Cover Page

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A STUDY TO ASSESS THE EFFECTIVENESS OF STANDARD ENDOTRACHEAL SUCTIONING TECHNIQUE ON PATIENTS WITH ARTIFICIAL AIRWAY IN SELECTED WARDS OF MUZAFFARNAGAR MEDICAL COLLEGE AND HOSPITAL, MUZAFFARNAGAR

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Abstract:

The study aims to assess the effectiveness of standard endotracheal suctioning technique on patients with artificial airway. The assessment was done by quasi-experimental one group pre-test post-test design. Non probability convenience sampling technique was used to assess the effectiveness of 60 patients (30 in experimental group and 30 in control group) on artificial airway in Muzaffarnagar Medical College & Hospital. The data was collected by using demographic performa and modified protocol given by American Association Respiratory Care Tool to assess the demographic data and effectiveness of standard endotracheal suctioning technique on clients with artificial airway. The result shows that experimental group mean after the procedure in terms of pulse are 85.27 on 1st day, 85.17 on 2nd day and SD are 8.46 on 1st day, 7.70 on 2nd day while in control group mean after the procedure are 110.43 on 1st day, 105.07 on 2nd day and SD are 19.31 on 1st day, 17.96 on 2nd day. In terms of respiration, experimental group mean after the procedure are 16.80 on 1st day, 17.37 on 2nd day and SD are 3.80 on 1st day, 3.92 on 2nd day while in control group mean after the procedure are 23.87 on 1st day, 21.57 on 2nd day and SD are 6.74 on 1st day, 4.57 on 2nd day. In terms of oxygen saturation, experimental group mean after the procedure are 99.57 on 1st day, 99.67 on 2nd day and SD are 0.90 on 1st day, 0.61 on 2nd day while in control group mean after the procedure in terms of oxygen saturation are 96.50 on 1st day, 96.77 on 2nd day and SD are 6.75 on 1st day, 4.14 on 2nd day. In terms of mean arterial pressure, experimental group mean after the procedure are 99.13 on 1st day, 98.99 on 2nd day and SD are 13.13 on 1st day, 13.65 on 2nd day while in control group mean after the procedure are 90.57 on 1st day, 90.96 on 2nd day and SD are 11.19 on 1st day, 11.57 on 2nd day. It reveals the effectiveness ofstandard endotracheal suctioning technique on patients with artificial airway assessed with the help of paired t-test. The "t" calculated value is greater than the "t" table value at P<0.05 level of significance. It denotes that the modified standard protocol for endotracheal suctioning technique based on American association for respiratory care that is used by the investigator is effective.

Keywords: Effectiveness, standard, patients, endotracheal suctioning technique, artificial airway, wards.

1. INTRODUCTION

According to **Suzanne smeltzer & Brenda Bare [2004],** Oxygen is required to sustain life. The cells of the body derive the energy from the oxidation of carbohydrates, fats and proteins. As with any type of combustion, the process requires oxygen. Certain vital tissues such as those of the brain and the heart cannot survive for long time without a continuing supply of oxygen.

Respiratory system facilitates life sustaining processes such as O2 transport, respiration & ventilation & gaseous exchange. Major functions of the pulmonary system are ventilation, gas exchange and lung defences. Mucus is continuously secreted at a rate of about 100 ml per day by goblet cells and sub mucosal glands. It forms a mucus blanket that contains the impacted particles and debris from distal lung areas. Cilia cover the airways from the level of the trachea to the respiratory bronchioles. Each ciliated cell contains approximately 200 cilia, which beat rhythmically about 1000 times / min in the large airways, moving mucus towards the mouth. Ciliary action is impaired by dehydration, smoking and inhalation of drugs such as atropines, anaesthetics, alcohol or cocaine. Cilia are often destroyed during these infections, resulting in impaired secretion clearance, a chronic productive cough and frequent respiratory infections.**[Lewis et al, 2000].** According

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to **Potter & Perry**, Illnesses & conditions that effect ventilation, o2 transport or suppression of defence mechanisms cause the pooling of secretions and alterations in respiratory functioning. The goal of suctioning is to clear the airway and to provide ventilation to produce a normal arterial carbon dioxide tension (paco2) between 35 & 45 mm of Hg & maintain a normal arterial O2 tension(pao2) between 95 & 100 mm of Hg.

Hyperventilation and hypoventilation refer to alveolar ventilation and not to the client's respiratory rate. Hypoxia is inadequate tissue oxygenation at the cellular level. This can result from a deficiency in O2 delivery or O2 utilizations at the cellular level which is in turn caused by improper airway clearance. As the hypoxia worsens, the respiratory rate may decline as a result of respiratory muscle fatigue. During early stages of hypoxia BP is elevated unless the condition is caused by shock. Patient with ineffective cough who cannot clear his such as acute respiratory failure, CNS depression, neuromuscular disease, chest wall injury, upper airway obstruction, aspiration prophylaxis, fractured cervical vertebrae with spinal cord injury requires mechanical aspiration which is called 'Endotracheal suctioning'. Secretion collection in the artificial airway or tracheobronchial tree may result in narrowing of the airway, respiratory insufficiency, and increased work of breathing and stasis of secretions. It is an imperative requisite of a professional nurse to perform endotracheal suctioning with a standard protocol to prevent complications and to promote recovery**.[Nursing journal of India , 2005].** Nursing interventions in the management of the patient with an artificial airway include humidification, cuff management, suctioning and communication.

According to **Joanna Briggs Institute,[2000]**Suctioning is a sterile procedure that is performed only when it is clinically indicated and not on a routine schedule. Indications for suctioning include coughing, secretions in the airway, respiratory distress, presence of rhonchi on auscultation, increased peak airway pressures on the ventilator & decreasing SaO2 or PaO2. According to **Linda et al, [2006]**, a number of complications are associated with suctioning including hypoxemia/ hypoxia, atelectasis, bronchospasms, dysrhythmias, increased ICP and airway trauma. Endotracheal suctioning is not a benign procedure, and operators should remain sensitive to possible hazards sand complications and take all necessary precautions to ensure patient safety.

1.1STATEMENT OF THE PROBLEM:

"A study to assess the effectiveness of standard endotracheal suctioning technique on patients with artificial airway in selected wards of Muzaffarnagar Medical College and Hospital, Muzaffarnagar."

1.2 OBJECTIVES:

1. To assess the pre test and post test level of physiological parametric outcomes among patients with artificial airway in experimental and control group.
2. To assess the effectiveness of standard endotracheal suctioning technique on patients with artificial airway in experimental group.
3. To associate the post test level of physiologic parametrical outcome with selected demographic variables among the patients in experimental and control group.

1.3 HYPOTHESIS:

There will be statistically significant difference in the level of physiological parametric outcomes of patients in experimental group.

1.4 ASSUMPTION:

It is assumed that the regular practice of the standard endotracheal suctioning helps to maintain the patent airway of patients with artificial airway to facilitate speedy recovery.

Cover Page

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1.5 METHODOLOGY

Research Approach: Quantitative research approach.

Research Design: Quasi-experimental research design.

Setting of the Study: The study was conducted in post ICU and Emergency ward of Muzaffarnagar Medical College and Hospital, Muzaffarnagar.

Variables:

Independent variable: Standard Endotracheal suctioning technique.

Dependant variable: Physiological parametric outcome of standard endotracheal suction.

Population: Patients on artificial airway.

Sample: Patients on artificial airway admitted in post ICU and Emergency ward in Muzaffarnagar Medical College and Hospital.

Sampling Technique: Non-probability convenience sampling technique.

Sample Size: 60 patients (30 in experimental group and 30 in control group) on artificial airway.

Criteria for Sample Selection:

Inclusion Criteria:

1. Patients on artificial airway admitted in post ICU and Emergency ward in Muzaffarnagar Medical College and Hospital.
2. Patients between ages of 20-80 years.
3. The study includes both male and female patients.
4. Patients who are co-operative.

Exclusion Criteria:

1. Patients with severe pulmonary complications.
2. Patients who are terminally ill.

2. METHODS OF DATA COLLECTION AND ANALYSIS

Description of the Tool:

Modified protocol for Endotracheal suctioning developed based on the protocol given by "***AMERICAN ASSOCIATION RESPIRATORY CARE***" was used to assessed the effectiveness of standard endotracheal suctioning technique on patients with artificial airway. The protocol was based on the following parameters: Vital signs, Oxygen saturation, Mean arterial pressure.

The Tool is divided into two parts.

TOOLS	COMPONENTS
Part l- Demographic data	Age, sex
Part ll- physiological parametric outcomes	Pulse, respiration, oxygen saturation, mean arterial pressure

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Data Analysis and Statistical Method Used:

The data was analysed in terms of objectives of the study by using various Descriptive & Inferential statistical methods like mean, SD, chi-square and t- test.

- Distribution of Demographic variables and Physiological parametric outcomes was analysed by using frequency and percentage.
- The effectiveness of standard endotracheal suctioning technique on patients with artificial airway in experimental group was analysed by using inferential statistics (t-test).
- Association between the post test level of physiologic parametric outcome with selected demographic variables among the patients was analysed by using inferential statistics (Chi-square analysis)

3. RESULT

Organization of the study findings:

Section A: Distribution of demographic variables

Section B: Mean, standard deviation and t-test for the physiological parametric

Table: 2a Mean and standard deviation of pulse
Table: 2b Mean and standard deviation of respiration
Table: 2c Mean and standard deviation of Oxygen saturation
Table: 2d Mean and standard deviation of Mean Arterial pressure
Table: 2e Frequency and percentage of amount of fluid after suctioning
Table: 2f Frequency and percentage of type of fluid

Section C: Comparison of post-test scores of physiological parametric outcomes in Experimental and control group.

Section D: Association of physiological variables with demographic variable.

SECTION – A

Table – 1: Frequency and percentage distribution of the demographic variables

N=60

Demographic variables	Experimental group N=30		Control group N=30	
AGE(years)	Frequency	Percentage	Frequency	Percentage
20-40	8	26.70%	13	43.3%
41-60	13	43.30%	11	36.70%
61-80	9	30%	6	20%
SEX				
Male	25	83.30%	25	83.30%
Female	5	16.70%	5	16.70%

Table-1: The table shows that in experimental group, based on age, 8 sample out of 30 [26.7%] belong to age group between 20 -40 years; 13 out of 30 [43.3%] belong to the age group between 41 – 60 years; 9 out of 30 [30%] belong to the age group between 61 – 80 years while in the control group 13 out of 30 [43.3%] belong to age group between 20 -40 years; 11 out of 30 [36.7%] belong to the age group of 41 – 60 years; 6 members out of 30 [20%] belong to the age group 61 – 80 years. Based on sex, the sample was equally distributed in both experimental and control groups i.e., 25[83.3%] are males and 5 members [16.7%] are females.

Cover Page

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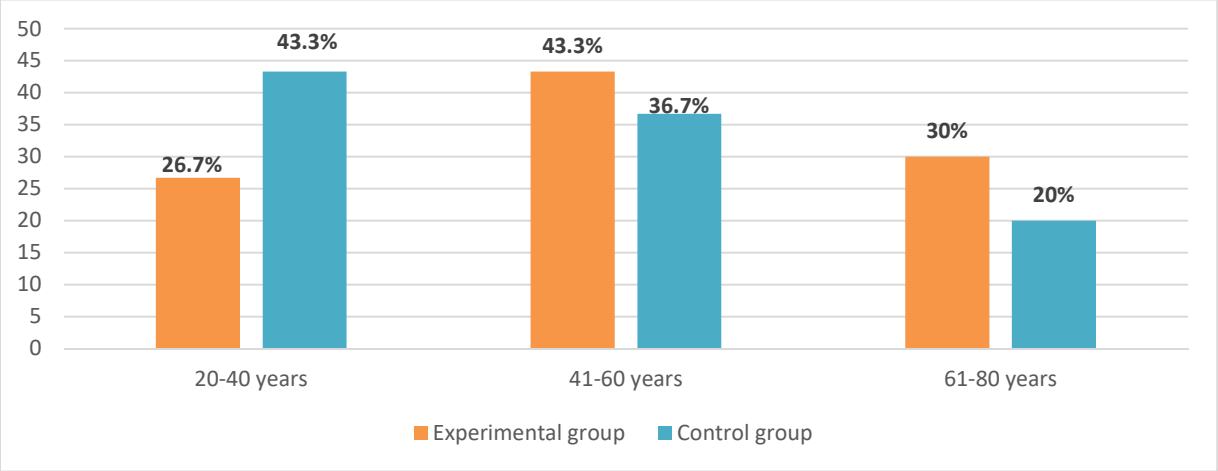

AGE(Years)

Figure 1: Frequency and percentage distribution of samples based on age

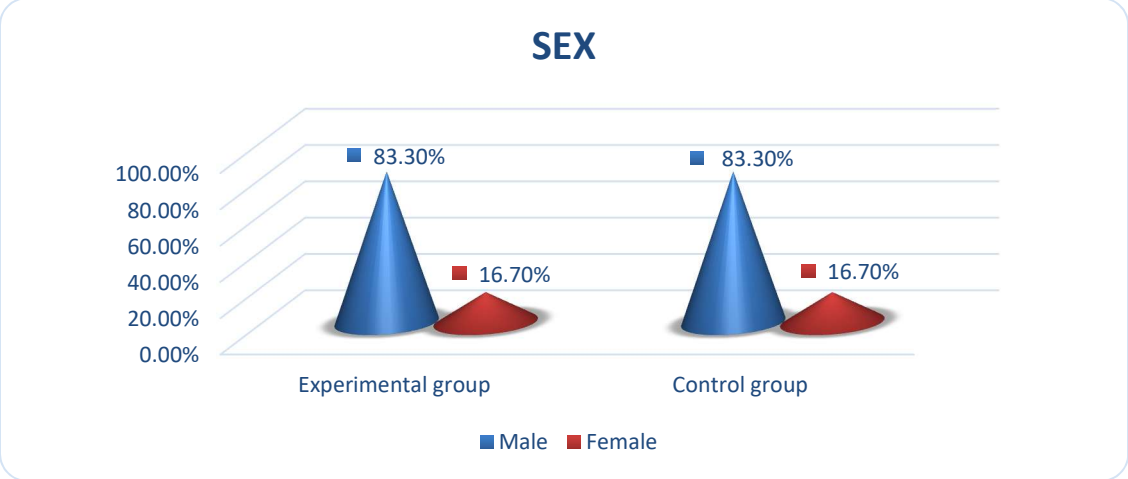

Figure 2: Frequency and percentage distribution of samples based on sex

SECTION - B

Mean, Standard Deviation of the Level of Physiological Parametric outcomes before and after Suctioning among patients with Artificial Airway in Experimental and Control Group.

Cover Page

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TABLE – 2a: Mean and Standard Deviation of Pulse

N=60

S.No	Physiological parameter	Day	Timing	Experimental group		Control Group	
				Mean	Standard Deviation	Mean	Standard Deviation
1	PULSE	I	Before	113.87	24.78	104.43	20.92
			After	85.27	8.46	110.43	19.31
		II	Before	107.1	18.06	99.40	15.81
			After	85.17	7.70	105.07	17.96

Table – 2a: The above table depicts that, in experimental group, on the first day the mean is 113.87 before the procedure and 85.27 after the procedure with the standard deviation 24.78 before the procedure and 8.46 after the procedure. On the second day the mean is 107.1 before the procedure and 85.17 after the procedure with the standard deviation 18.06 before the procedure and 7.70 after the procedure while in the control group, on the first day the mean is 104.43 before the procedure and 110.43 after the procedure with the standard deviation 20.92 before the procedure and 19.31 after the procedure. On the second day the mean is 99.40 before the procedure and 105.07 after the procedure with the standard deviation 15.81 before the procedure and 17.96 after the procedure.

TABLE – 2b: Mean and standard deviation of respiration

N=60

S.No	Physiological parameter	Day	Timing	Experimental group		Control group	
				Mean	Standard Deviation	Mean	Standard Deviation
2	RESPIRATION	I	Before	25.87	9.96	22.27	6.03
			After	16.80	3.80	23.87	6.74
		II	Before	23.30	7.17	20.83	4.65
			After	17.37	3.92	21.57	4.57

Table – 2b: The table depicts that, in experimental group, on the first day the mean is 25.87 before the procedure and 16.80 after the procedure with the standard deviation 9.96 before the procedure and 3.80 after the procedure. On the second day the mean is 23.30 before the procedure and 17.37 after the procedure with the standard deviation 7.17 before the procedure and 3.92 after the procedure. While in the control group, on the first day the mean is 22.27 before the procedure and 23.87 after the procedure with the standard deviation 6.03 before the procedure and 6.74 after the procedure. On the second day the mean is 20.83 before the procedure and 21.57 after the procedure with the standard deviation 4.65 before the procedure and 4.57 after the procedure.

Cover Page

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TABLE - 2c: Mean and standard deviation of oxygen saturation

N=60

S.No	Physiological parameter	Day	Timing	Experimental group		Control group	
				Mean	Standard Deviation	Mean	Standard Deviation
3	Oxygen saturation	I	Before	97.23	3.91	98.57	3.05
			After	99.57	0.90	96.50	6.75
		II	Before	95.38	1.96	98.97	1.85
			After	99.67	0.61	96.77	4.14

Table - 2c: The above table depicts thatin experimental group, on the first day the mean is 97.23 before the procedure and 99.57 after the procedure with the standard deviation 3.91 before the procedure and 0.90 after the procedure. On the second day the mean is 95.38 before the procedure and 99.67 after the procedure with the standard deviation 1.96 before the procedure and 0.61 after the procedure. While in the control group, on the first day the mean is 98.57 before the procedure and 96.50 after the procedure with the standard deviation is 3.05 before the procedure and 6.75 after the procedure. On the second day the mean is 98.97 before the procedure and 96.77 after the procedure with the standard deviation1.85 before the procedure and 4.14 after the procedure.

TABLE - 2d: Mean and standard deviation of mean arterial pressure

N=60

S.No	Physiological parameter	Day	Timing	Experimental group		Control group	
				Mean	Standard Deviation	Mean	Standard Deviation
4	MAP	I	Before	94.35	17.58	91.74	22.48
			After	99.13	13.13	90.57	11.19
		II	Before	94.06	15.20	97.18	17.24
			After	98.99	13.65	90.96	11.57

Table - 2d: The table depicts thatin experimental group, on the first day the mean is 94.35 before the procedure and 99.13 after the procedure with the standard deviation 17.58 before the procedure and 13.13 after the procedure. On the second day the mean is 94.06 before the procedure and 98.99 after the procedure with the standard deviation 15.20 before the procedure and 13.65 after the procedure. While in the control group, on the first day the mean is 91.74 before the procedure and 90.57 after the procedure with the standard deviation 22.48 before the procedure and 11.19 after the procedure. On the second day the mean is 97.18 before the procedure and 90.96 after the procedure with the standard deviation17.24 before the procedure and 11.57 after the procedure.

Cover Page

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TABLE: 2e: Frequency and percentage of amount of fluid after suctioning

N=60

Amount	Experimental				Control			
	I day		II day		I day		II day	
	frequency	%	frequency	%	frequency	%	frequency	%
1-5ml	8	26.6	9	30	5	16.7	5	16.7
6-10ml	12	40	15	50	16	53.3	18	60
11-15ml	9	30	5	16.7	8	26.6	7	23.3
>15ml	1	3.3	1	3.3	1	3.3	0	0

The above table 2e shows the frequency and percentage distribution of sample based on amount of fluid after suctioning.

TABLE - 2f: Frequency and percentage of type of fluid

N=60

Type of fluid	Experimental				Control			
	I day		II day		I day		II day	
	frequency	%	frequency	%	frequency	%	frequency	%
THICK	13	43.3	16	53.3	13	43.3	13	43.3
BLOOD STAINED	4	13.3	4	13.3	6	20	5	16.7
WATERY	7	23.3	6	20	3	10	4	13.3
YELLOWISH	6	20	4	13.3	8	26.6	8	26.7

The above table- 2f shows the frequency and percentage distribution of sample based on type of fluid suctioned

SECTION C:

TABLE – 3: Comparison of Post-Test Scores of Physiological Parametric Outcomes in Experimental and Control Group. N=60

Sl. No	Physiological parameter	Day	Group	Mean	S.D	t value
1	PULSE	I	Experimental Group	85.27	8.46	6.539*
			Control Group	110.43	19.31	
		II	Experimental Group	85.17	7.70	5.578*
			Control Group	105.07	17.96	
		I	Experimental Group	16.80	3.80	5.008*

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2	RESPIRATION	II	Control Group	23.87	6.74	3.822*
			Experimental Group	17.37	3.92	
			Control Group	21.57	4.57	
3	SpO2	I	Experimental Group	99.57	0.90	2.467*
			Control Group	96.50	6.75	
		II	Experimental Group	99.67	0.61	3.795*
			Control Group	96.77	4.14	
4	MAP	I	Experimental Group	99.13	13.13	2.717*
			Control Group	90.57	11.19	
		II	Experimental Group	98.99	13.66	2.459*
			Control Group	90.96	11.57	

* : significant at 0.05 level.(P<0.05)

TABLE – 3: The above table explained the comparison of post test score of physiological parametric outcomes in Experimental and Control group. The t-value of all the parameters is found to be significant at the level of 0.05 which denotes the effectiveness of standard endotracheal suctioning technique on patients with artificial airway.

SECTION - D:

TABLE - 4a: Association of Physiological Variables with Demographic Variables in Experimental Group

N=60

Variables	Low		Moderate		High		Chi square value
	No	%	No	%	No	%	
Age	**PULSE**						
20-40yrs	1	3.33	3	10	4	13.33	2.986 NS
41-60yrs	3	10	8	26.67	2	6.67	df = 4
61-80yrs	2	6.67	4	13.33	3	10	
Sex							
Male	3	10	13	43.33	9	30.00	6.720 NS
Female	3	10	2	6.67	0	0.00	Df = 2
Age	**RESPIRATION**						
20-40yrs	1	3.33	4	13.33	3	10	3.187 NS
41-60yrs	5	16.67	4	13.33	4	13	df = 4
61-80yrs	1	3.33	5	16.67	3	10	
Sex							
Male	5	16.67	11	36.67	9	30.00	1.050 NS
Female	2	6.67	2	6.67	1	3.33	Df =2
Age	**Spo2**						

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20-40yrs 41-60yrs 61-80yrs	3 2 1	10 6.67 3.33	5 10 5	16.67 33.33 16.67	0 1 3	0 3.33 10	6.189 NS Df = 4
Sex							
Male Female	6 0	20 0	15 5	50 16.67	4 0	13.33 0	3.000 NS Df = 2
Age				MAP			
20-40yrs 41-60yrs 61-80yrs	4 5 2	13.33 16.67 6.67	0 6 4	0 20 13.33	4 2 3	13.33 6.67 10	6.578 NS df = 4
Sex							
Male Female	8 3	26.67 10	10 0	33.33 0	7 2	23.33 6.67	3.091 NS Df = 2

NS= not significant df : degrees of freedom

KEY: NORMAL RANGE OF PARAMETERS

PARAMETERS	LOW	MODERATE	HIGH
PULSE	<60	61-100	>100
RESPIRATION	<12	12-20	>20
OXYGEN SATURATION	<90	90-98	98-100
MEAN ARTERIAL PRESSURE	<60	60-100	>100

TABLE – 4b: Association of Physiological Variables with Demographic Variables in Control Group

N=60

Variables	Low		moderate		High		chi square value
Age	No	%	No	%	No	%	
	PULSE						7.091 NS df = 4
20-40 41-60 61-80	5 1 2	16.67 3.33 6.67	3 9 1	10 30 3.33	4 3 2	13.33 10 6.67	
Sex							
Male Female	5 3	16.67 10	12 1	40 3.33	7 2	23.33 6.67	2.790 NS df = 2
Age			**RESPIRATION**				
20-40 41-60 61-80	7 2 2	23.33 6.67 6.67	4 6 2	13.33 20 6.67	1 5 1	3.33 16.67 3.33	5.870 NS df = 4
Sex							

Cover Page

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Male Female	8 3	26.67 10	10 2	33.33 6.67	6 1	20 3.33	0.590 NS df = 2
Age		**SpO2**					
20-40 41-60 61-80	2 2 0	6.67 6.67 0	5 5 1	16.67 16.67 3.33	5 6 4	16.67 20 13.33	2.385 NS df = 4
Sex							
Male Female	4 0	13.33 0	8 3	26.67 10	12 3	40 10	1.364 NS df = 4
Age				**Mean arterial pressure**			
20-40 41-60 61-80	4 5 0	13.33 16.67 0	4 3 1	13.33 10 3.33	4 5 4	13.33 16.67 13.33	4.100 NS df = 4
Sex							
Male Female	6 3	20 10	6 2	20 6.67	12 1	40 3.33	2.356 NS df = 2

NS: not significant df : degrees of freedom

KEY: NORMAL RANGE OF PARAMETERS

PARAMETERS	LOW	MODERATE	HIGH
PULSE	<60	61-100	>100
RESPIRATION	<12	12-20	>20
OXYGEN SATURATION	<90	90-98	98-100
MEAN ARTERIAL PRESSURE	<60	60-100	>100

Table - 4a: It shows the association of the physiological variables with the demographic variables. The physiological variables like pulse, respiration, oxygen saturation and mean arterial pressure has no significant association with the demographic variables in experimental group. It is not significant at the level of 0.05.

Table - 4b: It shows the association of the physiological variables with the demographic variables. The physiological variables like pulse, respiration, oxygen saturation and mean arterial pressure has no significant association with the demographic variables in control group. It is not significant at the level of 0.05.

From the above two tables it is concluded that there is no association of physiological variables with demographic variable.

IV. MAJOR FINDINGS OF THE STUDY

The study was conducted from 23/09/2024 to 24/10/2024. A total number of 60 patients (30 in experimental group and 30 in control group) on artificial airway who met the inclusion criteria were selected by using non-probability convenience sampling technique. Informed consent was obtained. The standard endotracheal suctioning procedure was performed by the investigator for the patients in experimental group and the heart rate, oxygen saturation and mean arterial pressure was determined. The procedure performed by the nurses in the control group was observed and the heart rate, oxygen saturation and mean arterial pressure were determined. The data in experimental group has been compared with the heart rate, oxygen saturation and mean arterial pressures of the patients in the control group.

Cover Page

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A quasi-experimental research design is utilized for effectiveness of standard endotracheal suctioning technique.

CONCLUSION:

The conclusion drawn from this study was that there was significant improvement in the physiological parametric outcomes of experimental group when compared with the control group. This shows that the modified standard protocol for endotracheal suctioning technique based on American association for respiratory care that is used by the investigator is effective.

IMPLICATIONS OF THE STUDY:

According to Tolsma (1995) the section of the research report that focuses on nursing implication usually includes specific suggestions for nursing practice, nursing education, nursing education and nursing research.

Nursing practice:

- The study revealed that the standard endotracheal suctioning on patients with artificial airway will improve the physiologic parametric outcomes.
- The nurses in critical care units need to follow the standard protocol to improve the quality of nursing care.

Nursing Education:

- Nursing curriculum should focus on updating the knowledge of nurses working in critical care units.
- The nurses need to be provided adequate training on standard procedures.

Nursing Administration:

- This study proposes the hospital administrator the need to plan for the introduction of standard protocols to be followed in the wards.

Nursing Research:

- Research towards the standardization of nursing procedures is needed to improve the quality care.

RECOMMENDATIONS:

- The study can be replicated with large sample.
- The same study can be conducted as a longitudinal study.
- A study can be conducted as structured teaching programme for nurses working in critical care areas.

CNE programmes can be conducted on the standard procedures to update the knowledge of nurses and student

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