

**A STUDY TO ASSESS THE KNOWLEDGE OF CARDIAC  
NURSES ABOUT VENTILATOR CARE BUNDLE IN  
CONGENITAL CARDIAC ICU IN SCTIMST**

**PROJECT REPORT**

**Submitted in the partial fulfillment of the requirements**

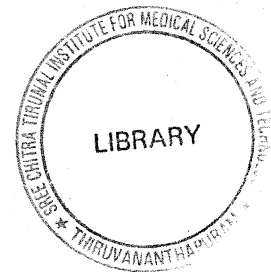
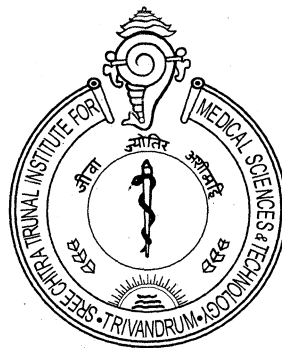
**For the**

**DIPLOMA IN CARDIOVASCULAR AND THORACIC NURSING**

**SUBMITTED BY**

**ANN MARY SEBASTIAN**

**Code No: 6204**



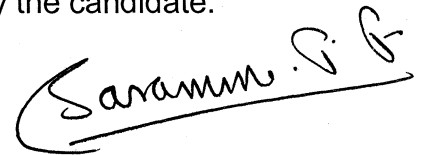
**SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCE  
AND TECHNOLOGY**

**TRIVANDRUM, 695011**

**November 2011**

## CERTIFICATE FROM SUPERVISORY GUIDE

This is certify that Miss. Ann Mary Sebastian has completed the project work on " A study to assess the knowledge of cardiac nurses about ventilator care bundle in congenital cardiac ICU in SCTIMST " under my direct supervision for the partial fulfillment for the Diploma in Cardiovascular and thoracic nursing of Sree Chitra Tirunal Institute for Medical Science and Technology. It is also certified that no part of this report has been included in any other thesis for procuring any other degree by the candidate.



**Dr. Saramma PP, PhD**  
Senior Lecturer in Nursing  
SCTIMST, Trivandrum.

**Thiruvananthapuram**

November 2011

## **CERTIFICATE FROM THE CANDIDATE**

This is to certify that the project on “ A study to assess the knowledge of cardiac nurses about ventilator care bundle in congenital cardiac ICU in SCTIMST ” is a genuine work done by me, under guidance of Dr. Saramma PP, PhD, Senior Lecturer in Nursing, SCTIMST, Trivandrum. It is also certified that this work has not been presented to any other university for award of degree, diploma or other recognition.

Miss. Ann Mary Sebastian

Code No : 6204

SCTIMST

Trivandrum

Thiruvananthapuram

November 2011

## APPROVAL SHEET

This is to certify that Miss. Ann Mary Sebastian bearing code no: 6204 has been admitted to the Diploma in Cardiovascular and Thoracic nursing, in January 2011 and she has undertaken the project entitled, **“A study to assess the knowledge of Cardiac Nurses about ventilator care bundle in Congenital heart ICU” in SCTIMST**, Thiruvananthapuram, which is approved for the Diploma in Cardiovascular and Thoracic nursing, awarded by the Sree Chitra Tirunal Institute for Medical Sciences and Technology, Thiruvananthapuram, and is found satisfactory.

Place:

Examiners

Date:

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## **AKNOWLEDGEMENT**

Investigator owes sincere thanks to God Almighty, who accompanied and directed her to achieve success throughout this study.

The present study has been completed under the expert guidance of Dr. Saramma P.P, Senior Lecturer in Nursing, SCTIMST, Trivandrum. Investigator expresses her sincere gratitude to Dr. Saramma P.P, for the valuable guidance, constant support and encouragement given from the beginning to the completion of the study.

The researcher greatly values the favour extended by Dr. Baiju. S. Dharan, Head of the department of Pediatric Cardiac Surgery, SCTIMST, Trivandrum, and all sisters and ward sister of CHICU, for which she is extremely grateful. Investigator would also like to acknowledge the contribution of all participants who kindly agreed to participate in the study. They generously gave their time and attention to the research. This study would have been impossible without such generosity.

Special thanks to computer division and library staff of SCTIMST for granting permission to utilize computer and library.

**Annmary Sebastian**

## ABSTRACT

**Topic:** A study to assess the knowledge of Congenital heart intensive care unit nurses about ventilator care bundle.

The purpose of this study was to determine the knowledge of nurses working in CHICU about ventilator care bundle for prevention of ventilator associated pneumonia ( VAP). Nurses are taking care of a child on ventilator. They must know about ventilator care bundle for effective care and also for the prevention of VAP.

**Objectives:** The objectives of this study were to identify the knowledge about ventilator care bundle among congenital heart intensive care nurses and to find out the relationship between their knowledge and selected variables.

**Method:** A descriptive survey of nurses in congenital heart intensive care unit were done by conducting a validated test. Thirty samples were selected. The duration of the study is from August- October. The data collection tool used for the study was a validated self prepared questionnaire to assess the knowledge about ventilator care bundle among nurses in congenital heart intensive care unit.

**Results:** In this study 14 item survey include specific questions about ventilator care bundle .A total of 30 cardiac nurses were responded to the survey. Study shows that cardiac nurses knowledge on ventilator care bundle were about 69.76% that is 9.77/14 . There is no statistically significant difference between the mean knowledge and age, professional qualification, professional experience and ICU experience.

**Conclusion:** This study shows that the knowledge of nurses in congenital heart intensive care unit about ventilator care bundle is above average. In this study the sample size was small. Similar study can be done by increasing the sample size.

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## **LIST OF ABBREVIATIONS**

|                |   |
|----------------|---|
| <b>CHICU</b>   | – Congenital heart intensive care unit                        |
| <b>VAP</b>     | _ Ventilator associated pneumonia                             |
| <b>IHI</b>     | _ Institute for health care improvement                       |
| <b>SCTIMST</b> | _ Sree Chitra Tirunal institute for science<br>and technology |

# Chapter –1

## INTRODUCTION

### 1.1 Introduction

Congenital cardiac disease has been defined as the presence of a gross structural abnormality of the heart or intrathoracic great vessels that is actually or potentially of functional significance (Hoffman, 2002). Approximately 9 people in 1000 are born with heart defects (Brian W M, 2002) require medication or surgery. Surgery is the most common treatment of choice. Ventilation should routinely be tailored to manipulate hemodynamic performance after surgery, and may often be of more benefit to the child than pharmacotherapy (Kimberly, 2010). Mechanical ventilation is very important for patient after congenital cardiac surgery, and it is also used for the prevention of end organ dysfunction including lungs (Vallely, 2001). It is also important to prevent perfusion, shunting and atelectasis (Corso, 2002).

Prolonged endotracheal intubation causes infection. An endotracheal tube bypasses the defence mechanisms of the naso pharynx and allows organisms to enter the sterile tracheobronchial tree. Bacterial colonization occurs after several days of endotracheal intubation and bacterial pneumonia develops in 5% to 40% of patients (Zapol, 2009). Aspiration also can occur as a result of an altered level of consciousness, abnormal swallowing, or a depressed gag or cough reflex (Recker, 1992). Mechanical ventilation, reintubation, self extubation, presence of a nasogastric tube and supine position are a few of the associated risk factors for ventilator associated pneumonia (Patricia, 2009).

VAP is defined as health care associated pneumonia in a patient who has been mechanically ventilated, (by endotracheal tube or tracheostomy) for at least 48 hours at the time of diagnosis (Patricia, 2009) . The radiograph shows new or progressive and persistent infiltrates. Other signs and symptoms include temperature higher than 100.4 fahrenheit, leukocytosis, new onset of purulent

sputum or cough, and worsening gas exchange. VAP is the third leading health care associated infection (Betsy, 2000).

## **1.2 Background of the study**

The use of ventilator care bundle improves the quality of patient care (Dontje, 2007). To discuss about ventilator care bundle for the prevention of VAP one has to first understand about ventilator care bundle and how it relates to nursing care. Nurses should have thorough knowledge about it to practice according to that and that ultimately improve the quality of patient care (Dontje, 2007).

As an investigator, in CHICU, I observed that VAP is a problem that greatly affects mechanically ventilated patients. It impacts greatly on their illnesses and outcomes leading to death. VAP is defined as a type of pneumonia in a patient receiving mechanical ventilation that was not present at the time of admission to hospital or that occurs 48 hours after intubation and mechanical ventilation. It is characterized by a new or a progressive pulmonary infiltrate, fever, leukocytosis and purulent tracheobronchial secretions (Hixon, 2006). It accounts for 47% of infections in intensive care unit's patients and complicates the course of 8% to 28% of mechanically ventilated patients (Cason, 2007). The mortality rate generally ranges from between 24% and 50% and may be as high as 74% in high risk populations (Grap, 2003). Intubation and mechanical ventilation both increase the risk of bacterial pulmonary infection because the invasive endotracheal tube allows direct entry of bacteria into the lower respiratory tract since the tube is located in the trachea. Bacterial colonization in the respiratory tract is further facilitated by the absence of the cough reflex and excessive mucus secretion in the mechanically ventilated patient (Grap, 2003). Prolonged ventilation increases the risk of VAP and increases hospital stay, which dramatically increases mortality rates. The frequency of VAP in the intensive care setting is high and VAP's negative impact on patient outcomes and resource utilization is huge (Hugonnet, 2007). Ventilator care bundle have been created in an attempt to find a solution to the problem of ventilator associated pneumonia. Practice according to this bundle decrease ventilator associated pneumonia and increase positive patient's outcomes.

The most advanced interventions are made by the IHI, Scottish intensive care society in 2010. The interventions includes elevation of the head of the bed, daily sedation vacations and assessment of readiness to extubate, peptic ulcer disease prophylaxis, deep venous thrombosis prophylaxis and daily oral care with chlorhexidine.

VAP is the leading cause of death from health care associated infections (Kollef, 2004). The incidence of health care associated pneumonia is increased 10 fold in intubated patients, and the risk for developing VAP is especially great in critically ill patients who are mechanically ventilated.

The highest age specific rates of VAP occurred in the 2 months to 12 months age group and the most common causative organism was pseudomonas aeruginosa, which accounted for 22% of cases.

Ventilator bundle include elevation of the bed between 30-35 degrees recommended but modified slightly for paediatrics. Use 15-30 degrees for neonates and 30-45 degrees for infants or above. This will reduce the incidence of aspiration of gastrointestinal contents or oropharyngeal nasopharyngeal secretions (Drakulovic, 2000 ). Daily sedation vacation and daily assessment of readiness to extubate is one component of ventilator care bundle. Sedation vacation not recommended in paediatrics due to high risk of unexplained extubation. It includes daily assessment of readiness to extubate in care rounds or a check list to assure daily performance (Kress, 2000).

Peptic ulcer diseases prophylaxis, as appropriate for the age and condition of the child. Agents that raise gastric PH may promote the growth of bacteria in the stomach, particularly gram-negative bacilli that originate in the deodenum (Dellinger, 2004). A surveying sepsis campaign guidelines were produced and it suggests that H2 receptor inhibitors are more efficacious than sucralfate and are the preferred agent (Cook, 1991). Deep venous thrombosis prophylaxis (unless contraindicated) as appropriate for the age and condition of the child. A clinical practice guideline issued as part of the seventh American college of chest

physicians conference on antithrombotic and thrombolytic therapy recommends prophylaxis for patients undergoing surgery (Greets, 2004).

Daily oral care with chlorhexidine, IHI added this element to the ventilator care bundle in 2010 following continued review of the literature and use of the element in the IHI bundle in Scotland over a year. The recommended solution strength is 0.12%. The use of chlorhexidine 0.12% oral rinse as a prophylactic measure to reduce nosocomial respiratory tract infections in cardiac surgery patients (Derisio, 1996).

Intensive care nurses are in the best position to put the evidence based guidelines into practice as they are at the patient's bedside 24 hours a day and therefore they play an important role in the prevention of VAP (Biancofiore, 2007). Nevertheless nurses need to have an awareness of the problem as well as knowledge on ventilator care bundle so as to adhere to such practices.

Skilled and knowledgeable nurses are extremely important and needed to make appropriate decisions in-patient care and minimize risks to patients. Knowledge on evidence-based practices should bring confidence to intensive care nurses to make appropriate decisions and prevent poor outcomes in the recovery of mechanically ventilated patients. Unfortunately little is known about the degree of nursing knowledge on ventilator care bundle for the prevention of ventilator-associated pneumonia and about factors that can contribute or represent barriers to their implementation. Understanding the importance of recommended practices increases the likelihood of adherence and may overcome barriers to implementation. If the nurse does not have enough knowledge on measures proven to decrease VAP rates she may not have the necessary confidence to take action and make decisions regarding such practices. Patient recovery may be delayed and other risks of complications from mechanical ventilation can be prevented. Prevention and control of VAP are dependant on education and awareness of ICU staff towards the problem and on the application of ventilator care bundle (Biancofiore, 2007). Adherence to the evidence based guidelines on prevention of VAP will occur once staff involved directly with the patient's care has knowledge on ventilator care bundle and can put them into practice. This study aims at evaluating CHICU nurses' knowledge on ventilator care bundle for the prevention of VAP.

### **1.3 Need and significance of the study**

Mechanical ventilation is one of the major supportive modalities in the intensive care unit but it carries a lot of risks and complications, the most common one being VAP. VAP is a problem in intensive care units worldwide and dramatically increases morbidity and mortality rates on mechanically ventilated patients. It is the most common infectious complication among patients admitted to intensive care units (Cason, 2007). The lungs are usually amongst the major organs involved in multiple organ failure and thus the challenge of delivering appropriate ventilation with as little complications as possible is extremely important (Hugonnet, 2007). To ensure the highest standards of nursing care, nursing practice must be based on a strong body of scientific knowledge. This can be achieved through adherence to the evidence based guidelines for prevention of VAP, ultimately improving patients' outcomes. Improved outcomes will shorten patient's ICU length of stay, hospitalization as well as benefit the patient financially with decreased hospital costs. Hospitals also gain benefits as they are continually faced with the challenge of providing cost effective services to patients and communities.

Knowledge of nurses on ventilator care bundle for the prevention of VAP and adherence to them would reduce the risk of occurrence of VAP and decrease morbidity and mortality of mechanically ventilated patients in the ICU.

Nursing care is growing rapidly in conjunction with technology and it is catching up with developed countries guidelines and standards of care. Nursing shortage, however, is a burden and intensive care nurses are in huge demand .The few intensive care nurses still practicing need to constantly update themselves with current knowledge and scientific evidence on many issues existent in the ICU, including VAP. Little is known regarding intensive care nurses' knowledge about ventilator care bundle and it's application during the provision of patient care. Therefore it is important to evaluate intensive care nurse's knowledge and to highlight possible contributors and barriers to the implementation of ventilator care bundle on prevention of VAP, which is what this study is aiming to achieve.

#### **1.4 Problem statement**

A study to assess the knowledge regarding ventilator care bundle among nurses in CHICU, SCTIMST, Trivandrum.

#### **1.5 Research objectives**

The objectives of this study are :-

1. To assess the knowledge about ventilator care bundle among CHICU nurses in SCTIMST, Trivandrum.
2. To find out the relationship between knowledge of CHICU nurses about Ventilator care bundle and selected variables.

#### **1.6 Operational definition**

##### **Knowledge :-**

A state of awareness or understanding with conscious mind. In this study the investigator assesses the knowledge on ventilator care bundle among CHICU nurses using validated questionnaire.

##### **CHICU nurses:-**

It means all temporary and permanent staff nurses working in congenital heart intensive care unit SCTIMST, Trivandrum.

##### **Ventilator care bundle:-**

Ventilator Bundle is a series of interventions related to ventilator care that, when implemented together, will achieve significantly better outcomes than when implemented individually.

#### **1.7 Methodology**

This is a descriptive survey of nursing staffs. The investigator first assesses the knowledge about ventilator care bundle among CHICU nurses with a validated test. All the nurses in CHICU will be selected for the study. The total duration of assessment is 15 minutes.

## **1.8 Delimitation**

This study was limited to nursing staff working in CHICU in Sree Chitra Tirunal Institute For Medical Science and Technology., Trivandrum.

## **1.9 Organization of the report**

The report is divided in to five chapters. The first chapter is the introduction. In this chapter the background of the study is outlined ,the subject assessing the nurses knowledge about ventilator care bundle, need and significance of research problem stressed, and problem and objectives are stated. An attempt is made to operationally define the terms so as to clarify a brief discussion on methodology adopted for the study. The delimitations are specified.

## **Chapter –2**

### **REVIEW OF LITERATURE**

#### **2.1 Introduction**

Review of literature is an important aspect of any research project from beginning to end. It refers to a broad, comprehensive in depth, systematic and critical review of scholarly publications, print materials and audiovisual materials. It gives character insight in to the problem and helps in selecting methodology developing tool and also analyzing data. With these in view a review of literature has been done.

The review of literature relevant to this study is presented in the following sections.

#### **2.2 Studies related to assessment of nurses knowledge on ventilator care bundle.**

El-Khatib, et al (2009), conducted a study to assess the critical care provider's knowledge of evidence-based guidelines for preventing VAP. Ten physicians, 41 nurses, and 18 respiratory therapists working in the intensive care unit of a major tertiary care university hospital center completed an anonymous questionnaire on 9 non pharmacological guidelines for prevention of ventilator-associated pneumonia The mean (SD) total scores of physicians, nurses, and respiratory therapists were 80.2% (11.4%), 78.1% (10.6%), and 80.5% (6%), respectively, with no significant differences between them. Furthermore, within each category of health care professionals, the scores of professionals with less than 5 years of intensive care experience did not differ significantly from the scores of professionals with more than 5 years of intensive care experience. The study concluded that a health care delivery model that includes physicians, nurses, and respiratory therapists in the intensive care unit can result in an adequate level of knowledge on evidence-based non pharmacological guidelines for the prevention of ventilator-associated pneumonia.

Labeau S, et al (2006) conducted a study to assess critical care nurses' knowledge of evidence-based guidelines for preventing VAP. Ten nursing-related interventions were identified from a review of evidence-based guidelines for preventing ventilator-associated pneumonia. Selected interventions and multiple-choice questions (1 question per intervention) were subjected to face and content validation. Item difficulty, item discrimination, and the quality of the response alternatives or options for answers (possible responses) were evaluated on the test results of 638 critical care nurses. Face and content validity were achieved for 9 items. Values for item difficulty ranged from 0.1 to 0.9. Values for item discrimination ranged from 0.10 to 0.65. The quality of the response alternatives led to the detection of widespread misconceptions among critical care nurses. The questionnaire is reliable and has face and content validity. Results of surveys with this questionnaire can be used to focus educational programs on preventing VAP.

Tolentino-DelosReyes, et al (2007), conducted a study to examine critical care nurses' knowledge about the use of the ventilator bundle to prevent VAP, and education sessions were held to present the findings to 61 nurses in coronary care and surgical intensive care units. Changes in the nurses' knowledge were evaluated by using a 10-item test, given both before and after the sessions. Changes in the nurses' practices related to ventilator-associated pneumonia, including elevation of the head of the bed to 30 degrees to 45 degrees, were observed in 99 intubated patients. After the education sessions, the nurses performed better on 8 of the 10 items tested ( $P$  from .03 to  $<.001$ ). The areas of most significant improvement were elevation of the head of the bed ( $P < .001$ ), charting of the elevation of the head of the bed ( $P = .009$ ), oral care ( $P = .009$ ), checking of the nasogastric tube for residual volume ( $P = .008$ ), washing of hands before contact with patients ( $P < .001$ ), and limiting the wearing of rings ( $P < .001$ ) and nail polish ( $P = .04$ ). Even after the education sessions, the nurses' compliance with hand-washing recommendations before contact with patients was low, though statistically some improvement was apparent. Contraindications to elevation of the head of the bed did not appear to affect the nurses' practices ( $P = .38$ ). Education sessions designed to inform nurses about the ventilator bundle and its use to prevent ventilator-associated pneumonia have a significant effect on participants' knowledge and subsequent clinical practice.

Won, et al (2004), conducted a 2-year-long multimodal intervention was instigated, which consisted of formal lectures, written and posted instruction regarding proper hand hygiene technique, covert observation, financial incentives, and regular feedback of observed hand hygiene rates. Surveillance of hand washing compliance and nosocomial infections from the pre- and postintervention periods were compared. The rate of hand hygiene compliance increased from 43% at baseline to 80% during the intervention, and the rate of respiratory infections decreased from 3.35 to 1.06 per 1,000 patient days ( $P = 0.002$ ) in the pre- and post intervention periods. The two parameters were statistically correlated ( $r = -0.385$ ;  $P = 0.014$ ). That study is helpful in demonstrating an association of hand hygiene and prevention of nosocomial pneumonia.

Fitch, et al (1999), demonstrated that an oral care protocol and scores developed by a dental hygienist could be used by ICU nurses to improve oral health in critically ill adult patients. Mean oral inflammation scores were significantly lower after the implementation of a standard oral care protocol using toothpaste, antibacterial mouthwash, and oral gel (3.9 [standard error of the mean, 3.0] versus 12.4 [standard error of the mean, 2.2];  $P = 0.03$ ). Those investigators also noted lower mean scores for oral candidiasis, purulence, bleeding, and plaque, but the differences were not statistically significant. The dental hygienist and nurses' assessments had a high degree of interrater reliability (kappa = 0.64). The scores used in that studies were developed by one of the investigators and reviewed by other dental faculty members but were not validated in other patient populations.

Babcock, et al (2004), performed an educational intervention in an integrated health system, with results compared across a large adult teaching hospital, two community hospitals, and a pediatric teaching hospital. The targeted health care workers were respiratory care practitioners and nursing staff working in the ICU setting. This intervention centered on a 10-page self-study module that focused on multiple aspects of VAP and also included posters, fact sheets, and in-services for nursing staff and respiratory therapists. VAP rates between the 12-month preintervention period and the 18-month postintervention period were compared. Nursing compliance rates were highest among nurses at the pediatric hospital (100%) and one of the community hospitals (98.9%). The adult teaching hospital and the other community hospital had significantly lower compliance rates

among nurses (64.9% and 44.2%;  $P < 0.001$ ). Three hospitals had a significant drop in the VAP rates from the preintervention period to the postintervention period. The VAP rate at the pediatric hospital fell 38%, from 7.9 episodes to 4.9 episodes per 1,000 ventilator days ( $P < 0.001$ ). The community hospital with no change in the rate of VAP had the lowest compliance of respiratory therapists compared to the other three hospital combined (56.3% versus 95.2%;  $P < 0.001$ ).

Arlene, et al (2007) conducted a study to examine critical care nurses' knowledge about the use of the ventilator bundle to prevent VAP. Published reports were reviewed for current evidence on the use of the ventilator bundle to prevent VAP, and education sessions were held to present the findings to 61 nurses in coronary care and surgical intensive care units. Changes in the nurses' knowledge were evaluated by using a 10-item test, given both before and after the sessions. Changes in the nurses' practices related to ventilator-associated pneumonia, including elevation of the head of the bed to 30° to 45°, were observed in 99 intubated patients. After the education sessions, the nurses performed better on 8 of the 10 items tested ( $P$  from .03 to  $< .001$ ). The areas of most significant improvement were elevation of the head of the bed ( $P < .001$ ), charting of the elevation of the head of the bed ( $P = .009$ ), oral care ( $P = .009$ ), checking of the nasogastric tube for residual volume ( $P = .008$ ), washing of hands before contact with patients ( $P < .001$ ), and limiting the wearing of rings ( $P < .001$ ) and nail polish ( $P = .04$ ). Even after the education sessions, the nurses' compliance with hand-washing recommendations before contact with patients was low, though statistically some improvement was apparent. Contraindications to elevation of the head of the bed did not appear to affect the nurses' practices ( $P = .38$ ). Education sessions designed to inform nurses about the ventilator bundle and its use to prevent ventilator-associated pneumonia has a significant effect on participants' knowledge and subsequent clinical practice.

## **2.2 Studies related to ventilator associated pneumonia in children on mechanical ventilator.**

Yildizdas, et al (2002), conducted a prospective study to find the incidence of VAP and associated mortality among patients randomized to one of four groups for stress ulcer prophylaxis in Turkey. That study included 160 PICU patients: 38

received sucralfate, 42 received ranitidine, 38 received omeprazole, and 42 did not receive prophylaxis. VAP occurred in 70 of 160 (44%) patients, ranging from 41 to 48% in individual treatment groups. There was no difference in the incidence of VAP across treatment groups. The overall mortality rate was 35 of 160 (22%) and did not differ significantly among treatment groups, ranging from 21 to 23% across groups. The overall incidence of VAP (44%) in this study was much higher than that reported in other pediatric studies from referral hospitals (5.1% to 10.2%) .It is possible that VAP was overdiagnosed in that study, although diagnostic criteria used in that study were similar to criteria used in this country. If VAP was overdiagnosed, this effect would likely be distributed throughout all study groups. That study may also have been underpowered to detect differences in the incidences of VAP among these patient groups.

Tantipong , et al (2007), conducted a randomized controlled trial and meta-analysis in a tertiary care university hospital, Bangkok, Thailand to determine the effectiveness of oral decontamination with 2% chlorhexidine solution for the prevention of ventilator-associated pneumonia (VAP). Patients who received mechanical ventilation and who were hospitalized in intensive care units and general medical wards. The patients were randomized to receive oral decontamination with 2%chlorhexidine solution or normal saline solution 4 times per day until their endotracheal tubes were removed. The outcome measures were the development of VAP and oropharyngeal colonization with gram-negative bacilli. Meta-analysis was performed by combining the results of the present study with those from another randomized controlled trial that also used a 2% chlorhexidine formulation for oral decontamination. The characteristics of the patients in the chlorhexidine group (n=102) and the normal saline group (n=105) were not significantly different. The incidence of VAP in the chlorhexidine group was 4.9% (5 of 102), and the incidence in the normal saline group was 11.4% (12 of 105) (P=.08). The rate of VAP in the chlorhexidine group was 7 episodes per 1,000 ventilator-days, and the rate in the normal saline group was 21 episodes per 1,000 ventilator-days(P=.04). Irritation of the oral mucosa was observed in 10 (9.8%) of the patients in the chlorhexidine group and in 1 (0.9%) of the patients in the normal salingroup (P=.001). Oropharyngeal colonization with gram-negative bacilli was either reduced or delayed in the chlorhexidine group. Overall mortality of the patients did not differ significantly between the groups. Meta-analysis of 2

randomized controlled trials revealed an overall relative risk of VAP for patients in the chlorhexidine group of 0.53 (95% confidence interval, 0.31-0.90;  $P=.02$ ). They concluded that oral decontamination with 2% chlorhexidine solution is an effective and safe method for preventing VAP in patients who receive mechanical ventilation.

Morris, et al (2011) conducted a study to determine the effects of implementing ventilator care bundle for the prevention of VAP. A before-and-after study conducted within the context of an existing, independent, infection surveillance program. An 18-bed, mixed medical–surgical teaching hospital intensive care unit was selected. All patients admitted to intensive care for 48 hrs or more during the periods before and after intervention were selected for the study. A four-element ventilator-associated pneumonia prevention bundle, consisting of head-of-bed elevation, oral chlorhexidine gel, sedation holds, and a weaning protocol implemented as part of the Scottish Patient Safety Program using Institute of Health Care Improvement methods. Main Results include compliance with head-of-bed elevation and chlorhexidine gel were 95%–100%; documented compliance with “wake and wean” elements was 70%, giving overall bundle compliance rates of 70%. Compared to the pre intervention period, there was a significant reduction in VAP in the post intervention period (32 cases per 1,000 ventilator days to 12 cases per 1,000 ventilator days;  $p < .001$ ). Statistical process control charts showed the decrease was most marked after bundle implementation. Patient cohorts staying  $\geq 6$  and  $\geq 14$  days had greater reduction in ventilator-associated pneumonia acquisition and also had reduced antibiotic use (reduced by 1 and 3 days;  $p = .008/.007$ , respectively). Rates of methicillin-resistant *Staphylococcus aureus* acquisition also decreased (10% to 3.6%;  $p < .001$ ). Implementation of a ventilator-associated pneumonia prevention bundle was associated with a statistically significant reduction in VAP, which had not been achieved with earlier ad hoc VAP prevention guidelines in our unit. This occurred despite an inability to meet bundle compliance targets of 95% for all elements. Our data support the systematic approach to achieving high rates of process compliance and suggest systematic introduction can decrease both infection incidence and antibiotic use, especially for patients requiring longer duration of ventilation.

## **2.4 Summary**

Review of literature mentioned above clarify the effectiveness of ventilator care bundle in the prevention of ventilator associated pneumonia. Studies show that there is no statistically significant difference between the knowledge score of experienced and less experienced health professionals regarding ventilator care bundle.

**Key words:** ventilator care bundle, ventilator-associated pneumonia, mechanical ventilator; intensive care unit nurses.

## **Chapter -3**

### **METHODOLOGY**

#### **3.1 Introduction**

This chapter deals with the research approach, setting, the sample and sampling technique, development of tool, description of tool, pilot study , data collection procedure and plan for analysis.

#### **3.2 Research approach**

Descriptive study approach is used.

#### **The objective of the study is: -**

To identify knowledge of nurse's about ventilator care bundle in congenital heart intensive care unit.

Find the relationship between knowledge about ventilator care bundle among nurses in congenital heart intensive care unit and selected variables.

#### **3.3 Settings**

The study is conducted in congenital heart intensive care unit, Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandram. CHICU is situated in the 3<sup>rd</sup> floor of the 1<sup>st</sup> block. There are 9 beds in CHICU. After every surgery patients will be on mechanical ventilator until they are settled.

#### **3.4 Sampling technique**

The sample was selected from the nurse's in Sree Chitra Tirunal Institute for Medical Sciences and Technology, Thiruvananthapuram. The size of the sample was thirty. The purposive sampling technique was used to collect the samples. The sample was selected from the staff nurses in the CHICU. The duration of the study period was from August 2011 to October 2011.

### **3.5 Inclusion criteria**

- (a) Staff nurse's working in Congenital Heart intensive care Unit with experience greater than 1year in Sree Chitra Tirunal Institute for Medical Sciences and Technology, Thiruvananthapuram.

### **3.6 Exclusion criteria**

- (a) Staff nurse's working other than CHICU.
- (b) Staff nurses those who are not willing to participate.
- (c) Staff nurses with experience less than 1 year.

### **3.7 Development of tool**

An extensive study and review of literature helped in preparation of the tool. A self prepared validated questionnaire is used as the tool for this study.

### **3.8 Description of tool**

**Part I** :- This part contains items such as demographic data which include age, sex, professional qualification, additional qualification, total years of experience.

**Part ii** :- Questionnaire about the knowledge of nurse's about ventilator care bundle.

### **3.9 Pilot study**

Pilot study was done on October 2011. Five students were taken for the pilot study. The pilot study was conducted to find out the feasibility and practicability of the tool and methodology. The questionnaire was used for this study. After pilot study no modification was done in the questionnaire.

### **3.10 Data collection**

The data was collected from the staff nurses in the congenital heart intensive care unit of Sree Chitra Tirunal Institute for Medical Sciences and Technology. They were given a questionnaire consisted of 14 questions regarding

ventilator care bundle for the prevention of VAP. The time given to answer the questions was 15 minutes. The period of data collection was from August 2011 to October 2011. The assessment of staffs were done while they were in CHICU.

### **3.11 Plan for analysis**

The investigator developed a plan of analysis after pilot study. The data were coded, entered in excel sheet and analyzed using Epi info Version.

### **3.12 Summary**

This chapter presented the research approach used for the study, setting of the study, sample and sampling techniques, development of data collection tool, description of the tool, pilot study, data collection procedure, and plan for data analysis.

## Chapter - 4

### ANALYSIS AND INTERPRETATION OF DATA

#### 4.1 Introduction

Analysis is a process of organizing and synthesizing data in such a way that research questions can be answered. The over all objective of analysis is to organize structure and elicit answers from the assessment.

Interpretation is the process of making sense of the result and examining the implication of finding within the broader content.

This chapter presents the analysis and interpretation of the data collected from 30 CHICU nurses at Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum. Thirty nurses were selected for assessing the knowledge about ventilator care bundle.

The finding of the study were analyzed and arranged under the following sections.

- 4.2 Distribution of sample according to demographic data.
- 4.3 Distribution of sample according to knowledge score.
- 4.4 Comparison of mean, standard deviation and p value of nurse's knowledge about ventilator care bundle and selected variables.

## 4.2 Distribution of sample according to demographic data

### (1) Distribution of sample according to age:-

The age of samples ranged from 23 to 49 with a mean age of 30.5, median of 29 and mode of 26.

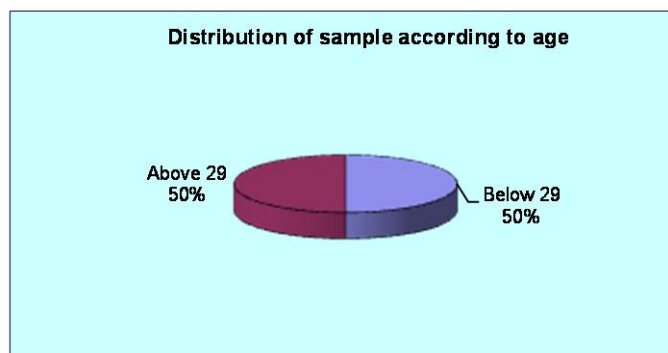
**Table 4.1 Distribution of sample according to age category.**

N =30

| Age In years | Frequency | Percentage |
|--------------|-----------|------------|
| Below 29     | 15        | 50%        |
| Above 29     | 15        | 50%        |
| Total        | 30        | 100%       |

The table 4.1 shows that 50% of samples having age below 29 years and 50% of samples having age above 28 years.

**Figure 4.1 Distribution of sample according to age category.**



The distribution sample according to age is shown in the pie diagram above.

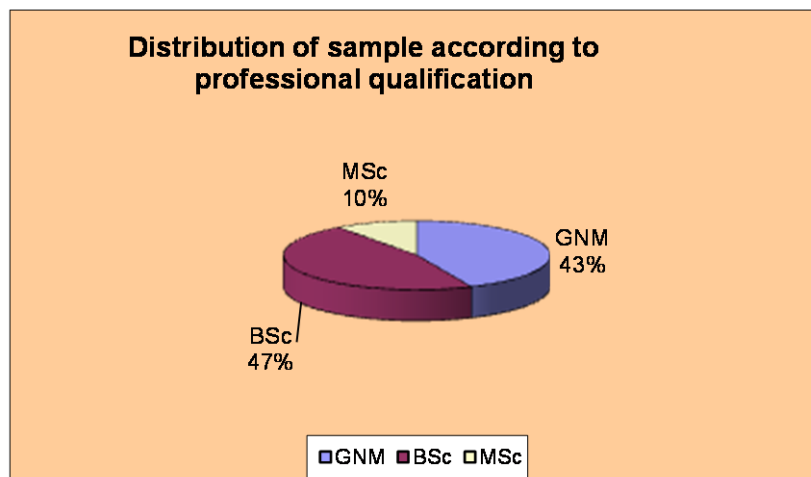
**(2) Distribution of samples according to professional qualification.**

**Table 4.2 Distribution of sample according to professional qualification.**

| Professional qualification | Frequency | Percentage |
|----------------------------|-----------|------------|
| GNM                        | 13        | 43.33%     |
| B sc                       | 14        | 46.67%     |
| M sc                       | 3         | 10 %       |
| Total                      | 30        | 100%       |

The data given in Table 4.2 shows majority of nurses were graduates.

**Figure 4.2 Distribution of sample according to professional qualification.**



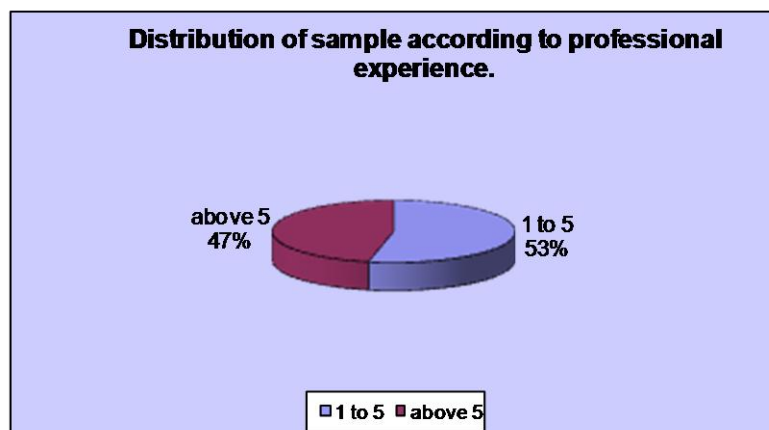
The above pie diagram shows that majority of the nurses in the sample were undergraduates.

**(3) Distribution of samples according to professional experience.**

**Table 4.3 Distribution of sample according to professional experience.**

| <b>Professional experience in years</b> | <b>Frequency</b> | <b>Percentage</b> |
|---|------------------|-------------------|
| 1 to 5                                  | 16               | 53.33%            |
| Above 5                                 | 14               | 46.67%            |
| Total                                   | 30               | 100 %             |

**Figure 4.3 Distribution of sample according to professional experience.**



From the above pie diagram it is clear that majority of the nurses were having professional experience more than 5 years.

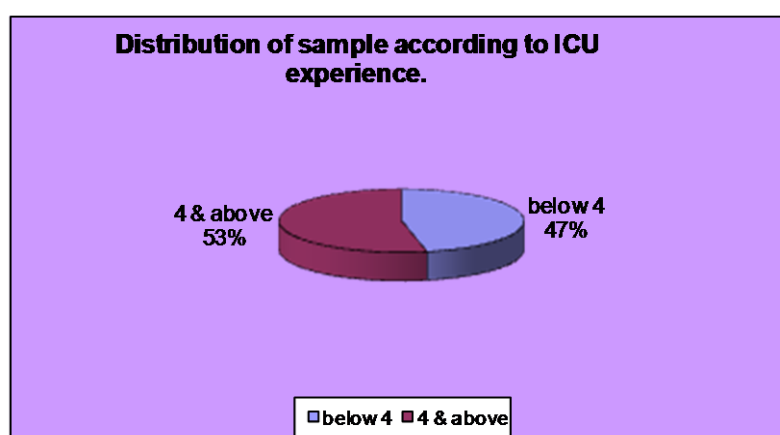
**(4) Distribution of sample according to ICU experiences.**

**Table 4.4 Distribution of samples according to ICU experience.**

| ICU experience in years | Frequency | Percentage |
|-------------------------|-----------|------------|
| Below 4                 | 14        | 46.67%     |
| 4 & above               | 16        | 53.33%     |
| Total                   | 30        | 100%       |

From the table above majority of the samples having ICU experience 4 years or more.

**Figure 4.4 Distribution sample according to ICU experience.**



### 4.3 Distribution of sample according to knowledge score

#### 1. Distribution of sample according to percentage of knowledge score about ventilator care bundle.

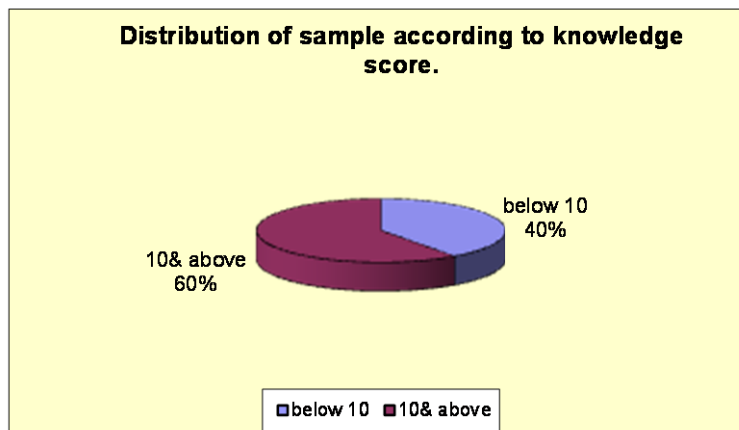
There were 14 questions in the knowledge test related to ventilator care bundle. The maximum score is 14. Total knowledge score obtained ranged from 6-13 with a mean of 9.77.

**Table 4.5 Distribution of sample according to percentage of Knowledge score.**

| Knowledge score | Frequency | Percentage |
|-----------------|-----------|------------|
| Below 10        | 12        | 40%        |
| 10 & above      | 18        | 60%        |
| Total           | 30        | 100%       |

The table 4.5 shows that majority of the samples having knowledge score above average.

**Figure 4.3 Distribution of sample according to knowledge score.**



## 2. Percentage of score in the area of knowledge about ventilator care bundle.

The data given in table 4.5 is percentage of samples obtained in each item of the knowledge test on ventilator care bundle. The knowledge percentage of nurses in each questions are given below. Knowledge about route for endotracheal intubation is 73.33%, frequency of changing ventilator circuits is 60%, type of airway humidifier is 90%, frequency of changing humidifier is 33.33%, recommended endotracheal suction system is 86.66%, frequency of changing suction system is 36.66%, effect of endotracheal tubes with extra lumen for the drainage of subglottic secretions is 96.66%, effect of kinetic beds on VAP is 83.33%, recommended position for a ventilator patient is 100%, clinical signs and symptoms in the child is 80%, head of bed elevation for infants using warmer is 56.66%, duration for the occurrence of VAP for a mechanically ventilated patient is 56.66%, component not included in the ventilator care bundle is 40% and organism not causing VAP is 86.66%.

**Table 4.6 Percentage of score in the area of knowledge about ventilator care bundle.**

| Area of knowledge   | Frequency | Percentage |
|---|-----------|------------|
| Route for endotracheal intubation   | 22        | 73.33      |
| Frequency of changing ventilator circuits                                 | 18        | 60         |
| Type of airway humidifier   | 27        | 90         |
| Frequency of changing humidifier  | 10        | 33.33      |
| Recommended endotracheal suction system                                   | 26        | 86.66      |
| Frequency of changing suction system                                      | 11        | 36.66      |
| Effect of ET tubes with extra lumen for drainage of subglottic secretions | 29        | 96.66      |
| Effect of kinetic beds on VAP   | 25        | 83.33      |
| Recommended position for a ventilator patient                             | 30        | 100        |
| Clinical signs and symptoms of VAP in the child                           | 24        | 80         |
| For infants using warmers, head of bed elevation can                      | 17        | 56.66      |
| VAP occur in patients on mechanical ventilator within                     | 17        | 56.66      |
| Component not included in the ventilator care bundle                      | 12        | 40         |
| Organism not causing VAP  | 26        | 86.66      |

Majority of the nurses having less knowledge regarding frequency of changing humidifier and suction system. All the nurses having knowledge about recommended position for a ventilator patient.

#### 4.4 Comparison of mean, standard deviation and p value

##### 1. According to age of sample

According to the age samples were divided in to two sections. That was age below 29 years and age above 29 years.

**Table 4.7 mean knowledge score according to age group**

| Age in years | Mean | Standard deviation | P value |
|--------------|------|--------------------|---------|
| Below 29     | 9.53 | 1.51               | 0.49    |
| Above 29     | 10   | 2.07               |         |

Knowledge score of age group below 29 years ranges from 7-13 with a mean of 9.539 (sd=1.51) and mode and median of 9. Knowledge score of age group above 29 years ranges from 6-12 with a mean of 10 (sd=2.01) and mode and median of 11. The student "t" test shows that there is no statistically significant difference between the mean knowledge score of sample with age below 29 years and age above 29 years (p value=0.49).

##### 2. According to qualification of samples.

The samples were divided in to graduates and under graduates.

**Table 4.7 Mean knowledge score according to qualification**

| Qualification | Mean | Standard deviation | P value |
|---------------|------|--------------------|---------|
| GNM/DCN/PBCN  | 9.71 | 1.61               | 0.84    |
| B Sc & M Sc   | 9.85 | 2.08               |         |

The knowledge score of undergraduates ranges from 7-13 with a mean of 9.7 (sd=1.61) and mean and median of 10. Knowledge score of graduates and post graduates ranges from 6-12 with a mean of 9.85 (sd=2.08) and mode and median of 10. The student “t” test shows that there is no statistically significant difference in mean knowledge score among GNM nurses and graduate nurses (p value=0.840).

### 3. According to professional experience of samples.

The samples were divided in to two.

**Table 4.8 Mean knowledge score according to professional experience of samples.**

| Professional experience in years | Mean  | Standard deviation | P value |
|----------------------------------|-------|--------------------|---------|
| 1-5                              | 9.31  | 1.7                | 0.14    |
| Above 5                          | 10.29 | 1.82               |         |

The knowledge score of nurses with less professional experience ranges from 6-13 with a mean of 9.31 (sd=1.7) and median and mode of 9. Knowledge score of nurses with more experience ranges from 6-12 with a mean of 10.29 (sd=1.82) and mode and median of 11 each. The student “t” test shows that there is no statistically significant difference between the knowledge score of nurses with less professional experience and with more experience (p value=0.14).

### 4. According to ICU experience of samples.

According to age groups samples were divided in to two sections.

**Table 4.9 Mean knowledge score according to ICU experience of samples.**

| ICU experience in years | Mean  | Standard deviation | P value |
|-------------------------|-------|--------------------|---------|
| Below 4                 | 9.29  | 1.26               | 0.17    |
| 4 & above               | 10.19 | 2.14               |         |

The knowledge score of nurses with less ICU experience ranges from 7-12 with a mean of 9.29 (sd=1.2) and mode and median of 9 each. Knowledge score of nurses with more ICU experience ranges from 6-13 with a mean of 10.19 (sd=2.14) and mode and median of 11. The student "t" test shows that there is no statistically significant difference between the knowledge score of nurses with less ICU experience and with more ICU experience (p value=0.17).

### **Summary**

This chapter contains distribution of samples according to demographic data, selected variables and the association between mean knowledge score and selected variables.

## **Chapter - 5**

# **SUMMARY, CONCLUSION, LIMITATION, DISCUSSION AND RECOMMENDATION**

### **5.1 Introduction**

This chapter gives a brief account of the present study including conclusions drawn from findings and possible applications of the results. Recommendations for further research and suggestion for improving the present study are also presented.

### **5.2 Summary**

This study was undertaken to assess the knowledge about ventilator care bundle among CHICU nurses, in Sree Chitra Tirunal Institute For Science and Technology, Trivandrum. The review of related research literature helped the investigator for getting a clear concept about the research topic undertaken as well as to develop tools , methodology of the study and for analysis. The prepared tool was given to experts for content validity. The pilot study findings revealed that the study was feasible and practicable. Purposive sampling techniques were used for study. A validated questionnaire was used for collecting data from 30 samples. Questionnaire consists of two parts, first consists of socio demographic data and second part consists of 14 questions regarding ventilator care bundle. The data collection done in the month of September 2011 to October 2011 analyzed and interpreted by using descriptive and inferential statistics.

### **5.3 Major findings of the study**

Knowledge of 30 nurses regarding ventilator care bundle is above average (9.77/14). Knowledge score of age group below 29 years ranges from 7-13 with a mean of 9.539(sd=1.51) and mode and median of 9. Knowledge score of age group above 29 years ranges from 6-12 with a mean of 10 (sd=2.01) and mode and median of 11. The student "t" test shows that there is no statistically significant difference between the mean knowledge score of sample with age below 29 years and age above 29 years (p value=0.49).

The knowledge score of undergraduates ranges from 7-13 with a mean of 9.71(sd=1.61) and mean and median of 10. Knowledge score of graduates and post graduates ranges from 6-12 with a mean of 9.85 (sd=2.08) and mode and median of 10. The student “t” test shows that there is no statistically significant difference in mean knowledge score among GNM nurses and graduate nurses (p value=0.840).

The knowledge score of nurses with less professional experience ranges from 6-13 with a mean of 9.31 (sd=1.7) and median and mode of 9. Knowledge score of nurses with more experience ranges from 6-12 with a mean of 10.29 (sd=1.82) and mode and median of 11 each. The student “t” test shows that there is no statistically significant difference between the knowledge score of nurses with less professional experience and with more experience (p value=0.14).

The knowledge score of nurses with less ICU experience ranges from 7-12 with a mean of 9.29 (sd=1.2) and mode and median of 9 each. Knowledge score of nurses with more ICU experience ranges from 6-13 with a mean of 10.19 (sd=2.14) and mode and median of 11. The student “t” test shows that there is no statistically significant difference between the knowledge score of nurses with less ICU experience and with more ICU experience (p value=0.17).

#### **5.4 Discussion**

In this study 14 item survey include specific questions about ventilator care bundle .A total of 30 cardiac nurses were responded to the survey. The data given in table 4.8 shows that the nurses had above average knowledge about ventilator care bundle. Study shows that cardiac nurses knowledge on ventilator care bundle were about 69.76% that is 9.77/ 14. There is no statistically significant difference between the mean knowledge and age, professional qualification, professional experience and ICU experience.

Many studies shows the effectiveness of ventilator care bundle in the prevention of ventilator associated pneumonia. Studies show that there is no statistically significant difference between the knowledge score of experienced and less experienced health professionals regarding ventilator care bundle.

El-Khatib, et al (2009), conducted a study to assess the critical care provider's knowledge of evidence-based guidelines for preventing VAP. Ten physicians, 41 nurses, and 18 respiratory therapists completed an anonymous questionnaire on 9 non pharmacological guidelines for prevention of ventilator-associated pneumonia. The mean (SD) total scores of physicians, nurses, and respiratory therapists were 80.2% (11.4%), 78.1% (10.6%), and 80.5% (6%), respectively, with no significant differences between them. The scores of professionals with less than 5 years of intensive care experience did not differ significantly from the scores of professionals with more than 5 years of intensive care experience.

## **5.5 Conclusion**

A descriptive study was undertaken to assess the knowledge of the CHICU nurses in SCTIMST, Trivandrum regarding ventilator care bundle. The study was conducted in a relatively small sample of 30 nurses.

## **5.6 Limitations**

1. This study was limited to nursing staff working in CHICU in Sree Chitra Tirunal Institute For Medical Science and Technology. Trivandrum.
2. The sample size was small (30 samples).

## **5.7 Recommendations**

Keeping in mind the findings and limitations of the study, the following recommendations were made for further research.

1. Similar study would be reported in other intensive care units and wards of this institute.
2. Similar study can be done by increasing the size of the samples.

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**KNOWLEDGE TEST ON VENTILATOR CARE BUNDLE FOR CARDIAC  
NURSES IN CONGENITAL HEART INTENSIVE CARE UNIT**

SOCIO DEMOGRAPHIC DATA

1.Age :

2.Sex :

3.Qualification

a. GNM   b. DCN/PBCN   c. BSc(N)   d. MSc(N)

4.Total years of professional experience :

5.Total years of ICU experience :

Note: Encircle the most appropriate answer. Total 14 questions, each question carries one mark.

1) Which is the most recommended route for endotracheal intubation?

a. Oral intubation.                      b. Nasal intubation.

b. Both routes of intubation.        d. I don't know.

2) How often should we change the ventilator circuits?

a .Every 24 hours.                      b. Every 48 hours.

c. Every week.                          d. Every new patient.

3) Which is the recommended type of airway humidifier?

- a. Heated humidifier.      b. Heat and moisture exchangers.
- b. Both type of humidifiers.      d. I don't know.

4) How frequently should we change the humidifier?

- a. Every 48 hours.      b. Every 72 hours.
- b. Every week.      d. Every new patient.

5) Which is the recommended endotracheal suctioning system?

- a. Open suction system.      b. Closed suction system.
- c. Both systems.      d. I don't know.

6) How often do we need to change the suction system?

- a. Every 24 hours.      b. Every 48 hours
- b. Weekly.      d. Every new patient

7) What is the effect of endotracheal tubes with extra lumen for drainage of subglottic secretions?

- a. Reduces the risk for VAP.      b. Increases the risk for VAP.
- c. No effect.      d. I don't know.

8) What is the effect of kinetic beds for the prevention of VAP?

- a. Increases the risk for VAP.    b. Reduces the risk for VAP.
- b. No effect.                      d. I don't know.

9) Which is the recommended position for a ventilator patient for the prevention of VAP?

- a. Supine position.              b. Semirecumbent position.
- b. Prone position.              d. Side lying position.

10) Which of the following clinical signs and symptoms indicate the likelihood of VAP in the child?

- a. Leukocytosis and sputum.    b. Fever , leukocytosis and purulent sputum.
- c. Fever and purulent sputum.    d. Positive sputum culture.

11) For infants using warmers, head of bed elevation can

- a. Not be done safely.
- b. Be done with reverse tredelenberg position.
- c. Not be done if the infant is also being enterally fed.
- d. Be done only periodically , not continually.

12) VAP would occur in patients who have received mechanical ventilation at the time of or within — hours before the onset of the event.

- a.6 hours.                      b.12 hours.
- c.24 hours.                      d.48 hours.

13) Which component is not included in the ventilator care bundle for the prevention of VAP?

- a. Hand hygiene.
- b. Head of bed elevation.
- d. Daily sedation vacation.
- d. Administration of antibiotics.

14) which among these organisms, does not cause V A P?

- a. Staphylococcus aureus.
- b. Pseudomonas aeruginosa.
- b. E.coli.
- d. H.pylori.

#### **ANSWER KEY**

1.a 2.d 3.b 4.c 5.b 6.d 7.a 8.b 9.b 10.b 11.b 12.d

13.d 14.d