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Effect of Using Multimodality Chest Physiotherapy on Myasthenia Gravis Patients' Clinical Outcomes

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Abstract: Background: Myasthenia gravis is a rare disease that affects the respiratory muscles with mechanical ventilator support. Multimodalities of respiratory therapies may reduce or prevent such those complications, thereby improving gas exchange and airway clearance. **Purpose:** To explore the effect of multimodality chest physiotherapy on myasthenia gravis patients' clinical outcomes. **Design:** A quasi-experimental research design was utilized. **Sampling:** A purposive sample of 80 adult patients were selected. Patients are equally divided into A: control and B: intervention groups. **Setting:** The study was conducted at Neurological Intensive Care Units at Tanta University Hospital. Instruments: One instrument was used to collect data and it consisted of 4 parts. **Results:** No significant relation between both groups in relation to demographic data and clinical data. Mean of respiratory rate in the group A increased from 1st d to 7th d with a significance difference (p <0.001). In the group B, the mean of respiratory rate was decreased to 21.0±2.13 in the 7th d at significance difference (p <0.001). Regarding oxygen saturation, the mean of Spo2 in group A in 7th d was 89.95±16.80, while in the group B was 95.95±16.80 at significance difference (<0.001). **Conclusion:** In myasthenia gravis patients, multimodality chest physical therapy aided to improve respiratory status and oxygenation parameters. **Recommendations:** Health education should be provided to nurses about use of a manual chest vibrating device and other chest physiotherapy procedures.

Keywords: *Chest physiotherapy, multimodalities, myasthenia gravis, ICU, critical ill patients.*

Introduction

An uncommon kind of autoimmune-based neuromuscular illness described myasthenia gravis (MG) which affects the muscles. Thomas Willis was the first to describe this unusual condition. It is an acquired autoimmune disease. It affects muscle from ocular muscle to respiratory muscle. The pathological cause is due to antibodies that directed work against the acetylcholine receptor. The diagnosis is difficult due to differentiate symptoms but the most common is weakness and excessive muscle fatigue (Kwiatkowski, 2018). Patients with MG suffer from increased skeletal muscle weakness and fatigue throughout the day. It can vary from patient to patient, generalized to localized, more proximal to distal. Respiratory muscle affected due to decrease respiratory volume and total lung capacity, decreased respiratory muscle strength and endurance due to rapid shallow breathing at rest or exercise. Weakness in respiratory muscle caused dyspnea and intolerance (Mohamed et al., 2022; Sinha & Singh, 2022). The underline pathophysiology of myasthenia gravis is antibody-mediated autoimmune disease, which is an example of a class II hypersensitivity reaction, as IgG autoantibodies. Acetylcholine receptors impaired due to attack of autoantibodies (Dresser et al., 2021).

Myasthenia gravis can produce respiratory muscle weakening in up to 40% of patients, which can lead to respiratory failure and the need for mechanical ventilation (Sinha & Singh, 2022). To enhance functional independence, minimize secondary medical comorbidities, avoid or limit deformities, and promote social integration, patients with MG need comprehensive rehabilitation (Corrado et al., 2021). Patients must frequently engage in both passive and active range-of-motion exercises for their limbs, as well as passive stretching exercises that contribute to the strength of their soft tissues and deep breathing and diaphragmatic exercises that guard against respiratory difficulties (Sinha & Singh, 2022). Freitag et al. (2018) reported that respiratory training has a significant impact in alongside usual therapy, and that it is practicable and effective for patients with varying degrees of MG. Breathable exercise is needed to enhance the standard of life of MG patients, and more research is needed. (Gilhus, 2021; Huttunen, 2021).Patients on mechanical ventilators are substantial risk for respiratory complications such as atelectasis, pneumonia, pleural effusion, and infection. These complications increase secretions and decrease lung compliance that directly affect respiratory muscle tone and lung parenchyma. These complications increase morbidity and mortality as well as ICU length of stay. Multimodalities of respiratory therapies may reduce or prevent such those complications, improve gas exchange, airway clearance. A member of this interdisciplinary team is a nurse (Goñi-Viguria et al., 2018). Chest physiotherapy has been regarded as an essential component of respiratory care for patients on mechanical ventilation in the critical care unit (Chiscano-Camón et al., 2022).

Chest physiotherapy is understood to be an essential part of respiratory care in all critically sick patients requiring mechanical ventilation, even in the absence of primary or severe lung disease (Spapen et al., 2017). Respiratory physiotherapy refers to a variety of methods that encourage lung expansion, remove airway secretion, improve ventilation perfusion mismatching, clear of airway secretions, and facilitate the removal of retained secretions (Pozuelo-Carrascosa et al., 2018; Spapen et al., 2017). Several methods are utilized to enhance the ventilation including the difficulty of the expectoration depending on the amount of cooperation of the patient. For patients on mechanical ventilation, chest physiotherapy is safe and economical. Changes in posture, postural drainage, suction, humidification, manual hyperinflation, and chest vibration are some of the techniques used in this method (Gupta, 2018; Morrow, 2019). There is no proof that individuals with myasthenia gravis should do routine or conventional respiratory physiotherapy to prevent respiratory complications. According to Pozuelo-Carrascosa et al (2018), mechanical ventilator patients who received multimodality respiratory physiotherapy had a lower death rate, fewer respiratory problems, and shorter lengths of stay.

Significance of study:

Myasthenia gravis (MG) is a rare neurological disease affecting 0.3 to 2.8 people per 100,000 globally. Yet, there is still a care gap in this condition since patients frequently have an arbitrary clinical course, namely stability, remission, relapse, and aggravation, and may need to wait years for a correct diagnosis (Jiang et al., 2023). Chest physiotherapy using many modalities is a comprehensive method that integrates different techniques. Chest physiotherapy enhanced respiratory functions and muscle weakness, the death rate of MG has decreased significantly (Dresser et al., 2021). Despite being an important part of myasthenia gravis patient treatment, but there were few scientific clinical trials that could identify the best strategy for minimizing or avoiding respiratory compromise. It is hoped that this study would draw attention to the need for guidelines for treating such patients to improve the standard of care and lower morbidity and death (A Askar et al., 2022). Therefore, we aimed at determining the effect of using multimodality chest physiotherapy on myasthenia gravis patients' clinical outcomes.

Materials and Method

Purpose:

This study aimed at exploring the effect of multimodality chest physiotherapy on myasthenia gravis patients' clinical outcomes.

Operational definition:

- **Multimodalities chest physiotherapy** refer to conventional chest physiotherapy plus mechanical chest vibration including performing tracheal suctioning, manual hyperinflation, positioning, postural drainage, chest percussion, and chest vibration from admission to seven observational days. It will be assessed using Part 4 of instrument one namely Multimodality chest physical therapy care observation checklist.

- **Patients' clinical outcomes** refer to signs and symptoms of respiratory distress, oxygenation parameters, cognitive function, ICU length of stay, body mass index, and end tidal carbon monoxide (Etco2) readings, oxygenation parameters, Horowitz index, and rapid shallow breath index using part 2 of instrument one.

Research design:

A Quasi-experimental research design was employed.

Setting:

The study was performed at neurological intensive care units at Tanta university hospital contain 4 rooms, each room consisted of 10 beds. These units receive patients with different neurological conditions including stroke, neuromuscular disorder, and post operative neurological surgery.

Sampling:

A purposive sample of 80 adult patients who were diagnosed with myasthenia gravis patients were included. The total population was 269 over the last 6 months. The calculated sample size based on G. power analysis was 80. Population proportion 50%, margin of error 5%, and confident level 95%.

x = Z(c/100)2r(100-r)

n = N x/((N-1)E2 + x)

E = Sqrt[(N - n)x/n(N-1)]

Where N is the population size, r is the fraction of responses that you are interested in, and Z(c/100) is the critical value for the confidence level c.

Exclusion criteria:

Patients who hemodynamic instability, contraindication for chest physiotherapy such as chest trauma, spinal cord injury, hypertension, pulmonary embolism, and empyema.

Instrument:

One instrument was developed by the researcher based on pertinent literature (Kechichian et al., 2022; Kwiatkowska, 2018; Pattanshetty & Gaude, 2010; Pozuelo-Carrascosa et al., 2018). It included four parts. Part 1 was used to assess a patient's demographic and clinical characteristics. Age, gender, history, severity of illness using SOFA, Apache II score and used medications were assessed. Part 2 included vital signs, level of consciousness using Glasgow coma scale and ventilation parameters were assessed. The total score classified as 15–13 conscious, 12–8 semiconscious, and less than 8 unconscious on the Glasgow Coma Scale. Respiratory pattern, rhythm, and abnormal breathing sounds were included. Oxygenation parameters such as PH, SaO2, and PaO2. Laboratory investigations such as hemoglobin and white blood count were involved. Part 3, the patient's clinical outcomes included signs and symptoms of respiratory distress, oxygenation parameters, cognitive function using Richmond Agitation-Sedation Scale (RASS), ICU length of stay, body mass index, and end tidal carbon monoxide (Etco2) reading. Hypoxic index, Horowitz index, and quick shallow breath index were among the oxygenation measurements. Multimodality chest physical therapy care observation checklist for the part 4. It includes chest percussion, chest vibration, postural drainage, tracheal suctioning, manual hyperinflation, positioning, and tracheal suctioning. Each task received a score of one if completed and zero if not.

Validity and reliability:

The tool was developed by a researcher. The content validity was done after reviewing 5 panels of expert in the field of study. The necessary modifications were made. The reliability of tool was done using Cronbach Alpha reliability; it was 0.84 which is acceptable.

Pilot study:

A pilot study was done on 10% of the study population, the needed modifications were done.

Procedure:

The hospital director received a letter from the dean of Tanta University's faculty of nursing outlining the goals and procedures for gathering data. Ethical approval from the faculty of medicine ethical committee Tanta university was obtained. After explanation aim of the study, administrative authorities were obtained to conduct the study. Data collection starting from March 2023. The research included every patient with a myasthenia gravis diagnosis. Patients in the control group are distributed equally: A and the intervention team B. 40 patients approximately per group.

Group A was assessed for routine chest physiotherapy care used in the unit using multimodality chest physiotherapy care observation checklist. Group B were subjected to multimodalities chest physiotherapy including tracheal suctioning, manual hyperinflation, positioning, postural drainage, chest percussion, and chest vibration. Tracheal suction was done according to patients needs after respiratory assessment. The color and consistency of section were assessed. Tracheal suctioning with hyperinflation O2 100% was done after percussion and mechanical vibration. Changing position was done every two hours with elevated head of bed.

Chest vibration was done twice throughout consecutive 7 observations days at morning and night shift using Presens Chest Vibrator device and each session last for 20-30 min. It is characterized by 200 - 240 Voltage and 50 - 60 Hz frequency. Chest percussion manual using cupped hand anterior, posterior, lateral for 3-5 min followed by chest vibration. Patients placed on postural drainage positions according to affected lung during percussion and mechanical vibration to promote drainage of the lung segment. Postural drainage positions were provided based on the region of concern to increase lung segment evacuation by getting a favourable gravity influence on mucus flow, so that tapping, vibration treatment, and suction therapy could be performed quickly and efficiently. A manual resuscitation bag was used to perform the manual hyperinflation procedure. Squeezing the bag entirely for 3-5 seconds during inspiration and returning passively during expiration. The operation was done 5 times at a rate of 8-13 b/min.

Both groups were assessed for clinical outcomes using tool one part three. Signs and symptoms of respiratory distress, oxygenation parameters, cognitive function, ICU length of stay, body mass index, and end tidal carbon monoxide (Etco2) readings were assessed throughout the observation days. Oxygenation parameters included partial pressure of oxygen level, Horowitz index (Pao2/Fio2), and rapid shallow breath index (frequency/tidal volume) were assessed throughout the observational days.

Statistical analysis of the data: The computer was loaded with data, and Data was entered into IBM SPSS software version 23.0 and was used to analyze data. Kolmogorov-Smirnov test was utilized. Mean and standard deviation were used to describe quantitative data. The Chi-square test (Monte Carlo or Fisher Exact) was used to compare groups for categorical variables. Student t-test was used for comparisons between means and standard deviation. The correlation between properly distributed quantitative variables was determined using the Pearson coefficient. The acquired results' significance was determined at the 5% level.

Ethical consideration:

Ethical approval from the Faculty of medicine ethical committee Tanta University was obtained (approval code 36264PR144/3/23). After explanation aim of the study, administrative authorities were obtained to conduct the study. The autonomy, confidentiality and privacy of data were assured. Patients had the right to refuse or withdraw from the study.

Results:

Table 1 illustrates that there is an insignificant relation between both groups according to demographic data and clinical data. The mean age of group A was 49.88±.60, and mean age of group B was 50.93±5.10. About 62.5% of group A and 60.0% of group B were males. History of neurological disorders were found in 30.0% of group A and 35.0% of group B. About 85.0% of patients in group A received bronchodilators and prophylactic antibiotics. About 92.5% of group B also received prophylactic antibiotics. The SOFA score of group A was 17.48±3.09, while group B was 17.70±3.28. Regarding the duration of hospitalization, there was no statistically significant difference between the two groups.

Figure 1:- show comparison between multimodalities utilization in the two groups throughout observation days. Tracheal suction was more utilized for both B and A groups. Changing position was also conducted for in both groups B, which was 100 and A 90%. Chest percussion was done for 35% group A and 100% group B.

Additionally, chest vibration was conducted for 20% of group A and 100% of group B. Manual inflation and posture drainage were not demonstrated in group A.

Table 2:- illustrates comparison between both groups in relation to different clinical assessment parameters. Regarding vital signs, it was found that there was no significant difference between the two groups in the 7th d in relation to heart rate and mean arterial pressure (p= 0.365, 0.114, orderly). On the other hand, the mean of respiratory rate was increased in the group A (p <0.001). In group B, the mean respiratory rate was decreased to 21.0±2.13 in the 7th d at significance difference (p <0.001). In relation to temperature, the temperature in group A increased (38.88±0.50) in the 7th d at significance difference (0.029). Temperature readings had showed a statistical significance difference between two groups in the 7th d (p <0.001). The mean of Glasgow coma scale in group A was 9.53±1.91, while in group B was 11.50±2.01 at statistical significance difference (0.029).

The mean of partial pressure of carbon monoxide in the group A was also 45.60±3.99 and in the group B was 40.60±3.99 at significance difference (p<0.001). Regarding oxygen saturation, the mean of Spo2 in group A in the 7th d was 89.95±16.80, while in group B was 95.95±16.80 at statistical significance difference (<0.001). There was a very highly statistically significant difference between the 1st and 7th d in group A regarding the white blood count (<0.001). In the 7th d, the breath rhythm in group A was significant difference in the group B at level of significance (0.007). Additionally, there was a highly statistical significant difference between the A and B group in relation to breathing sound in the 7th d (p= 0.011).

Table 3:- illustrates comparison between both groups according to ventilator data. There was no significant difference between the two group in relation to ventilator mode (p=0.130), tidal volume (0.123), vital capacity (0.259), positive end-expiratory pressure PEEP (0.368), Fio2 (0.268), peak air way pressure (0.269). Regarding minute ventilation, there was a statistically significant difference between the two groups (p= 0.003).

Table 4:- illustrates comparison between the two studied groups according to patient clinical outcomes. It was found that there was a very highly statistical significance difference than groups B and A in the 7th d toward restlessness (<0.001), use of accessory muscles (0.032), and diaphoresis (<0.001). The mean of PaO2 in group A was 95.88±2.0 and became 90.15±4.27 in the 7th d while, in group B was 95.63±1.25 and become 95.38±1.22 in the 7th d. There was a very highly statistically significant difference between the two groups in the 7th d (<0.001). The mean of Horowitz index was 291.25±71.51 in group A and was 323.75±62.0 in group B in the 7th d with a statistical significance difference (0.033). The mean of rapid shallow breath index in group A was 108.88±5.91, while in

group B was 105.33±6.96 in the 7-observation day. Regarding the level of agitation, there was a statistically significant difference between both groups in relation to RASS scale in the 7th d (0.008). Mean duration of hospitalization of group A was 15±18 and was 20±25 for group B at significance difference (0.032). The mean of end tidal CO reading in group A was 45.78±2.99 in the 7th d, while in the group B was 39.48±3.40 with a very highly statistical significance difference (<0.001).

Figure 2 shows the relationship between the number of multimodalities nursing B and ICU length of stay. There was moderate negative correlation between number of multimodalities nursing interventions and duration of ICU hospitalization (p<0.001, r=-0.690).

Figure 3 indicates the relationship between the number of multimodalities nursing B and SOFA score. There was moderate negative correlation between number of multimodalities nursing interventions and SOFA score (p<0.001, r=-0.690).

Table (1): Comparison between the studied groups according to demographic and clinical data:

Parameters	Group A (n = 40)		Group B (n = 40)		Test of Sig.	p
	No.	%	No.	%		
Age						
Mean ± SD	49.88±.60		50.93 ± 5.10		t = 1.063	0.291
Sex						
Male	25	62.5%	24	60.0%	c^2=2.581	0.108
Female	15	37.5%	16	40.0%		
Health history						
Respiratory	6	15.0%	3	7.5%	c^2= 2.263	0.515
Cardiovascular	6	15.0%	7	17.5%		
Renal	9	22.5%	5	12.5%		
GIT	7	17.5%	11	27.5%		
Neurological	12	30.0%	14	35.0%		
Medication*						
Bronchodilators	34	85.0%	28	70.0%	c^2=2.581	0.108
Prophylactic antibiotics	34	85.0%	37	92.5%	c^2=1.127	0.481
ACEI	31	77.5%	33	82.5%	c^2= 0.313	0.576
SOFA	17.48±3.09		17.70±3.28		t =0.316	0.753
APACH II score	39.53±13.89		41.13±12.73		t =0.537	0.593

χ^2: Chi square test t: Student t-test *muti-response

Figure (1): Comparison between Multimodalities Utilization in the two groups throughout observation days.

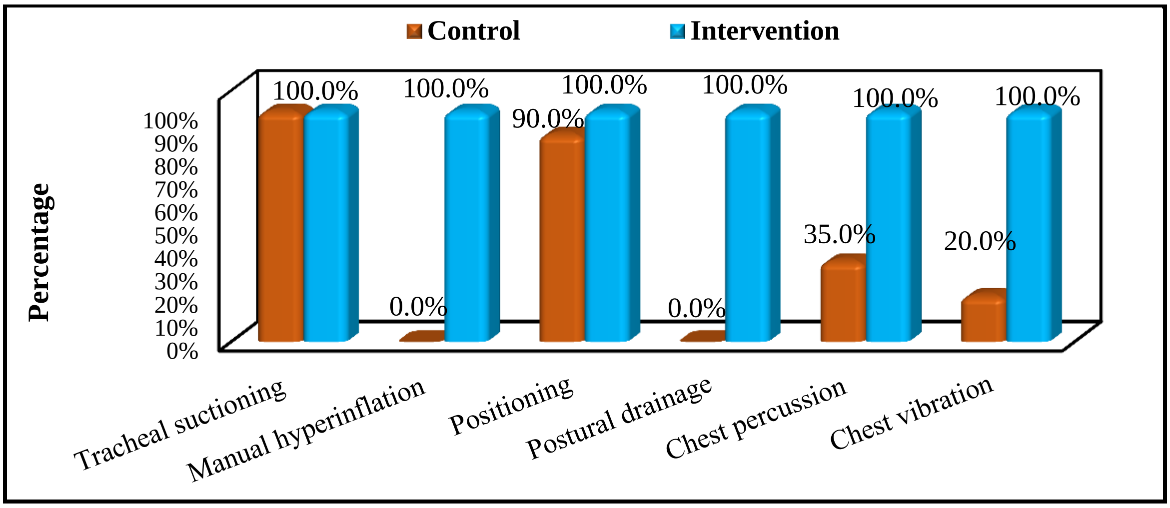


Table (2): Comparison between both studied groups according to different clinical assessment parameters:

Parameters	Group A (n = 40)					Group B (n = 40)					$t_2(p_2)$ A vs B	
	First		Seven		$t_1(p_1)$	First		Seven		$t_1(p_1)$	First	Seven
Hemodynamic parameters												
Heart rate	86.40±22.90		87.88±21.90		0.818 (0.418)	88.83±23.02		87.85±17.36		0.395 (0.695)	0.472 (0.638)	0.911 (0.365)
MAP	77.13±18.0		77.35±19.76		0.340 (0.125)	74.13±17.09		72.75±17.02		0.395 (0.695)	0.764 (0.447)	1.600 (0.114)
Respiratory rate	29.43±3.40		32.0±4.15		8.634* (<0.001*)	26.33±3.30		21.0±2.13		7.634* (<0.001*)	0.472 (0.638)	8.029* (<0.001*)
Temperature	37.82±0.46		38.88±0.50		2.223* (0.029*)	37.53±0.25		37.58±0.50		0.395 (0.695)	0.472 (0.638)	5.078* (<0.001*)
Level of consciousness	10.28±1.62		9.53±1.91		2.223* (0.029*)	10.60±1.69		11.50±2.01		8.029* (<0.001*)	0.878 (0.382)	2.223* (0.029*)
Oxygenation parameters												
PH	7.18±0.27		7.35± 0.0		1.778 (0.083)	7.28±0.27		7.35± 0.0		1.778 (0.083)	0.472 (0.638)	0.462 (0.627)
PaCo2	38.70±4.22		45.60±3.99		7.020* (0.001*)	38.50±4.22		40.60±3.99		3.020* (0.004*)	0.878 (0.382)	4.088* (<0.001*)
SPO2	94.33±9.27		89.95±16.80		5.811* (<0.001*)	94.98±9.87		95.95±16.80		3.500* (0.001*)	0.524 (0.603)	7.634* (<0.001*)
HCO3	27.50±5.89		26.83±4.49		1.027 (0.388)	27.50±5.89		27.73±4.29		1.077 (0.287)	0.120 (0.905)	0.472 (0.638)
Laboratory investigation												
WBC in Cmm.	11550±2123		13375±1580		5.811* (<0.001*)	11580±2233		11275±1380		0.878 (0.382)	0.472 (0.638)	0.472 (0.638)
Potassium	4.58±1.20		4.28±1.20		0.472 (0.638)	4.25±0.98		4.30±0.55		0.120 (0.905)	0.878 (0.382)	0.120 (0.905)
Respiratory rhythm	No.	%	No.	%	p_1	No.	%	No.	%	p_1	$c^2{}_2(p_2)$	
Regular	19	47.5	22	55.0%	<0.001*	18	45%	24	60.0%	<0.001*	0.472 (0.638)	2.760* (0.007*)
Irregular	21	52.5	18	45.0%		22	55%	16	40.0%			
Auscultation of breath sounds:												
Normal	10	25.0%	6	7.5%	<0.001*	12	30.0%	10	25.0%	<0.001*	0.463 (0.647)	2.656* (0.011*)
Wheezes	20	50.0%	22	55.0%		18	45.0%	20	50%			
Crackles	10	25.0%	12	30.0%		10	25.0%	10	25.0%			

t_1 (p_1): Paired t-test for comparing between first and Seven day in each group. $t_2(p_2)$: Student t-test fp_2: p value for Marginal Homogeneity Test for comparing between first and Seven day in each group.
$\chi^2 p_2$: Chi square test *: $p \leq 0.05$.

Table (3): Comparison between both studied groups according to relation to mechanical ventilator data:

Ventilator data	Group A (n = 40)		Group B (n = 40)		Test of Sig.	p
	No.	%	No.	%		
Mode						
Pressure control	9	18.5%	7	17.5%	2.296	0.130
SIMV	11	27.5%	13	32.5%		
Assist control	11	27.5%	11	27.5%		
Spontaneous	9	22.5%	9	22.5%		
Tidal volume	456.0± 39.54		446.0±39.54		t = 0.230	0.123
Vital capacity	63.38±3.95		64.38±3.95		t = 0.256	0.259
PEEP	5.13±5.72		5.10±5.72		t = 0.269	0.368
Fio2	60.20±4.76		60.28±5.76		t = 0.358	0.268
Minute ventilation	11.27± 0.92		9.23± 0.32		t = 2.268	0.003*
Peak air way pressure	32.58±8.98		33.58±8.97		t = 0.278	0.269

χ^2: Chi square test t: Student t-test

Table (4): Comparison between both studied groups according to patient clinical outcomes:

Parameters	Group A (n = 40)					Group B (n = 40)					$c^2(p_2)$ A vs B	
	First		Seven		p_1	First		Seven		p_1	First	Seven
Patient clinical outcomes:	**No.**	**%**	**No.**	**%**		**No.**	**%**	**No.**	**%**			
S&S of Respiratory distress												
Restlessness	31	77.5%	30	72.5%	0.157	36	90.0%	31	77.5%	<0.001*	2.296 (0.130)	18.061* (<0.001*)
Use of accessory muscles	28	70.0%	13	32.5%	<0.001*	35	87.5%	10	25.0%	<0.001*	3.660 (0.056)	4.588* (0.032*)
Diaphoresis	31	77.5%	27	67.5%	0.045*	36	90.0%	10	25.0%	<0.001*	2.296 (0.130)	14.532* (<0.001*)
Oxygenation index					**t1(p1)**					**t1(p1)**	**t2(p2)**	
Partial pressure of O2 (PaO2)	95.88±2.0		90.15±4.27		11.278* (<0.001*)	95.63±1.25		95.38±1.22		0.480 (0.634)	0.669 (0.506)	6.296* (<0.001*)
Horowitz index	263.75±68.86		291.25±71.51		6.297* (<0.001*)	303.75±63.44		323.75±62.0		4.639* (<0.001*)	2.702* (0.008*)	2.172* (0.033*)
Rapid shallow breath index	114.20±5.86		108.88±5.91		10.835* (<0.001*)	112.80±6.22		105.33±6.96		11.389* (<0.001*)	1.036 (0.304)	0.679 (0.506)
Cognitive function											$c^2(p_2)$	
RASS scale	**No.**	**%**	**No.**	**%**	p_1	**No.**	**%**	**No.**	**%**	p_1		
0	0	0.0	1	2.5%	<0.001*	0	0	5	12.5%	0.002*	9.493* (0.006*)	12.049* (0.008*)
+1 or -1	31	77.5%	15	37.5%		20	50.0%	18	45.0%			
+2 or -2	9	22.5%	14	35.0%		14	35.0%	10	25.0%			
+3 or -3	0	0.0%	10	25.0%		6	15.0%	7	17.5%			
ICU stay	25±18					20±25					4.588* (0.032*)	
End Tidal CO2	43.05±3.37		45.78±2.99		11.475* (<0.001*)	43.22±3.37		39.48±3.40		18.263* (<0.001*)	0. 568 (0.258)	8.803* (<0.001*)

t_1 (p_1): Paired t-test for comparing between first and Seven day in each group. $t_2(p_2)$: Student t-test
p_2: p value for Marginal Homogeneity Test $\chi^2 p_2$: Chi square test

Figure (2): Relationship between the Number of multimodalities nursing and ICU length of stay among the studied group.

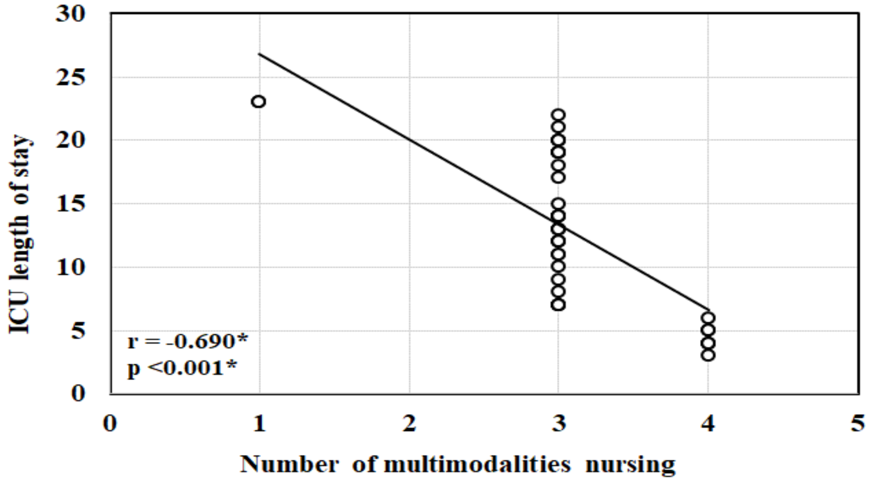
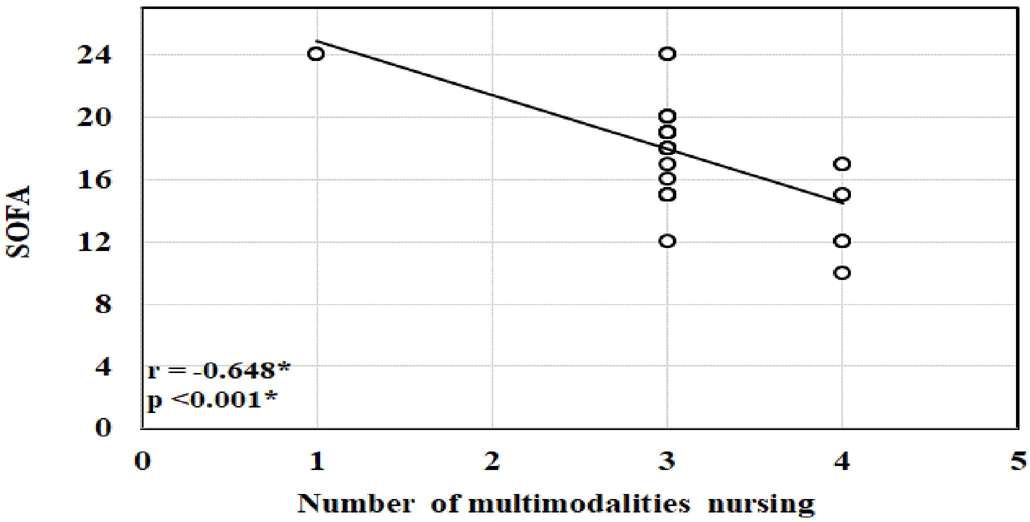


Figure (3): Relationship between the number of multimodalities nursing and SOFA score among the studied group.



Discussion:

Chest physiotherapy is a part of bronchial hygiene. Immobility, hospitalization, and inflammation all contribute to pneumonia, decreased lung compliance, and higher airway resistance during a critical illness. These illnesses cause the respiratory system to fail, the respiratory muscles to weaken (Lottering & Van Aswegen, 2016). Patient diagnosed with myasthenic crisis are more risk for respiratory musculature weakness, which can quickly deteriorate into respiratory distress and aspiration. Exacerbation requires immediate medical attention (Schroeter et al., 2018). The optimal care for respiratory function improves quality of life and survival in myasthenia gravis patients (Diebold, 2018; Hsu et al., 2020).

This study results revealed that the more than half of the control and intervention patients were males. Neurological diseases were the most common health history found in both groups. There was no significance difference between both groups in relation to age, sex, past medical history, administered medications, and severity illness scores.

When compared to group A, which got standard hospital treatment, the mean scores for respiratory rate and temperature were statistically considerably better in group B, which was allocated to the multimodalities chest physiotherapy. This may be understood by the fact that group B received multimodal chest physiotherapy over the course of the 7 observational days, which facilitated airway clearance and reduced the risk of lung infection. Respiratory issues are the main cause of mortality in people with myasthenia gravis. These issues were brought on by weakened inspiratory and expiratory muscles as well as bulbar muscle dysfunction, which resulted in inadequate airway protection, wheezing, and hypoventilation (Diebold, 2018).

On the 7th observation day, group B performed substantially better than group A in terms of peripheral oxygen saturation and partial pressure of carbon dioxide in relation to breathing and oxygenation parameters. Additionally, during the 7 observation days, group B patients' degree of consciousness increased more than it did for the control group.

Moreover, it was discovered that group A's white blood cell count was greater than the baseline data, which suggested the existence of infection among patients in group A. The 1st and 7th observation days' respiratory assessment results showed a significant difference between the two groups. Group A had more incidence for irregular breath than group B. Due to the quickly progressing nature of their diseases, patients with neuromuscular disorders including Guillain-Barre syndrome and myasthenia gravis require constant nursing care. In these patients, respiratory infections have the potential to be lethal, necessitating prompt nursing care (Diebold, 2018). There was significant change between both groups in relation to presence of irregular breathing pattern and abnormal breathing pattern were found in the 1st and 7th d. This findings in line with Own et al (2020) who reported that intervention group received multimodalities chest physiotherapy had normally respiratory findings during assessment and decreased recurrence of tachypnea after chest physiotherapy. This can be due to ability to remove retained secretions, better breathing and lower airway resistance, and improved lung compliance as well as respiratory condition. The ventilatory muscles determine mechanical loads based on minute ventilation, airway resistance, and lung compliance. Ventilatory muscle failure led to hypoventilation and inability to meet respiratory demand (Webb & Macintyre, 2016). This can also interpreted due to patients with myasthenia gravis have weak respiratory muscles that lead to respiratory failure because of alveolar hypoventilation, deteriorating respiratory muscle fatigue, and the existence of micro atelectasis in the bases of the lungs (Diaz-Abad et al., 2019).

Throughout the observation days, group B displayed less respiratory distress symptoms than group A, including diaphoresis, restlessness, and the use of auxiliary muscles. This could be help ventilated patients to eliminate retained or excessive airway secretions is to reduce airway resistance, increase lung compliance, and lessen the effort required to breathe (Spapen et al., 2017).

Concerning the oxygenation indices, these findings exhibit that group A had a statistically significant decrease in the partial pressure of oxygenation in the 7th d than the 1st observation day. While, in group B, there was not a statistically significant difference between the 1st and 7th observation day. In relation to rapid shallow breath index. Meawad et al. (2018) also supported our findings that oxygenation indices e.g., PaO2 had improved throughout three observation days which supported role of chest physiotherapy in increasing PaO2.

In relation to the level of agitation, group B had a decrease in level of agitation than group A in the 7-observation day. For the duration of hospitalization in ICU, patients in group B spent much less time in the ICU overall than those in group A, according to statistics. The current study in line with Rizvi et al (2020) reported that the duration of mechanically ventilated patients' stays and the likelihood of respiratory infections were both dramatically reduced by passive chest physiotherapy that comprised body posture, percussions, and suctioning. End Tidal CO2 data revealed a statistically significant rise in group A on the last observation day, but a statistically significant drop-in group B on the seventh observation day.

There was a negative link between the number of modalities used and the number of ICU days, as well as between those two variables and the mean SOFA score. Aupetitallot & Franco, (2021) reported that physiotherapist therapies focused on strengthening muscles improve sufferers' functional abilities in myasthenia gravis.

Chest physiotherapy improve respiratory muscle weakness respiratory failure management in patients with MG, has shown to be an extremely successful approach (Corrado et al., 2020).

Mean duration of hospitalization of group A was decreased compared to group B at significance difference. Ahmed Sayed & Galal Sayed (2020) reported that the length of stay in the ICU was significantly reduced in the study group with the use of multiple chest physiotherapy modalities. The studies used these modalities because they were crucial in reducing respiratory tract secretion accumulation, improving lung compliance, preventing lung adverse effects, and preventing breathing and peripheral muscle weakness.

Wang et al. (2019) found that the incidence of ventilator associated pneumonia did not reduce by chest physiotherapy only, but multimodality chest physiotherapy may be an substitute respiratory rehabilitation program in ventilator patients based on individualized approach. Younes et al (2022) was also reported that using multimodality chest physiotherapy interventions had better effect on reduce risk for pneumonia, and improve oxygenation. In order to promote sputum clearance and improve oxygenation in ventilated patients, combining manual hyperinflation and ventilatory muscle endurance exercises with chest physical therapy may be beneficial (Ibrahim & Mohamed, 2018). The limited sample size of the current study, which may be caused by the neurological condition myasthenia gravis, is a summary of its limitations.

Conclusion:

From the study's findings, it can be inferred that adopting multimodality chest physiotherap benefits myasthenia gravis patients' respiratory health, oxygenation parameters, and risk for respiratory problems.

Recommendations:

The nursing staff should know when to use a manual chest vibrating device and other chest physiotherapy techniques, depending on the patient's health. Training programs must be developed to help nurses to known the benefits, limitations, and ideal ways to use artificial chest vibration devices. There should be enough manually operated chest vibration machines available at medical institutions. Chest physical therapy is seen to be an essential part of the multidisciplinary team in myasthenia gravis, although further research trials are needed to fully examine its cost effectiveness.

References:

A Askar, A., F. Abdalla, K., F. Marzouk, S., & H. Bakr, Z. (2022). Different Respiratory Modalities among Patients undergoing Cardiac Surgeries regarding Post-Operative Pulmonary Complications Rate: Comparative Study. Egyptian Journal of Health Care, 13(4), 1050–1059. https://doi.org/10.21608/ejhc.2022.266531

Ahmed Sayed, Z., & Galal Sayed, I. (2020). Effect of Multimodality Chest Physiotherapy on Extubation and Critically Ill Mechanically Ventilated Patients Outcomes. Egyptian Journal of Health Care, 11(2), 775–788. https://doi.org/10.21608/ejhc.2020.195793

Aupetitallot, V., & Franco, A. B. (2021). Effects of Physical Exercise on Functional and Respiratory Capacity, Quality of Life, and Fatigue Perception in Myasthenia Gravis Patients: A Systematic Review. Critical Reviews in Physical and Rehabilitation Medicine, 33(1), 87–101. https://doi.org/10.1615/CritRevPhysRehabilMed.2021037593

Chiscano-Camón, L., Ballesteros-Reviriego, G., Ruiz-Rodríguez, A., Planas-Pascual, B., Pérez-Carrasco, M., Gómez-Garrido, A., Contreras, S., Spiliopoulou, S., & Ferrer, R. (2022). Impact of Early Mobilization Added to Respiratory Physiotherapy Postextubation on Weaning Success. Archivos de Bronconeumologia, 58(6), 523–525. https://doi.org/10.1016/j.arbres.2022.03.002

Corrado, B., Di Luise, C., & Servodio Iammarrone, C. (2021). Management of Muscle Spasticity in Children with Cerebral Palsy by Means of Extracorporeal Shockwave Therapy: A Systematic Review of the Literature. Developmental Neurorehabilitation, 24(1), 1–7. https://doi.org/10.1080/17518423.2019.1683908

Corrado, B., Giardulli, B., & Costa, M. (2020). Evidence-based practice in rehabilitation of myasthenia gravis. A systematic review of the literature. Journal of Functional Morphology and Kinesiology, 5(4). https://doi.org/10.3390/JFMK5040071

Diaz-Abad, M., Todd, N., Zilliox, L., Sanchez, A., & Hafer-Macho, C. (2019). Use of noninvasive ventilation with volume-assured pressure support for treatment-refractory myasthenia gravis. Innovations in Clinical Neuroscience, 16(11–12), 11–13.

Diebold, D. (2018). Ventilatory Management in Neuromuscular Disease. In Clinical Handbook of Neuromuscular Medicine (pp. 183–189). Springer International Publishing. https://doi.org/10.1007/978-3-319-67116-1_9

Dresser, L., Wlodarski, R., Rezania, K., & Soliven, B. (2021). Myasthenia Gravis: Epidemiology, Pathophysiology and Clinical Manifestations. Journal of Clinical Medicine, 10(11), 2235. https://doi.org/10.3390/jcm10112235

Freitag, S., Hallebach, S., Baumann, I., Kalischewski, P., & Rassler, B. (2018). Effects of long-term respiratory muscle endurance training on respiratory and functional outcomes in patients with Myasthenia gravis. Respiratory Medicine, 144, 7–15. https://doi.org/10.1016/j.rmed.2018.09.001

Gilhus, N. E. (2021). Physical training and exercise in myasthenia gravis. In Neuromuscular Disorders (Vol. 31, Issue 3, pp. 169–173). https://doi.org/10.1016/j.nmd.2020.12.004

Goñi-Viguria, R., Yoldi-Arzoz, E., Casajús-Sola, L., Aquerreta-Larraya, T., Fernández-Sangil, P., Guzmán-Unamuno, E., & Moyano-Berardo, B. M. (2018). Respiratory physiotherapy in intensive care unit: Bibliographic review. In Enfermeria Intensiva (Vol. 29, Issue 4, pp. 168–181). https://doi.org/10.1016/j.enfi.2018.03.003

Gupta, L. (2018). Physiotherapy for Respiratory Conditions. Advanced Nursing & Patient Care International Journal, 1(1).

Hsu, C. W., Lin, H. C., Tsai, W. C., Lai, Y. R., Huang, C. C., Su, Y. J., Cheng, B. C., Su, M. C., Lin, W. C., Chang, C. L., Chang, W. N., Lin, M. C., Lu, C. H., Tsai, N. W., & Bernardo-Filho, M. (2020). Respiratory Muscle Training Improves Functional Outcomes and Reduces Fatigue in Patients with Myasthenia Gravis: A Single-Center Hospital-Based Prospective Study. BioMed Research International, 2020. https://doi.org/10.1155/2020/2923907

Huttunen, J. K. (2021). Effects of Physical Exercise on Functional and Respiratory Capacity, Quality of Life, and Fatigue Perception in Myasthenia Gravis Patients: A Systematic Review Victoire. Critical ReviewsTM in Physical and Rehabilitation Medicine, 33(1), 87–101.

Ibrahim, A. A., & Mohamed, A. R. (2018). Effect of adding different physiotherapy modalities to standard chest physiotherapy for critical ill patients. Research Journal of Pharmaceutical, Biological and Chemical Sciences, 9(3), 144–152. https://www.embase.com/search/results?subaction=viewrecord&id=L622428783&from=export

Jiandani, M. P., & Patel, A. (2018). Cardiorespiratory Response to Chest Physiotherapy in Intensive Respiratory Care Unit. In International Journal of Health Sciences & Research (www.ijhsr.org) (Vol. 8, Issue 7, p. 159). www.ijhsr.org

Jiang, F., Su, Y., & Chang, T. (2023). Knowledge mapping of global trends for myasthenia gravis development: A bibliometrics analysis. Frontiers in Immunology, 14. https://doi.org/10.3389/fimmu.2023.1132201

Kechichian, A., Lafrance, S., Matifat, E., Dubé, F., Lussier, D., Benhaim, P., Perreault, K., Filiatrault, J., Rainville, P., Higgins, J., Rousseau, J., Masse, J., & Desmeules, F. (2022). Multimodal Interventions including Rehabilitation Exercise for Older Adults with Chronic Musculoskeletal Pain: A Systematic Review and Meta-analyses of Randomized Controlled Trials. In Journal of Geriatric Physical Therapy (Vol. 45, Issue 1, pp. 34–49). https://doi.org/10.1519/JPT.0000000000000279

Kwiatkowska, K. (2018). Physiotherapy in myasthenia gravis. Journal of Education, Health and Spor, 8(12), 1027–1038. https://doi.org/I http://dx.doi.org/10.5281/zenodo.3242665 http://ojs.ukw.edu.pl/index.php/johs/article/view/7008 The

Lottering, M., & Van Aswegen, H. (2016). Physiotherapy practice in South African intensive care units. Southern African Journal of Critical Care, 32(1), 11–16. https://doi.org/10.7196/SAJCC.2016.v32i1.248

Meawad, M. A., Abd El Aziz, A., Obaya, H. E., Mohamed, S. A., & Mounir, K. M. (2018). Effect of Chest Physical Therapy Modalities on Oxygen Saturation and Partial Pressure of Arterial Oxygen in Mechanically Ventilated Patients. The Egyptian Journal of Hospital Medicine, 72(8), 5005–5008. https://doi.org/10.21608/ejhm.2018.10278

Mohamed, R. A., Mohamed, E. S. H., Basiouny, M. A., Hamoda, I. M., Hanoura, E. S. M., Elhenedi, E. I., & Sherief, A. E. A. A. (2022). Effect of Two Different Rehabilitation Approaches on Pulmonary Functional Tests, Neuromuscular Functions and Quality of Life in Juvenile Myasthenia Gravis: A Randomized Controlled Trial Study. Medicina (Lithuania), 58(3). https://doi.org/10.3390/medicina58030374

Morrow, B. . (2019). Airway clearance therapy in acute paediatric respiratory illness: A state-of-the-art review. The South African Journal of Physiotherapy, 7(1), 12–15.

Own, D. G., Mohamed, N. T., ProfOsama Hassan, A. S., & ProfFatma Abd El-Fattah, A. R. (2020). Effect of Chest Percussion and Squeezing on Respiratory Status for Mechanically Ventilated Patients. In International Journal of Novel Research in Healthcare and Nursing (Vol. 7, Issue 3, pp. 119–130). www.noveltyjournals.com

Pattanshetty, R., & Gaude, G. (2010). Effect of multimodality chest physiotherapy in prevention of ventilator-associated pneumonia: A randomized clinical trial. Indian Journal of Critical Care Medicine, 14(2), 70–76. https://doi.org/10.4103/0972-5229.68218

Pozuelo-Carrascosa, D. P., Torres-Costoso, A., Alvarez-Bueno, C., Cavero-Redondo, I., López Muñoz, P., & Martínez-Vizcaíno, V. (2018). Multimodality respiratory physiotherapy reduces mortality but may not prevent ventilator-associated pneumonia or reduce length of stay in the intensive care unit: a systematic review. Journal of Physiotherapy, 64(4), 222–228. https://doi.org/10.1016/j.jphys.2018.08.005

Rizvi, N., Fahad, S. M., Rizvi, S., Syed, F. S., & Zaidi, S. (2020). Effectiveness of Passive Chest Physiotherapy in Prevention of Ventilator Associated Pneumonia in Sepsis. In Archives of Physiotherapy and Rehabilitation (Vol. 3, Issue 2, pp. 41–052).

Schroeter, M., Thayssen, G., & Kaiser, J. (2018). Myasthenia gravis - Exacerbation and Crisis. Aktuelle Neurologie, 45(4), 271–277. https://doi.org/10.1055/s-0043-118475

Sinha, B. K., & Singh, A. (2022). Myasthenia Gravis and its Physiotherapeutic Management. In Acta Scientific Microbiology (pp. 06–11). https://doi.org/10.31080/asmi.2022.05.1027

Spapen, H. D., Regt, J. De, & Honoré, P. M. (2017). Chest physiotherapy in mechanically ventilated patients without pneumonia-a narrative review. Journal of Thoracic Disease, 9(1), E44–E49. https://doi.org/10.21037/jtd.2017.01.32

Wang, M.-Y., Pan, L., & Hu, X.-J. (2019). Chest physiotherapy for the prevention of ventilator-associated pneumonia: A meta-analysis. American Journal of Infection Control, 47(7), 755–760. https://doi.org/10.1016/j.ajic.2018.12.015

Webb, A., & Macintyre, N. R. (2016). 91 Indications for mechanical ventilation.

Younes, S., Ahmed, N., Ahmed, I., & Hassan, E. (2022). Effect of Multimodality Chest Physiotherapy Interventions on Prevention of Ventilator Associated Pneumonia among Mechanically Ventilated Patients. Alexandria Scientific Nursing Journal, 24(1), 36–46. https://doi.org/10.21608/asalexu.2022.246005