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A Study to Assess the Effectiveness of Bronchial Hygiene Therapy (BHT) on Clinical Parameters among Mechanically Ventilated Patients in Selected Hospitals at Erode

Yogapriya .S[1]
M.Sc. Nursing II Year
Dhanvantri College of Nursing, Namakkal, Tamil Nadu

Dr. P. Padmavathi[2] (Professor)
Principal
Dhanvantri College of Nursing, Namakkal, Tamil Nadu

Dr. C. Grazy[3]
Professor
Dhanvantri College of Nursing, Namakkal, Tamil Nadu

Abstract:-

- ***Background:***

Bronchial hygiene therapy has the potential to improve cystic fibrosis and bronchiectasis. Neuromuscular degenerative disorders (such as ALS and muscular dystrophy), postoperative complications (such as pneumonia), respiratory disorders (such as asthma and chronic bronchitis), cerebral palsy, and mechanical ventilation are among the over a hundred conditions linked to impaired airway clearance Mechanically ventilated patients also have changes in the vital parameters due to the construction of arteries, but this subtly depends on the condition of the patients.

- ***Materials and Methods:***

Quasi-experimental approach design was used. A study was conducted with 30 patients with mechanically ventilated.15 patients were experimental group and 15 patients with control groups. Assessment tool were used clinical parameters observational scale.

- ***Results:***

From the finding of the study, it can be concluded that to compare the efficacy of the control and experimental groups, as measured by post test score on clinical parameters, an unpaired t-test was computed. Compared to the table value of 2.05, the unpaired t-test total score of 4.53 was high. Clinical indicators among mechanically ventilated patients showed that bronchial hygiene treatment was more successful than control group.

- ***Conclusion:***

From this study, it can be concluded that the highest percentage of patients were in age group of 20 to 30 years. Most of them were females, mode of ventilation were SIMV. Highly significant effectiveness was found between pretest and posttest score. Therefore, Bronchial hygiene therapy was used as an effective method to improve the patient among mechanically ventilated patients.

Keywords:- *Bronchial Hygiene Therapy, Clinical Parameters. Mechanical Ventilator.*

I. INTRODUCTION

Human life and breath are interconnected that in the mind of the common man, one means the other. When a child is born, cries to take its first breath and continues breathing till death. In order to keeps metabolism going, humans need an oxygen supply that is always available. Metabolic support is provided by oxygen delivered by the respiratory system. (Carrol, 2021)

The ability for air to flow freely through the airways, both upper and lower, is essential for proper ventilation. Airway narrowing or blockage may occur in a variety of diseases and conditions as a result of things like bronchoconstriction, foreign bodies, or secretions building up. Ensuring a clear airway in critical situations, such as while caring for a patient who has been intubated with an endotracheal or tracheostomy tube (Mortan, 2005).

Acute respiratory failure is a common reason for admission to the intensive care unit. ARF may be caused by a variety of medical conditions, including pulmonary sickness, neuromuscular disease, shock, and the requirement for airway protection or short-term breathing support after major surgery. Mechanical ventilation (MV) is the cornerstone of ARF treatment. (Slutsky AS & Rittayamai N, 2015).

Hospitalization is difficult for people of any age. Patients in the critical care unit can experience high levels of stress are faced with life threatening situation in a highly technical and dehumanizing atmosphere. A mechanically

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ventilated patient often experience a feeling of loss, separation from family, lack of communication, distress, isolation, anxiety, depression, fear etc. The need for restoration of life for the mechanically ventilated patients is being essential. This can be done not only by the pharmacological and hi-tech treatment modalities, (Roxanne Sabatini, 2007)

Illness and hospitalisation in a patient can lead to various stressors, such as physical signs of activation in the sympathetic nervous system and psychological distress. These stressors often require treatment with medication. In such cases, physical restraints or chemical sedation may be necessary. However, these interventions can have negative effects and potentially worsen the patient's underlying medical conditions. (Mary Kathleen Wilkins, Margery L Moore, 2004)

Mechanical ventilation is administered to 30,000 to 40,000 intensive care unit patients daily. Patients in (ICU) who are suffering from respiratory problems, neurological concerns, cardiac dysfunctions, metabolic illnesses, poisoning, and other conditions often find life-saving therapeutic options in mechanical ventilation. Mechanically ventilated individuals face an even higher threat to their quality of life from cognitive deterioration, who already face limitations in physical activity. Regardless, artificial breathing has the potential to make the patient uncomfortable and even frightened. (Wong, Lopez-Nahas, 2001).

➢ *Objectives of the Study*

- To assess the level of clinical parameters among mechanically ventilated patients in experimental and control group before and after bronchial hygiene therapy.
- To compare the effectiveness of bronchial hygiene therapy on clinical parameters between experimental and control group of mechanically ventilated patients.
- To find out the association between the post test scores on clinical parameters among mechanically ventilated patients in experimental and control group with their demographic variables.

➢ *Hypotheses*

- H1: There is a significant difference in the level of clinical parameters among mechanically ventilated patients in experimental and control group before and after bronchial hygiene therapy.
- H2: There is a significant effectiveness of bronchial hygiene therapy on clinical parameters among mechanically ventilated patients in experimental and control group.
- H3: There is a significant association between post test scores on clinical parameters among mechanically ventilated patients in experimental and control group with their demographic variables.

II. MATERIAL AND METHODS

➢ *Study Design:*
Quasi experimental approach nonequivalent group design.

➢ *Study Location:*
Selected hospitals, Erode, Tamil Nadu.

➢ *Study Duration:*
September to October 2023.

➢ *Sample Size:*
30 patients on mechanical ventilation; 15 served as controls and 15 as experimental group.

➢ *Selection Method:*
Non probability convenience sampling.

➢ *Inclusion Criteria:*
Mechanically Ventilated Patients with

- Age group between 21 to 60 years
- Both gender
- Zero day of intubation
- Conditions such as

✓ Head injury/trauma
✓ Organo phosphorous compound poisoning
✓ Sepsis

➢ *Exclusion Criteria:*
Mechanically Ventilated Patients with

- Agitation
- Chronic kidney failure
- Immuno compromised
- Heart failure
- Unstable vital parameters

➢ *Procedure Methodology*
Pretest Consent was obtained from the patient relatives; the investigator administered Clinical parameters observational scale with 7 clinical parameters systolic pressure, diastolic pressure, heart rate, respiratory rate, Oxygen Saturation, PEEP and Peak pressure. Implementation of ventilator care bundle Experimental group Bronchial Hygiene therapy was given from 1st day of ventilation to 15 days. It consisted of a group of Nursing care activities like Manual chest vibrocompression, Closed Tracheal suction and Passive ROM exercise Control group received routine hospital care. Posttest was conducted after the intervention by using Clinical parameters observational scale was used to evaluate the clinical outcomes for both experimental and control group.

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III. RESULT

After successfully implementing of bronchial hygiene therapy among mechanically ventilated patients the clinical outcome has improved by showing difference in the parameters than the control group, which is statistically significant, which is evident in posttest with significant difference in the parameters.

Table 1 shows demographic variables with percentage distribution we can see that 46% and 40% of the mechanically ventilated patients were between the ages of 21- 30 years in both groups, although 27% of patients in the control group and 33% of patient in experimental group were in the age 41-50 years, a comparable number 27% of patients in both groups were in the age 31-40 years.

Demographic variables	Control group		Experimental group	
	Frequency (N_1)	Percentage (%)	Frequency (N_2)	Percentage (%)
1. Age in years				
b) 20-30 years	7	46	6	40
c) 31-40 years	4	27	4	27
d) 41-50 years	4	27	5	33
2. Gender				
a) Male	6	40	7	47
b) Female	9	60	8	53
3. Type of Intubation				
a) Oro tracheal	14	92	14	95
b) Naso tracheal	1	8	1	5
4. Mode of Ventilation				
a) CMV	2	13	3	20
b) VCV	1	7	1	7
c) SIMV	12	80	11	73
5. Associated condition				
a) Diabetes mellitus	9	74	10	67
b) Hyper tension	2	13	3	20
c) Both	0	0	2	13
d) Nil	2	13	0	0

When looking at the gender distribution of the samples, it is clear that the majority of mechanically ventilated patients were female (60% and 53% in the two groups, respectively), while the percentage of male patients was much lower (40% and 47%). As far as anybody can tell, more women than men are impacted.

Both the mechanically ventilated group and the control group had a disproportionately high number of oro tracheal intubated patients (92% and 95%, respectively). There were only 8% and 5% nasotracheal patients on mechanical ventilation, respectively.

Among the mechanically ventilated patients in the control group, 80% used the SIMV mode, whereas in the experimental group, 73% used the same way. Nevertheless, a 13% and 20% CMV mode, and a 7% and 7% VCV mode, were seen in the two groups of patients who were mechanically ventilated Diabetes mellitus was the comorbidity in which the majority of mechanically ventilated patients (74% and 67%, respectively) fell. Yet, hypertension affected 13% and 20% of individuals on mechanical ventilation.

Table 2 Frequency and Percentage Distribution of Pre and Post Test Scores on Clinical Parameters among Mechanically Ventilated Patients in Control Group (N1= 15)

Level of Vital Parameters	Control group			
	Pre test		Post test	
	Frequency	Percentage	Frequency	Percentage
Normal	0	0	0	0
Moderate	5	33	12	80
Unchanged vital parameters	10	67	3	20

The distribution and frequency of clinical parameters in the control group show that, before the test, 67% of participants had unaltered vital parameters and 33% had moderate levels; after the test, 80% of participants had moderate levels and 20% had unchanged vital parameters. This demonstrates that there were minor shifts in post-test results among the control group samples.

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Table 3 Frequency and Percentage Distribution of Pre and Post Test Scores on Clinical Parameters among Mechanically Ventilated Patients in Experimental Group (N2= 15)

Level of clinical parameters	Experimental group			
	Pre Test		Post Test	
	Frequency	Percentage	Frequency	Percentage
Normal	0	0	8	53
Moderate	20	100	7	47
Unchanged vital parameters	0	0	0	0

The frequency and percentage distribution of clinical parameters in the experimental group shows that all of them had moderate levels before the test, but after the test, 53% of them had normal levels and 47% had moderate vitals. It is evident that bronchial hygiene treatment is beneficial in terms of important criteria.

Compare the Effectiveness of bronchial hygiene therapy on clinical parameters Among Control and Experimental Group of Mechanically Ventilated Patients.

Table 4 Area wise Comparison of mean, SD, and mean Percentage of Control Group Pre and Post Test Scores on Clinical Parameters

Clinical Parameters	Maximum Scores	Control group						Mean Difference
		Pre test scores			Post test scores			
		Mean	SD	Mean (%)	Mean	SD	Mean (%)	
Systolic pressure	3	1.18	1.5	59	0.7	0.31	35	24
Diastolic pressure	3	1.3	1.2	65	0.84	0.75	42	23
Heart rate	3	1.33	081	67	0.96	0.61	48	19
Respiratory rate	3	1	0.01	50	0.45	0.81	23	27
Oxygen Saturation	3	1.2	0.64	60	0.71	1.95	36	24
PEEP	3	1.02	0.42	67	0.12	0.52	46	21
Peak pressure	3	0.8	0.42	40	0.3	1.55	15	25
TOTAL	**21**	**19.01**	**0.97**	**90**	**14.53**	**0.28**	**70**	**20**

The results show that the control group had a mean score of 1.33±0.81 (67% of the total) in the pre-test and a mean score of 0.962±0.61 (48% of the total) in the post-test when it came to heart rate. A difference of 19% is shown. The region of peak pressure had a lowest mean score of (0.8±1.0.42) or 40% in the pre-test, and a mean score of (0.3±1.55) or 15% in the post-test. In it, the 25% discrepancy is shown.

In pre-test, the average score was 19.01±0.97, or 90%, however in the post-test, it was 14.53±0.28, or 70%. A difference of 20% is shown. In patients who are on mechanical ventilation, it seems that less change in clinical parameters occur in the absence of intervention.

Table 5 Paired T Test value of Pre and Posttest Scores on Clinical Parameters in Control Group (N1=15)

S.No	Clinical parameters	Paired 't' value	Table value	Level of significance
1.	Systolic pressure	10.8	2.15	**P < 0.05 significant**
2.	Diastolic pressure	4.33	2.15	**P < 0.05 significant**
3.	Heart rate	5.01	2.15	**P < 0.05 significant**
4.	Respiratory rate	5.62	2.15	**P < 0.05 significant**
5.	Oxygen Saturation	3.08	2.15	**P < 0.05 significant**
6.	PEEP	3.99	2.15	**P < 0.05 significant**
7.	Peak pressure	7.3	2.15	**P < 0.05 significant**
8.	**TOTAL**	**9. 8**	**2.15**	**P < 0.05 significant**

In order to compare the control group pre and posttest scores on various levels of clinical parameters, we used a paired t-test. When compared to the table value of 2.15, the total paired t-test score of 9.8 was high. In patients who are on mechanical ventilation, it seems that less change in clinical parameters occur in the absence of intervention.

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Table 6 Area wise Comparison of mean, SD, and mean Percentage of Experimental Group Pre and Post Test Scores on Clinical Parameters

Clinical Parameters	Maximum Scores	Experimental group						Mean Difference
		Pre test scores			Post test scores			
		Mean	SD	Mean (%)	Mean	SD	Mean (%)	
Systolic pressure	3	1.23	0.87	61	0.73	0.84	37	24
Diastolic pressure	3	1.34	0.86	67	0.89	1.01	45	22
Heart rate	3	1.3	0.82	65	0.89	1.57	45	20
Respiratory rate	3	1	1.27	50	0,8	1.52	40	10
Oxygen Saturation	3	1.14	1.35	57	0.98	1.63	49	8
PEEP	3	1.02	1.94	55	0.7	1.80	35	20
Peak pressure	3	1.20	0.45	65	0.8	0.11	45	20
TOTAL	**21**	**18.02**	**1.95**	**86**	**9.5**	**2.04**	**45**	**41**

The results show that the experimental group had a mean score of 1.34±0.86, or 67%, in the region of diastolic pressure before the test and a mean score of 0.89±1.01, or 45%, after the test. The comparison of means, standard deviations, and mean percentages shows this. A difference of 22% is shown.In the region of peep, the lowest mean score before the test was (1.02 ±1.94), which is 55%, while the mean score after the test was (0.7±1.80), which is 35%. A difference of 20% is shown

Table 7 Paired T Test value of Pre and Posttest Scores on Clinical Parameters in Experimental Group (N_1=15)

S.No	Clinical parameters	Paired 't' value	Table value	Level of significance
1.	Systolic pressure	16.7	2.15	**P < 0.05 significant**
2.	Diastolic pressure	9.49	2.15	**P < 0.05 significant**
3.	Heart rate	8.49	2.15	**P < 0.05 significant**
4.	Respiratory rate	11.07	2.15	**P < 0.05 significant**
5.	Oxygen Saturation	9.08	2.15	**P < 0.05 significant**
6.	PEEP	8.52	2.15	**P < 0.05 significant**
7.	Peak pressure	7.3	2.15	**P < 0.05 significant**
	TOTAL	**14.31**	**2.15**	**P < 0.05 significant**

Paired t test was calculated to analyze the effectiveness between pre and post test scores of experimental group on different aspects on level of Clinical parameters. The paired t test score for overall was 14.31 when compared to table value (2.15) it was high. It seems that bronchial hygiene therapy was effective for Clinical parameters among Mechanically Ventilated Patients.

Table 8 Unpaired T Test value of Posttest Scores on Clinical Parameters in Control Group and Experimental Group

S. No	Clinical parameters	Unpaired 't' value	Table value	Level of significant
1.	Systolic pressure	4.12	2.09	P<0.05 Significant
2.	Diastolic pressure	3.01	2.09	P<0.05 Significant
3.	Heart rate	3.96	2.09	P<0.05 Significant
4.	Respiratory rate	4.93	2.09	P<0.05 Significant
5	Oxygen Saturation	3.22	2.09	P<0.05 Significant
6	PEEP	3.05	2.09	P<0.05 Significant
7	Peak pressure	4.52	2.09	P<0.05 Significant
	Total	**4.53**	**2.09**	**P<0.05 Significant**

Unpaired t' test was calculated to analyze the effectiveness between control group and experimental group, post test score on Clinical parameters. The unpaired t' test total score was 4.53, when compared to table value (2.09) it was high. It seems that bronchial hygiene therapy was effective for Clinical parameters among Mechanically Ventilated Patients in experimental group than control group.

Table 9 Association between Control Group Posttest Scores and Demographic Variables of Clinical Parameters among Mechanically Ventilated Patients.

S.No	Demographic variables	Df	χ^2 Value	Table Value	Level of significance
1.	Age	2	1.32	3.84	p>0.05 Not significant
2.	Gender	1	0.7	3.84	p>0.05 Not significant
3.	Type of Intubation	2	1.35	3.84	p>0.05 Not significant
4.	Mode of ventilation	2	0.77	3.84	p>0.05 Not significant
5.	Associated condition	2	1.8	3.84	p>0.05 Not significant

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It reveals that there is no significant association between post test scores of control group when compared to age, gender, type of intubation, mode of ventilation and associated disease condition (P >0.05). Hence the difference observed in the mean score value was only by chance and not true difference. It seems that bronchial hygiene therapy was effective on clinical parameters to all Mechanically Ventilated Patients irrespective of their demographic variables.

Table 10 Association between Experimental Group Posttest Scores and Demographic Variables of Clinical Parameters among Mechanically Ventilated Patients

S.No	Demographic variables	Df	χ^2 Value	Table Value	Level of significance
1.	Age	2	1.3	3.84	p>0.05 Not significant
2.	Gender	1	0.7	3.84	p>0.05 Not significant
3.	**Type of Intubation**	2	2.58	3.84	p>0.05 Not significant
4.	Mode of ventilation	2	0.33	3.84	p>0.05 Not significant
5.	Associated condition	2	1.49	3.84	p>0.05 Not significant

Results show no statistically significant correlation between experimental group post-test scores and demographic variables such as age, gender, intubation type, ventilation mode, or comorbid diseases (P > 0.05). Consequently, the discrepancy in the mean score was due to random chance and not a genuine difference. It seems that all mechanically ventilated patients, regardless of demographic characteristics, benefited clinically from bronchial hygiene treatment

IV. DISCUSSION

The efficiency of the experimental group on various levels of clinical parameters was examined by calculating paired t-tests between their pre and posttest scores. Overall, the paired t test score was 14.31, which was high compared to the table value of 2.15. Clinical indicators among mechanically ventilated patients suggest that bronchial hygiene treatment was beneficial.

To compare the efficacy of control and experimental groups, as measured by posttest scores on clinical parameters, an unpaired t test was computed. Compared to the table value of 2.05, the unpaired t test total score of 4.53 was high. Clinical indicators among mechanically ventilated patients showed that bronchial hygiene treatment was more successful than control group

Chi square was calculated to determine association between the post test scores on clinical parameters among mechanically ventilated patients in experimental and control group with their demographic variables. When compared to demographic variable such as age, gender, intubation technique, ventilation mode, and comorbid diseases, it shows that the experimental group post test scores did not correlate significantly (P > 0.05).

V. CONCLUSION

In the control group, patients had an average posttest score of 14.53 ±0.28, or 70%, but in the experimental group, patients had an average posttest score 9.5 ± 2.04, or 45%. All mechanically ventilated patients benefited significantly from bronchial hygiene treatment, according to the paired t test (t = 9.8 and t = 14.31). Results from the post-test did not correlate significantly with demographic factors such as age, gender, intubation type, breathing mode, or comorbid medical conditions, according to a chi-square analysis.

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