturer, Pediatrics	15
Use of antibiotics	Lecture	Assistant Professor, Pediatrics	15
Collecting specimens for investigations	Lecture	Lecturer, Pediatrics	15
Counseling a parent for the need of early appropriate	Lecture	Lecturer, Pediatrics	15
Example cases and their management (3 separate groups)	Group Work	Facilitators (4)	30

Table II: One-Day Training Design.

RESULTS

All 24 nurses included in this study participated in knowledge evaluation before the training, immediately after training and at 12 and 24 months after the training. 4 of the nursing staff had left the institution during the course of the study and completed the post-training survey via email. The respondents comprised of all females, and they varied widely in their number of years of experience. The median age of the nursing staff was 28.6 and the median years of job experience was 6.4. The majority (75%) listed Bachelor of Science (BSc) in Nursing as their highest degree.

The characteristics of participants are presented in Table III.

Variables		Total (n) - 24
Age	21-30	16
	31-40	8
Education	Proficiency Certificate Level (PCL) in Nursing	6
	Bachelor's (BSc) Nursing	13
	PCL and BSc Nursing	5
Years of Job Experience	0-2	4
	3-5	7
	6-10	11
	>10	2

Table III: Characteristics of Participants..

The KAP assessment revealed a low total score of 14.5 out of 25 prior to the SIRS/Sepsis training There was a significant change (<0.001) in the mean knowledge score after the one-day training, 14.5 compared to 22.3, and the knowledge was retained 12 months after the training 19.2, whereas after 24 months post-training was 15.9 (Table IV). In the thematic area 'Early recognition of signs/symptoms of SIRS' and 'Assessment of application of knowledge', there was a significant change (<0.001) from baseline in the mean scores once the nurses underwent training. In spite of an average of 6.4 years of job experience, there was a significant gap in knowledge in rapid recognition of clinical symptoms. 99% of the nurses workers were competent immediately after the training ($p < 0.001$); however they failed to remain so after a year, and more so after 2 years after the training.

Thematic Area	Mean Score before the Training (n=24)	Mean Score After the Training (n=24)	Mean Score 12 Months Post-Training (n=24)	Mean Score 24 Months Post-Training (n=24)
Early recognition of signs/ symptoms of SIRS (10)	4.2	9.2	7.4	6.1
Ability to triage a septic child (5)	3.6	4.4	4.2	2.8
Assessment of application of knowledge (5)	2.7	3.9	3.2	2.9
Counselling of parents (5)	4.0	4.8	4.4	4.1
Total (25)	14.5	22.3	19.2	15.9

Table IV: Changes in SIRS/Sepsis Knowledge Acquired.

DISCUSSION

Although a vast amount of information regarding pathophysiology and management of sepsis in children is available in medical literature, the ability of clinicians to accurately and efficiently recognize sepsis, especially in its earlier stages, remains relatively undetermined.[10] Similar previous studies have surveyed physicians'[10, 11] and nurses [9,12] knowledge in recognizing sepsis. In the study done by Jeffrey et al, their findings demonstrated a significant knowledge deficit among participants in several key areas of SIRS/sepsis recognition. In the 242 pediatric nurses they surveyed it was demonstrated that nurses easily recognize septic shock but had difficulty recognizing patients in earlier stages of the sepsis continuum. They also found that significant confusion was evident regarding the role of blood pressure and serum lactic acid levels in diagnosing sepsis. Lactic acid being a key indicator of tissue perfusion should be determined in the initial resuscitation phase of severe sepsis and should be a valuable laboratory result in recognizing and managing sepsis.[6] It is further added that many nurses also did not realize a normotensive patient could be experiencing severe sepsis. The studies surveying physicians noted similar findings. As a result of the small amount of literature available on the topic of nursing knowledge/recognition of SIRS/sepsis, this study sought to find the knowledge gap in our hospital context.

We applied a one-day training to improve the knowledge and skills on rapid recognition and early initiation of SIRS and sepsis in pediatric nurses of our hospital. Our study demonstrated lack of awareness of some of the major key indicators of early recognition of signs/symptoms of SIRS, the ability to triage a septic child and the skill to counsel their parents. There was a huge knowledge gap even in presumably universally accepted facts of danger vital signs and cut-offs for blood pressure readings in the pediatric age group. However, a short one day training seems inadequate to sustain clinical competency over the years. Our study also emphasized how there is a need for constant re-inforcement of training of pediatric nurses, as their knowledge significantly wears off after a year or 2 of training. Refresher courses and review meetings are a must to help retention the this knowledge and their application on a daily basis in the management of SIRS/sepsis pediatric cases.

LIMITATIONS

With nurses from only one organization participating in the study, there is the possibility that the results are not representative of the national knowledge and practice of pediatric sepsis. There may be some discrepancy between actual practice and what was recorded as the results of this study depended on whether these forms were completed fully and correctly by the participants. Also, this being a time-series design study and with questions being multidimensional measuring various aspects of SIRS/sepsis, the effectiveness of each individual component of sepsis diagnosis and treatment cannot be accurately evaluated.

CONCLUSION

In spite of sepsis being one of the leading causes of death in childhood, no evaluation has been undertaken to assess the

competency of pediatric nurses in addressing these cases. There is an urgent need to train and constantly re-train our nursing staff to ensure their ability of to accurately and efficiently recognize sepsis and hence help prevent pediatric morbidity and mortality.

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