



EFFECTIVENESS OF 3% HYPERTONIC SALINE NEBULIZATION AND SUCTIONING ON AIRWAY CLEARANCE AMONG ICU PATIENTS UNDER MECHANICAL VENTILATOR AT SELECTED HOSPITAL, SALEM.

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ABSTRACT

Introduction: Mechanically ventilated patients may have airway obstruction due to variety of conditions, including weakened expiratory muscles, ineffective cough, and decreased mucociliary function. This could lead to blockage of airway secretions. The hypertonic saline nebulization and suction will be hydrating the airways and helps the respiratory tract move the mucus from the lungs. Therefore, this study aims to assess the effectiveness of 3% hypertonic saline nebulization and suction on airway clearance among ICU patients under mechanical ventilator. **Method:** A quantitative research approach, quasi experimental pre-test and post-test control group design was used. The samples size was 60; each 30 in experimental group and control group were selected by using non-probability purposive sampling technique. The written consent was obtained from the samples. Semi structured interview schedule and modified bio- physiological parameters with arterial blood gas analysis scale were used. The level of airway clearance were recorded before and after administration of 3% hypertonic saline nebulized suctioning for 2 times in day followed by three days. **Results:** The paired 't' test was conducted to determine a statistically significant difference in the level of airway clearance before and after intervention of 3% hypertonic saline nebulization and suctioning in Experimental group. The finding revealed that the mean score of the airway clearance during pre- test the mean 14.65 ± 1.85 after the intervention 1.1 ± 1.42 and the difference in mean 13.56 and the 't' value 55.17 at $p < 0.001^{***}$ which is statistically highly significant. The unpaired 't' test was conducted to compare the mean difference between control and experimental group. In control group post-test the mean and standard deviation is 13.57 ± 3.58 , where as in experimental group 1.1 ± 1.42 and the difference in mean 12.46. The calculated 't' value 17.71 and p value $P < 0.001$ (HS) which is statistically highly significant. The findings showed that there was a significant difference in the mean score on airway clearance between control group and experimental group. There was no significant association between the pre-test level of airway clearance among samples in experimental group and control group with their selected demographic and clinical variable. **Conclusion:** It seems that the 3% hypertonic saline nebulization and suctioning was effective on airway clearance among ICU patients under mechanical ventilator. Therefore, it can be suggested that 3% hypertonic saline nebulization and suctioning can be provided to ICU patients under mechanical ventilator.

KEYWORDS

Hypertonic Saline Nebulized Suctioning, Mechanical Ventilation, Airway Clearance.

BACKGROUND OF THE STUDY

Mechanical ventilator support is administered for patients with respiratory distress in the ICUs due to various underlying conditions such as organ failure, cardiovascular disease, multiple fractures, renal dysfunction, neurological disorders, organ transplantation, cancer, and requirement of postoperative care. However, implementation of mechanical ventilation causes several vital changes in the patient's airway such as introduction of microorganisms, obstruction of airway, atelectasis and gas restoration in the distal part of the obstructed passage. Large atelectasis may even promote the risk of development of lung injury. In addition, persistent of sputum in the bronchial airways may provide an ideal environment for colonization of microorganisms, which finally results in VAP. Thus, proper care of the airway is critical in preventing VAP as the virulence of microorganisms and prior host diseases are non-modifiable factors during the treatment period by means of ventilation (Sonal Shashikant Bhavane, 2019).

Maintaining the patency of the airway is the primary goal of nursing care in patients with intubation. Endotracheal tube suctioning (ETS) is a procedure aimed to keep the airways patent by mechanically removing accumulated pulmonary secretions. ETS is one of the most frequent and important responsibilities of the nurses working in the intensive care units. Despite being a necessary procedure, it can lead to complications, such as mucus traumatization, pain, and discomfort, and infection, impairment of the physiological indices, bronchoconstriction, atelectasis and increase in intracranial pressure (Mahdi Shamali, 2016).

Initiation of hypertonic saline (HTS) nebulization therapy for patients with early (ARDS) appears to be tolerable with significant improvement in oxygenation. The therapy is associated with trends to decrease mortality, ICU stay, and mechanical ventilation (MV) duration, and therefore may be added to the protective lung strategy (Amr Sobhy, 2020).

India has approximately 1.9 million hospital beds, 95,000 ICU beds

and 48,000 ventilators. Nationally, hospital beds are concentrated in the private sector (hospital beds: 1,185,242 private vs 713,986 public). ICU beds and ventilators follow a similar trend (ICU beds: 59,262 private vs 35,699 public; ventilators: 29,631 private: 17,850 8 public). Most hospital beds and ventilators in India are concentrated in seven States - Uttar Pradesh (14.8%), Karnataka (13.8%), Maharashtra (12.2%), Tamil Nadu (8.1%), West Bengal (5.9%), Telangana (5.2%) and Kerala (5.2%) (Geetanjali Kapoor et al, 2020).

Dr. Metilda Ph.D. (N) (2020) conducted a study to assess Effect of Nebulized Suctioning with 3% Hypertonic Saline for Mechanically Ventilated Patient on Airway Clearance among mechanical ventilated patients in ICU PESIMSR at Andhra Pradesh. Quantitative evaluative approach of one group pre-test post-test design was used in this study. Patients were selected by convenience sampling technique and sample consists of 30. Semi structured interview schedule and modified bio-physiological parameters with arterial blood gas analysis scale were used. The study has shown that hypertonic saline nebulization is the cheap, safe, effective and easy way to maintain the airway patency of patients connected to artificial airway.

Here increasing need of mechanical ventilation and ventilator care, so the purpose of the study is to assess the effectiveness of 3% hypertonic saline nebulization and suctioning in airway clearance among ICU patients under mechanical ventilator.

OBJECTIVES

1. To assess the level of airway clearance among patients with mechanical ventilator in experimental and control group.
2. To evaluate the effectiveness of 3% hypertonic saline nebulization and suctioning on airway clearance among patients with mechanical ventilator in experimental group.
3. To compare the level of airway clearance before and after intervention in experimental and control group.
4. To find out the association between pre-test level of airway clearance score and their selected socio demographic variables and clinical

variables in experimental and control group.

METHODS AND MATERIALS

Quantitative approach Quasi Experimental research - pre-test and post-test control group design was adapted for this study. The study was conducted in one of the private hospital in Salem, which has the 350 bedded hospital. Non-probability purposive sampling technique was used to select the 60 sample. Inclusion Criteria for this study was Patients with age group above 20 years, Patients who were in mechanical ventilation, both male and female patients. The variables included in the study such as independent variable is 3% hypertonic saline nebulization and suctioning, dependent variables are airway clearance. Instrument used for the data collection it has two sections.

Section: A – Demographic data, It consists of age, gender, income per month, educational qualification, personal habit, reason for mechanical ventilator, frequency of suctioning, duration of ventilator, position during suctioning, frequency of nebulization, and types of mucous secretion.

Section: B - Bio physiological Parameters with ABG analysis it includes Spo₂, Heart rate, Respiratory rate, Breath sound, Involvement of accessory muscle, Dyspnea and ABG. The Patient anonymity and confidentiality was maintained throughout the research, not noted any physical or psychological damage to patients. The collected data was analysed by descriptive and inferential statistics. In this study Modified Ernestine Wiedenbach's Helping Art of Clinical Nursing Theory (1964) was adopted.

RESULT AND DISCUSSION

In the experimental group, 12 (40%) of the participants were between the ages of 31 and 40, while only 8 (27%) of the participants in the control group were between the ages of 21 and 30. More than half of the participants 17(56.7%) were males in the experimental group and 20(66.7%) in the control group. In terms of monthly income, the majority of the experimental group's participants 9(30%) were from the Rs. 5,001–10,000 income range, whereas in the control group, nearly half of the participants 14(46.7%) were from the Rs. 10,001–15,000 income range. When comparing the education status in experimental group, nearly one fourth of the participants 7(23%) were from the higher secondary educational status where as in control group, majority of the participants 10 (33.3%) were from the higher secondary level. Regarding occupation in experiment group, most of the participants 10(33.3%) were from the category of daily wages in control group majority of the participants 10 (33.3%) were from the category of government employee.

Regarding reason for mechanical ventilation in experimental group, nearly half of the participants 13 (43.3%) were from the respiratory disorder and 13(43.3%) cardiac disorder in control. While discussing frequency of suctioning in experimental group, nearly half of the participants 14 (46.7%) were from the every 2nd hourly, where as in control group 67 nearly half of the participants 13 (43.3%) were from the every 4th hourly once suctioning. When discussing the frequency of nebulization, the majority of the participants 24(80.2%) in the experimental group and 18 (60%) in the control group were nebulized twice daily. Regarding mucous secretion type, the majority of participants (25, or 83.3%) in the experimental group fell into the mild secretion category, whereas in the control group, more than half of the participants (17, or 56.7%) did as well.

In control group, during the pretest majority of the participants 27 (90%) were belongs to minimally cleared category, 2 (6.7%) were belongs to moderately cleared category and rest of the participants 1 (3.3%) were belongs to very minimally cleared. Where as in experimental group, majority of the participants 26 (86.7 %) are belongs to minimally cleared category and rest of the participants 4 (13.3%) were belongs to moderately cleared category. After the intervention in control group, majority of the participants 20 (66.7%) were belongs to moderately cleared, one fourth of the participants 8 (26.7%) were belongs to minimally cleared category, 1 (3.3 %) were belongs to very minimally cleared 1 (3.3%) were belongs to well cleared. Where as in experimental group, majority of the participants 28 (93.3%) were belongs to well cleared category and rest of the participants 2 (6.7%) were belongs to moderately cleared category.

Table 1: Mean, SD And Mean Difference And Paired 't' Test Value Before And After The Intervention In The Control Group And

Experimental Group. (N=60)						
Level of Airway Clearance	Pre Test		Post Test		Mean Difference	't'- Value
	Mean	SD	Mean	SD		
Control Group	15.23	1.43	13.57	3.58	1.67	2.41
Experimental Group	14.65	1.85	1.1	1.42	13.56	55.17
						P=0.02* (S) P<0.001*** (HS)

*-P<0.05, significant and **-P<0.01 & ***-P<0.001, highly significant

The findings revealed that the mean score and standard deviation of the airway clearance in control group pretest is 15.23± 1.43. After the intervention 13.57 ± 3.58 and the mean difference is 1.67. The calculated 't' value is 2.41 and p value is p= 0.02* which is statistically significant where as in experimental group pretest is 14.65± 1.85. After the intervention 1.1 ±1.42 and the mean difference is 13.56. The calculated 't' value is 55.17 and p value is p<0.001*** which is statistically highly significant.

Table 2: Mean, SD And Mean Difference And Unpaired 't' Test Value After Intervention In The Control Group And Experimental Group. (N=30)

Post Test	Control group		Experimental group		Mean difference	't'- Value	P- Value
	Mean	SD	Mean	SD			
Level of airway clearance	13.57	3.58	1.1	1.42	12.46	17.71	P< 0.001 (HS)

*-P<0.05, significant and **-P<0.01 & ***-P<0.001, highly significant

In control group posttest the mean and standard deviation 13.57± 3.58 where as in experimental group 1.1 ± 1.42 and the difference in mean 12.46. The calculated 't' value is 17.71 and p value P<0.001(HS) which is statistically highly significant.

The present study was supported by k. charumathi (2019) who has done a study to assess the Effect of Nebulized Suctioning with 3% Hypertonic Saline for tracheostomy Patient on Airway Clearance. From the findings of the study it can be concluded that the overall area wise comparison between experimental and control posttest mean percentage difference was 22 % for respiratory parameter assessment scale. Highly significant difference was found post test score of patients in experimental group at the level of significant (P<0.05).

Summary And Recommendations

The present study showed that 3% hypertonic saline nebulization and suctioning was cheap, safe, effective, and easy way to maintain the airway patency of among ICU patients under mechanical ventilator. It helps in reducing the further complications of mechanical ventilator. It reduces the ventilator stay and ICU stay of the patient. A similar study can be conducted in other settings like Intensive respiratory Care Unit, Pediatric intensive care Unit and at any place where individual is intubated and ventilated.

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