Effect of Implementing Modified Valsalva Maneuver on Clinical Outcomes for Patients with Acute Supraventricular Tachycardia

[1]Gehan A. Younis, [2]Mahmoud M. Mohammed, [3]Raghda G. El-Sheikh, [4]Nagwa S. El-Ashmawy.

[1]Prof of Critical Care and Emergency Nursing, Faculty of Nursing, Tanta University.

[2] Demonstrator of Critical Care and Emergency Nursing, Faculty of Nursing, Tanta University.

[3] Prof of cardiology, Faculty of Medicine, Tanta University.

[4] lecture of critical care and emergency Nursing, Faculty of Nursing, Tanta University.

Corresponding author: Mahmoud.Morsy@nursing.tanta.edu.eg

Abstract

Background: Supraventricular tachycardia (SVT) is a common cause of emergency room visits. Modified Valsalva maneuver (MVM) is proven to be safe to some extent, effective in terminating SVT episodes and can be easily performed by critical care nurses. **Aim**: -This study aimed to evaluate the effect of modified Valsalva maneuver on clinical outcomes for patients with acute supraventricular tachycardia. **Design**: Quasi-experimental research design. **Setting: -** This study was conducted in cardiac emergency unit at Tanta Main University Hospital. **Subjects**: - A purposive sample of 80 patients diagnosed with acute supraventricular tachycardia divided into two equal groups, control group received routine care for reversion of SVT by cardiac nursing staff and study group managed by modified Valsalva maneuver with routine hospital care that implemented by the researcher. **Tools**: - Two tools were used in this study, **tool I** Supraventricular Tachycardia Patient's Assessment Tool and **tool II**. Patient's clinical outcomes included hemodynamic parameters assessment, electrocardiography (ECG) rhythm monitoring, and numeric rating scale for measuring nausea and modified Borg dyspnea scale. **Results:** Study group showed significant difference regarding hemodynamic parameters, heart rhythm, and severity of nausea and dyspnea throughout the periods of intervention. In addition, there was significant difference between control and study groups in relation to hemodynamic parameters and ECG rhythm, but it was not significant in relation to the severity of nausea and dyspnea. **Conclusions:** The present study's results suggest that modified VM therapy was more effective for terminating SVT. The modified VM therapy also indirectly reduced the need for anti-arrhythmic medication and decrease severity of nausea and dyspnea. **Recommendations: -** Modified Valsalva maneuver should carry out as first-line therapy for patients with stable SVT.

Key Words: Acute supraventricular tachycardia, Clinical outcomes, Modified valsalva maneuver

Introduction

Supraventricular tachycardia is a rhythm disturbance with a rate greater than 120-beats\ minute **(Olshansky et al., 2017).** Episodes of SVT attacks are often recurring and, if not properly recognized, can be life threatening. The most typical SVTs consist of atrioventricular nodal re-entrant tachycardia, atrioventricular re-entrant tachycardia and atrial tachycardia (atrial flutter and atrial fibrillation) **(Kotadia et al., 2020).**

The incidence of SVT is approximately 35 cases per 100,000 patients with a prevalence of 2.25 cases per 1,000 in the general population in USA, with a female predominance of 2:1 across all age groups (**Brugada et al., 2019**). Patients who arrive with episodes of SVT may describe symptoms. such as palpitation, dyspnea, chest pain, nausea, dizziness, and syncope, which similar to acute coronary syndrome manifestation **(Chen et al., 2023)**. The origin of abnormal SVT rhythms can be found in the atria or atrioventricular node.. They are generally due to one of two mechanisms: reentry or increased automaticity (**Al-Zaiti et al., 2016**). Diagnosis of SVT usually confirm by serial electrocardiogram (ECG), holter monitor, or event monitor. Blood tests may be performed to rule out specific underlying causes such as hyperthyroidism, pheochromocytomas , or electrolyte abnormalities as calcium and potassium **(Govender et al., 2022 &Kucia et al., 2022).** Management of SVT depends on the hemodynamic stability of the patient. If the patient is unstable (include hypotension, hypoxia, shortness of breath, chest pain, shock, evidence of poor end-organ perfusion, or altered mental status), synchronized cardioversion is recommended, while for hemodynamically stable patients, there are pharmacological and nonpharmacological methods for termination of regular SVT **(Chung et al., 2019 &Voerman et al., 2018).**

Pharmacological treatment of SVT includes anti- arrhythmic drugs such as intravenous adenosine, beta-blocker and calcium channel blockers. Nevertheless, the medication can cause side effects, as light-headedness, nausea, and feeling of impending doom, which have negative effect on the patient satisfaction **(Budhathoki et al., 2021).** One of the nonpharmacological methods for reversion of SVT in a stable patient is vagal maneuver, involving the Valsalva maneuver which activate the parasympathetic system. This slows impulse formation at the sinus node, slows conduction velocity at the AV node, lengthens the AV node refractory period, and decreases ventricular inotropy **(Patti &Ashurst, 2023).**

Valsalva maneuver is performed safely and involve expiratory effort against a closed glottis in the sitting or supine position with the increased intrathoracic pressure raised to 40 mmHg for 15-20 second after which the pressure is suddenly released and the breathing restored to normal pattern. is performed. This stimulates the baroreceptors in the aortic arch, resulting in increased parasympathetic tone that blocks the Atrioventricular Node. The Valsalva maneuver is effective in 20% to 50% of

hemodynamically stable patients **(Kumar et al., 2018).**

Additional experiments showed that a modified Valsalva maneuver, with the traditional Valsalva maneuver being held for 60 seconds at a 45-degree recumbent position, then being switched to supine positioning with passive leg elevation for 15 seconds, was more efficacious than the standard Valsalva maneuver. This Postural modification causes even more blood flow back to the heart, leading to an increase in stroke volume and cardiac output. This causes further vagal-parasympathetic -stimulation. This can convert the patient back into sinus rhythm **(Shoukat et al., 2023; Lan et al., 2021 & Appelboam et al., 2015).**

The role of critical care nurse (CCN) regarding care the patient with acute supraventricular tachycardia is vital. It includes monitoring the electrocardiogram (ECG) for rate and rhythm, assessing vital signs and reporting abnormal changes to the physician immediately, emotional support for the patient and family. Educate the patient about different vagal maneuvers and how to perform. **(Keller et al., 2020).**

Significance of the study:

Acute supraventricular tachycardia (SVT) is a common cause of hospital admissions and can cause significant patient discomfort and distress. Although medical treatment such as adenosine or cardioversion remains a lifesaving supporting therapy, it also carries considerable risk for complications such as transient asystole, a sense of impending doom, or feeling that they are about to die and find this very unpleasant and frightening. Moreover, vagal maneuvers are a safe, available, and non-invasive treatment for SVT. The most commonly used vagal maneuver is the Valsalva maneuver (**Çorbacıoğlu et al., 2017)**. An improvement in the success rate of the Valsalva maneuver with a simple safe and cost-free modification to patient positioning during the maneuver would be an important finding, with benefits for patients and healthcare providers worldwide, including regions with few health-care resources **(Wang et al., 2020)**

Aim of the study:

The current study aimed to evaluate the effect of modified Valsalva maneuver on clinical outcomes for patients with acute supraventricular tachycardias.

Research Hypothesis:

Patients with acute supraventricular tachycardia who undergone modified Valsalva maneuver were expected to exhibit improvement in clinical outcomes compared to control group.

Clinical Outcomes:

In the current study, clinical outcomes included reversion of the supraventricular tachycardia to normal sinus rhythm; regain and \ or maintain pulse rate, respiratory rate, blood pressure, and oxygen saturation within normal ranges, and decreasing the adverse events such as nausea, dyspnea and unstable SVT.

Subjects

Research design: A quasi-experimental research design was utilized in the current study.

Setting: The study was conducted at the Cardiac Emergency Unit in Tanta Main University Hospital.

affiliated to the Ministry of Higher Education and Scientific Research

Subjects: A purposive sample of (80) patients were diagnosed with acute supraventricular tachycardia admitted to the previously mentioned setting and who were fulfilled the inclusion criteria. The sample then was divided into two equal groups, (40) patients in each group as follows:

Control group: who received routine care for reversion of SVT by cardiac care unit staff such as connecting the patient with ECG monitoring, monitoring vital signs and carotid massage.

Study group: received the modified Valsalva maneuver with routine hospital care by the researcher. Subjects were selected according to the following criteria.

Inclusion criteria: Adult patient (21-60) years old of both sex with supraventricular tachycardia (regular, narrow complex tachycardia with QRS duration <0·12 s on ECG).

Exclusion Criteria include unstable patients with systolic blood pressure less than 90 mm Hg and an indication for immediate cardioversion. Any contraindication to Valsalva maneuver as aortic stenosis, recent myocardial infarction, glaucoma, retinopathy, or recent eye surgery, inability, to lie flat, or have legs lifted, third-trimester pregnancy and sever dyspnea, esophageal varices and inguinal and umbilical hernia.

Tools of Data Collection: - Two tools were used in this study.

Tool (I): Supraventricular Tachycardia Patient's assessment. This tool was developed by the researcher after reviewing the related literature **(Chen et al., 2023; Kotadia et al., 2020& Olshansky et al., 2017)** and included the following parts:

Part (1) patient's demographic characteristics: This part included data about patient's age, sex, marital status, educational level, and occupation.

Part (2) Patient Clinical Data: This part included data about current diagnosis, past and present medical history, surgical history, family history, present signs and symptoms, anti-arrhythmic medication, previous SVT, and ECG findings.

Tool (II): Patient's Clinical Outcomes: -This tool was developed by the researcher based on extensive review of recent relevant literature (**Pstras et al., 2016& Chaofeng et al., 2020)** and it included the following parts:

Part (1) Hemodynamic Parameters Assessment: - This part used by the researcher to assess vital signs (heart rate, respiration, blood pressure) and oxygen saturation. **Scoring system:** Vital signs and O_2 saturation were described as mean scores.

Part (2) Electrocardiogram Monitoring: -]

This part used by the researcher to assess ECG rhythm after the modified Valsalva maneuver. Normal ECG scored as zero, and abnormal ECG scored as1.

Part (3) Numeric Rating Scale for measuring nausea (NRS). This scale was developed by **Meek R et al (2009),** to assess the severity of nausea. Patients rated nausea on a 100-mm visual analogue scale (VAS) (0=least severe, 100=most severe) every 15 minutes until they left the Emergency Department (ED). **Scorning system:** -The NRS scores categorized into four groups

(0 = no nausea, 10–30 = mild, 40–60= moderate, 70–100 = severe).

Part (4) Modified Borg Dyspnea Scale (MBDS):

This scale was developed by **Boogaert et al (2000)**. It is a valid and reliable assessment tool. It used to measure the severity of dyspnea as perceived by the patient in the Emergency Department. It scored as 0 (No breathlessness at all) to 10(Maximal) rated scale given to the patient to evaluate their dyspnea at rest

Scoring system:

Modified Borg Dyspnea Scale range from (0) to (10) based on patient subjective response, it scored as the following: -

0: -No breathlessness at all
1: -Very, very slight (Just noticeable)
2: -Very Slight
3: -Moderate
4: -Somewhat sever
5: -Sever breathlessness
7: -Very sever breathlessness
8: -Very, very sever (almost maximal)
9: -Maximal.

Method

Permission to the hospital was acquired from the cardiac care units' responsible authority. Data were collected over a period of 6 months. **Ethical considerations: -**

- Approval of The Scientific Research Ethics Committee of the Faculty of Nursing was obtained with the code number (127/11/22) and The Scientific Research Ethics Committee of the Faculty of Medicine with the code number (36097/11/22)
- Informed consent was obtained from the patients to participate in the study after explaining the purpose of the study.
- Confidentiality and privacy were assured using code numbers on sheets instead of names.
- The study didn't cause any harm or pain for the entire subjects.
- Any unexpected risks appeared during the course of the research were cleared to participants and the ethical committee on time.
- Withdrawal from the study was reserved at any time.

Nine experts in the field of Critical Care Nursing, Cardiologists and Medical biostatistics tested the developed tools for content validity. A pilot study was carried out on 8 patients to test the applicability and feasibility of the tools.

Tool development: - Tools I and II (part 1 and 2) were developed by the researcher after a review of the relevant literature. **Tool reliability**: - A pilot study was carried out on 10% of patients to test the feasibility and applicability of the tools and the pilot sample was excluded from the study sample.

This study was conducted in four phases. During **assessment phase**, both groups were assessed to collect base line data by using study's tools.

Planning phase: This phase was formulated based on data from the assessment phase, literature review priorities, goals.

- The expected outcome criteria of the study include: Reversion of the supraventricular tachycardia to normal sinus rhythm.
- Regain and \ or maintain pulse rate, respiratory rate, blood pressure, and oxygen saturation into normal values.
- Decrease the adverse events such as nausea, dyspnea, and unstable SVT

During this phase, the researcher prepared the equipment used to perform the Valsalva maneuver for the patient (aneroid manometer).

In implementation phase: **Patients in the control group** received their emergency routine hospital nursing care as provided to the patients by cardiac emergency unit staff such as connect the patient with ECG monitoring, intravenous access for potential emergency medication, monitoring vital signs and carotid massage.

Study group patients received modified Valsalva maneuver combined with routine care that implemented by the Master student of the presence of a cardiologist in the cardiac emergency care unit, the researcher conducted the maneuver as follow:

Patient preparation before MVM technique

- Explain procedure to the patient and advice the patient to follow the instruction, attach the patient with cardiac monitoring and the patient is placed in a semi-recumbent position

Modified Valsalva maneuver technique

- The Valsalva manoeuvre strain was standardized to a pressure of 40 mm Hg sustained for 15 seconds by forced expiration measured by an aneroid manometer with the target pressure marked and visible to the participant and treating team. Standardized verbal instructions were used to help participants to achieve target pressure and strain duration.
- Immediately at the end of the strain, the patients brought to a supine position and have their legs risen by a member of staff to 45° for 15 seconds**.**
- During the next 45 seconds, the patient's response was assessed by ECG monitoring.
- If the Valsalva was not initially successful, the maneuver was repeated up to three times with a 1-min rest between attempts.

Post MVM technique:-

- If modified Valsalva maneuver resulted in reversion to sinus rhythm, patients placed again in comfortable position.
- Continuously monitor the patient heart rate and rhythm for any changes.
- If modified Valsalva maneuver did not result in reversion, patients received antiarrhythmic treatment as the department's usual guidelines

During evaluation phase, Patients in both control and study groups were evaluated three times as follow: Immediately, 15 and 30 minutes after routine care of supraventricular tachycardia for control group and after modified Valsalva maneuver for study group by using tool II.

Results

Table (1) illustrates distribution of studied patient's with acute supraventricular tachycardia according to their demographic characteristics between both groups. Observations revealed that the percentage (32.5%) of the patients in control group were in age group 50 to 60 years old, while the same percentage (32.5%) of the patients in study group were between 30 to 40 years old with a mean age **43.88±11.303** and **46.63 ± 10.60** for patients in control and study groups respectively . **As regard to sex**, it was noticed that nearly three quarter of the control and study groups patients

(75% and 72.5%) were female respectively

Concerning marital status and educational level, it showed that more than half of patients (62.5% and 60%) were married in the control and study groups. Moreover, (50% and 55.0%) of studied patients in had University /Higher education in control and study groups respectively. **As for occupation** (50% and 35%) of the patients in control and study groups were employee respectively. There was no statistically significant difference between the control and study groups in relation to their demographic characteristics.

Figure (1) illustrates distribution of the studied patients regarding their current diagnosis. It clarified that 55.0% and 52.5 of the patients in control and study groups diagnosed by Atrioventricular Node Re-Entrant Tachycardia (AVNRT)**,** while the minority of the patients on control and study groups (15% and 22.5% respectively diagnosed by atrial tachycardia.

Figure (2) illustrates distribution of the studied patients regarding their anti-arrhythmic medications and previous SVT. Concerning Anti-arrhythmic medications history, the figure showed that 37.5% and 42.5% of the patients in control and study groups taking anti-arrhythmic drugs respectively. **Regarding to previous SVT**, nearly half of the patient in control and study groups 47.5 % and 52.5% had previous history of SVT respectively.

Table (2) shows mean scores of hemodynamic parameters. It finds that mean scores of **heart rate** for control group were 180.78±11.729, 166.25±31.495, 162.73±36.334 and 162.25±40.263 on admission, immediate, 15 minute and 30 minutes after routine care. While, mean scores of heart rate for study group were 181.73±14.037, 136.85±34.745, 124.63±35.851 and 122.13±39.287 on admission, immediate, 15 minute and 30 minutes after modified Valsalva maneuver respectively with P. 0.000.Also, the mean scores of **respirations** were 24.48±1.811, 23.85±2.359, 23.23±3.117 and 23.30±3.164 for control group on admission, immediate, 15 minute and 30 minutes after routine care. For study group, mean scores of respirations were 24.50±1.359, 22.43±2.385, 21.13±2.884 and 21.05±3.021on admission, immediate, 15 minute and 30 minutes after modified Valsalva maneuver respectively where P. 0.000.

Concerning systolic blood pressure, the mean scores were 92.50±3.755, 94.63±5.926, 95.25±7.334 and 95.50±8.901 for control group on admission, immediate, 15 minute and 30 minutes after routine care. For study group, mean scores of respirations were 91.00±2.320, 96.63±5.926, 103.13±9.246 and 105.63±10.202 on admission, immediate, 15 and 30 minutes after modified Valsalva maneuver respectively.

Regarding oxygen saturation (SaO2), the mean scores were 94.73±1.569, 94.80±1.652, 95.03±1.747 and 95.10±1.795 for control group on admission, immediate, 15 minute and 30 minutes after routine care. While, mean scores were 94.65±1.350, 95.05±1.632, 95.58±1.738 and 95.65±1.847 for study group on admission, immediate, 15 minute and 30 minutes after modified Valsalva maneuver respectively. There were statistically significant differences between both groups in relation to

hemodynamic parameters except oxygen saturation (SaO2).

Figure (3) illustrates distribution of the studied patients with acute supraventricular tachycardia regarding ECG rhythm throughout periods of intervention. On admission, it was observed that all (100%) of the patients on both groups had abnormal ECG rhythm. While, immediately after routine care one-fifth (20%) of the patients in control group and 67.5% in study group regain normal ECG rhythm. After 15 and 30 minutes of routine care in control group, only one quarter (25%) return to normal rhythm. On other hand, after 15 and 30 minutes of modified Valsalva maneuver in study group, three quarter (75%) of the patients return to normal ECG rhythm**.**

Table (3) shows distribution of the studied patients with acute supraventricular tachycardia regarding severity of nausea throughout periods of intervention. Among control group, more than one quarter (27.5%, 30.0%) suffered from moderate nausea on admission and immediate after routine care respectively then the percentage decreased to 25.0% on 15 minute and 30 minutes after routine care. **Also,** about one third (32.5%) and (22.5%) and the minority (17.5%) of the patients in study group had moderate nausea on admission, immediate, 15 minute and 30 minutes after modified Valsalva maneuver respectively. No statically significant difference was observed among control group throughout the periods of the study. On the other hand, statically significant difference was observed among study group throughout the periods of the intervention where P= 0.010.

Table (4) illustrates distribution of the studied patients with acute supraventricular tachycardia regarding dyspnea level throughout periods of intervention. Among control group, nearly one quarter (30.0%, 27.5%) suffered from moderate dyspnea on admission and immediate after routine care respectively then the percentage decreased to 25.0% on 15 minute and 30 minutes after routine care. **Also,** nearly half (47.5%) and (22.5%) and one fifth (20.0%) of the patients in study group had moderate dyspnea on admission, immediate, 15 minute and 30 minutes after modified Valsalva maneuver respectively.

On the other hand, more than half (60.0%) among control group and more than three quarter (77.5%) of the study group had normal breathing pattern after 15 minutes and 30 minutes of intervention. **Finally,** No statically significant difference was observed among control group throughout the periods of the study. While, statically significant difference was observed among study group throughout the periods of the intervention where P= 0.007

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Table (1): Distribution of the studied patients with acute supraventricular tachycardia regarding their socio-demographic characteristics among control and study groups.

Characteristics	The studied patients (n=80)				χ^2 P
	Control group (n=40)		Study group (n=40)		
	N	%	N	%	
Age (in years)					
▪ (21-<30)	5	12.5	7	17.5	1.324 0.723
▪ (30-<40)	10	25.0	13	32.5	
▪ (40-<50)	12	30.0	9	22.5	
▪ (50-60)	13	32.5	11	27.5	
Range Mean ± SD	**(24-60) 43.88±11.303**		**(23-60) 40.68±11.586**		t=1.250 P=0.215
Gender					
▪ Male	10	25.0	11	27.5	FE 1.00
▪ Female	30	75.0	29	72.5	
Marital status					
▪ Single	8	20.0	10	25.0	3.061 0.382
▪ Married	25	62.5	24	60.0	
▪ Widowed	7	17.5	6	15.0	
Level of education					
▪ Illiterate	2	5.0	1	2.5	1.162 0.762
▪ Read and write	5	12.5	7	17.5	
▪ Secondary education	13	32.5	10	25.0	
▪ University /Higher	20	50.0	22	55.0	
Occupation					
▪ Not work	2	5.0	3	7.5	6.443 0.375
▪ Manual work	1	2.5	1	2.5	
▪ Technical work	2	5.0	6	15.0	
▪ Employee	20	50.0	14	35.0	
▪ Student	4	10.0	5	12.5	
▪ Housewife	9	22.5	11	27.5	
▪ On retirement	2	5.0	0	0.0	

FE: Fisher' Exact test**.**

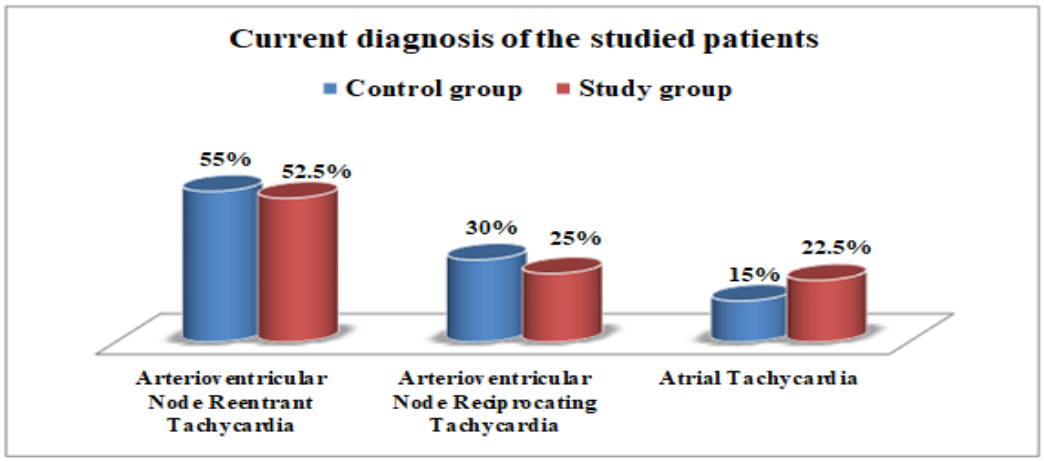

Figure (1): Distribution of the studied patients regarding their current diagnosis

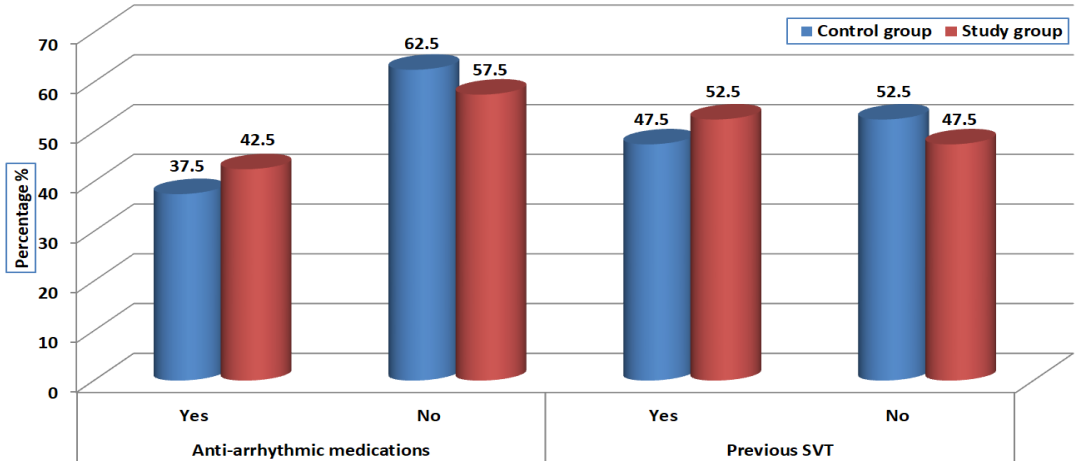

Figure (2): Distribution of the studied patients regarding their anti-arrhythmic medications and previous SVT

Table (2): Mean scores of hemodynamic parameters of the studied patients with acute supraventricular tachycardia between control and study throughout periods of intervention.

Vital Signs	The studied patients (n=80) Range Mean ± SD									
	Control group (n=40)				F P	Study group (n=40)				F P
	On admission	Immediate After	After 15 min	After 30 min		On admission	Immediate after	After 15 min	After 30 min	
1. Heart rate	(165-210) 180.78±11.72	(100-210) 166.25±31.49	(96-210) 162.73±36.33	(85-210) 162.25±40.26	**2.976 0.033***	(161-215) 181.73±14.03	(102-200) 136.85±34.7	(98-199) 124.63±35.85	(90-205) 122.13±39.28	**28.975 0.000***
Gp1 Vs Gp2 t , P	0.328 , 0.743	**3.965 , 0.000***	**4.721 , 0.000***	**4.511 , 0.000***						
2. Respiration	(21-28) 24.48±1.8	(19-29) 23.85±2.3	(17-29) 23.23±3.1	(17-30) 23.30±3.16	1.882 0.135	(21-27) 24.50±1.35	(18-28) 22.43±2.385	(17-29) 21.13±2.88	(17-29) 21.05±3.021	**16.648 0.000***
Gp1 Vs Gp2 t , P	0.070 , 0.94	**2.687 , 0.009***	**3.127 , 0.002***	**3.253 , 0.002***						
3. Blood pressure										
▪ Systolic	(90-100) 92.50±3.755	(90-110) 94.63±5.926	(90-110) 95.25±7.334	(80-110) 95.50±8.901	1.631 0.184	(90-100) 91.00±2.320	(90-110) 96.63±5.926	(90-120) 103.13±9.246	(90-120) 105.63±10.202	**30.253 0.000***
Gp1 Vs Gp2 t , P	**2.149 , 0.035***	1.509 , 0.135	**4.220 , 0.000***	**4.730 , 0.000***						
▪ Diastolic	(60-70) 62.00±3.721	(60-80) 64.25±5.943	(60-80) 64.25±6.258	(60-80) 64.63±7.015	1.677 0.174	(60-70) 63.75±4.770	(60-80) 68.25±5.006	(60-80) 70.88±7.061	(60-80) 72.88±7.917	**15.513 0.000***
Gp1 Vs Gp2 t , P	1.829, 0.071	**3.256 , 0.002***	**4.441 , 0.000***	**4.933 , 0.000***						
4. SaO2	(92-98) 94.73±1.569	(91-98) 94.80±1.652	(91-98) 95.03±1.747	(91-98) 95.10±1.795	0.445 0.721	(92-97) 94.65±1.350	(91-98) 95.05±1.632	(91-98) 95.58±1.738	(91-98) 95.65±1.847	**3.244 0.024***
Gp1 Vs Gp2 t , P	0.229, 0.819	0.681 , 0.498	1.412 , 0.162	1.351 , 0.181						

* Statistically significant at level P<0.05

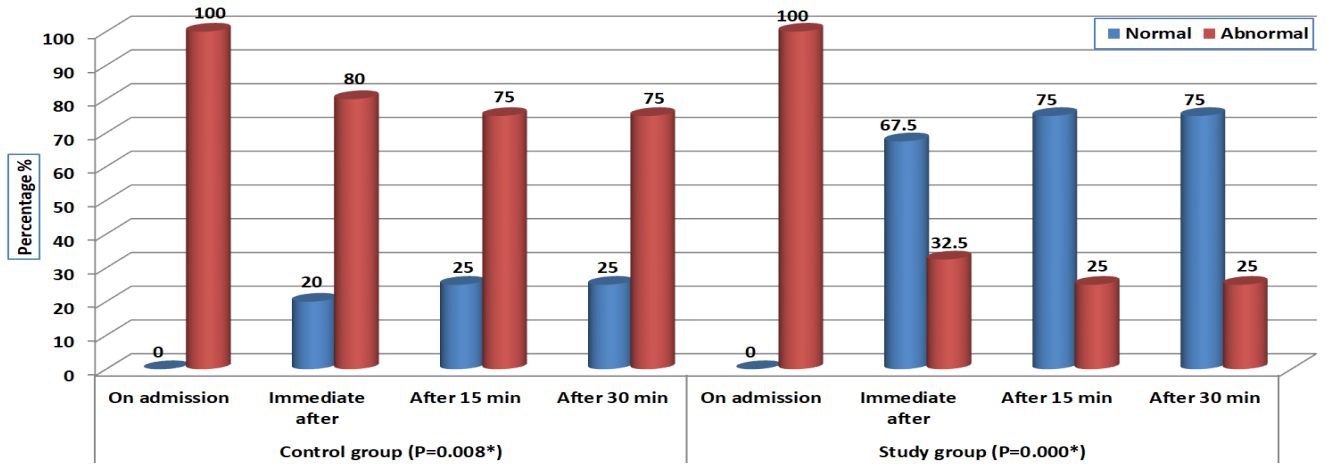

Figure (3): Distribution of the studied patients with acute supraventricular tachycardia regarding ECG rhythm among control and study groups throughout periods of intervention.

Table (3): Distribution of the studied patients with acute supraventricular tachycardia regarding severity of nausea among control and study groups throughout periods of intervention.

Nausea Severity	The studied patients (n=80)																
	Control group (n=40)								χ^2 P	Study group (n=40)								χ^2 P
	On Admission		Immediate after		After 15 min		After 30 min			On admission		Immediate after		After 15 min		After 30 min		
	N	%	N	%	N	%	N	%		N	%	N	%	N	%	N	%	
▪ None	21	52.5	23	57.5	25	62.5	25	62.5		18	45.0	29	72.5	32	80.0	32	80.0	
▪ Mild	5	12.5	4	10.0	4	10.0	4	10.0	2.623 0.977	3	7.5	1	2.5	0	0.0	0	0.0	**21.784 0.010***
▪ Moderate	11	27.5	12	30.0	10	25.0	10	25.0		13	32.5	9	22.5	7	17.5	7	17.5	
▪ Severe	3	7.5	1	2.5	1	2.5	1	2.5		6	15.0	1	2.5	1	2.5	1	2.5	
Range Mean ± SD	**(0-100) 24.00±28.35**		**(0-80) 20.25±25.16**		**(0-80) 17.75±24.54**		**(0-80) 17.75±24.54**		F=0.528 P=0.66	**(0-100) 31.75±33.27**		**(0-80) 13.75±23.39**		**(0-80) 10.50±21.83**		**(0-80) 10.50±21.83**		**F=6.383 P=0.000***
Gp1 Vs Gp2 χ^2 , P	1.897 , 0.594		2.921 , 0.404		5.389, 0.145		5.389, 0.145											

* Statistically significant at level P<0.05

Table (4): Distribution of the studied patients with acute supraventricular tachycardia regarding dyspnea level throughout periods of intervention.

Dyspnea Level	The studied patients (n=80)																
	Control group (n=40)								χ^2 P	Study group (n=40)								χ^2 P
	On admission		Immediate after		After 15 min		After 30 min			On admission		Immediate after		After 15 min		After 30 min		
	N	%	N	%	N	%	N	%		N	%	N	%	N	%	N	%	
▪ No breathlessness	18	45.0	21	52.5	24	60.0	24	60.0		15	37.5	29	72.5	31	77.5	31	77.5	
▪ Very, very slight	1	2.5	1	2.5	0	0.0	0	0.0		1	2.5	1	2.5	0	0.0	0	0.0	
▪ Very slight	3	7.5	2	5.0	1	2.5	1	2.5	5.108 0.954	5	12.5	1	2.5	1	2.5	1	2.5	**22.573 0.007***
▪ Moderate	12	30.0	11	27.5	10	25.0	10	25.0		19	47.5	9	22.5	8	20.0	8	20.0	
▪ Somewhat sever	6	15.0	5	12.5	5	12.5	5	12.5		0	0.0	0	0.0	0	0.0	0	0.0	
Gp1 Vs Gp2 χ^2 **P**	8.353 0.079		6.813 0.146		6.113 0.106		6.113 0.106											

* Statistically significant at level P<0.05

Discussion

The current study described the effect of modified Valsalva maneuver on clinical outcomes for patients with acute supraventricular tachycardia**. Regarding demographic characteristics** of the studied patients with acute SVT, the result of the present study revealed that nearly one third of the study sample was between fifty to sixty years old. From the researcher's point of view, this age considered the age of stress and risk of cardiovascular diseases. This finding is in line with study results that conducted by **Kotruchin et al. (2022)** who reported that supraventricular tachycardia (SVT) is the most common tachyarrhythmia in middle adults. The average age of the total study population was 54 years old. In addition, **Rehorn et al. (2021)** reported that among the identified SVT patients, half of the study sample was between the ages of 45 and 64 years old.

Regarding to gender, the present study found that nearly three quarter of the patients in control and study groups were female. From the researcher's point of view, estrogen may increase the risk of certain types of arrhythmia, and may correspond to the increased frequency and duration of SVT. In addition, Females who reported cyclical variations in their SVT symptoms were more likely to be inducible when estrogen levels were high. This finding was in line with study results that conducted by **Kotruchin et al., (2022)** entitled comparison between the double syringe and the single syringe techniques of adenosine administration for terminating supraventricular tachycardia; they found that women were predominated in both study groups.

In addition, **Rosengren et al., (2018)** found that SVT was more common in female than male in study about hospitalization rate of paroxysmal supraventricular tachycardia in Sweden. On the other hand, this result disagreed with **Ko et al., (2016)** they stated in study entitled (Atrial fibrillation in women: epidemiology, pathophysiology, presentation, and prognosis) clarified that the incidence of atrial fibrillation (per 1000 person-years) is reported to be between 1.6 and 2.7 in women and between 3.8 and 4.7 in men.

In relation to marital status, it was showed that more than half of patients in both groups were married; this may be due to the effect marital stress among younger adults (ages eighteen to fifty-five years) this result is accepted by **Al-Betar et al., (2023) and Nordblom et al., (2017)** in study conducted to investigate impact on a person's daily life during episodes of supraventricular tachycardia. They found that, most of the study patients were married. This may be due to the effect marital stress among younger adults (ages eighteen to fifty-five years). In addition, this result was in line with **Dhindsa et al., (2020)** who concluded that psychosocial and socioeconomic factors, as well as other acute stressors, might contribute to the association between marital status and cardio-vascular disease outcomes, but the underlying mechanisms are not completely clear.

Concerning occupation, it was found that the higher percentage of the patients in both groups were employee. Because there is a complex and dynamic interaction between the heart and brain especially in the setting of negative emotions, stress, anger, and depression have all been shown to have a significant impact on cardiac arrhythmogenesis. This result was supported with **Alexander et al., (2015)** who stated that vigorous exercise contributes to arrhythmia and myocardial ischemia that leads to cardiac arrest. While the current study result is in contrast with **Allesøe et al., (2023)** in a study that examine the relationship between cardiovascular disease and occupational risk factors ,who stated that lack of physical exertion increase the risk of cardiovascular events.

Regarding present diagnosis, the current study clarified that more than half of the patients in control and study groups diagnosed by Atrioventricular Node Re-Entrant Tachycardia (AVNRT). AVNRT can start with exercise, periods of emotional stress, or other situations that increase sympathetic tone. In others, it can start after ingesting, tea, or coffee. This result is in line with **Kotadia et al., (2020)** who mentioned in a study entitled (supraventricular tachycardia: An overview of diagnosis and management) that AVNRT is the most common SVT in the general population and accounts for over 60% of patients.

Regarding to previous SVT, nearly half of the patients in control and study groups had previous history of SVT and the average range of previous SVT duration was (1-10) years in control while the average range was (1-9) years in study group. This result is in line with **Tsaregorodtsev et al., (2021)** who stated that SVT is recurrent disorder under certain conditions. Also some patients have attacks for several times per day whereas others have an attack only every few years. While **Sohinki & Obel (2014)** found that recurrence, rates of SVT may be as low as 8%.

Concerning hemodynamic parameters between both groups throughout periods of intervention, a significant improvement in heart rate was observed among study group patients throughout periods of intervention compared with control group. This may be due to the effect of Valsalva maneuver that implemented by the researcher and its action on the vagus nerve to slow heart rate. **Wang et al., (2020)** found that the modified VM group had higher success rates of SVT conversion after single intervention than standard VM approve this result.

Concerning ECG rhythm throughout periods of intervention.

On admission, it was observed that all of the patients on both groups had abnormal ECG rhythm. This is because all study subjects had SVT on admission and all of them had abnormality of ECG. While, immediately after routine care one fifth of the patients in control group and two third in study group regain normal ECG rhythm. After 15 and 30 minutes of routine care in control group, only one quarter return to normal rhythm. On other hand, after 15 and 30 minutes of modified Valsalva maneuver in study group, three quarter of the patients return to normal ECG rhythm.

This result is accepted with **Lodewyckx et al., (2021)** who concluded that adults with stable SVT, the modified Valsalva maneuver achieves a high rate of conversion to sinus rhythm with a Number Needed to Treat (NNT) of 3.8 and without significant adverse effects.

Regarding severity of nausea throughout periods of intervention, the current study clarified that nearly one quarter of patients in control group suffered from moderate nausea on admission and immediate after routine care then the percentage decreased to one quarter on 15 minute and 30 minutes after routine care. From the researcher's point of view, nausea and gastric syndrome are associated with arrhythmia. Additionally, it was noticed that about one third, more than one fifth of the patients in study group had moderate nausea on admission, immediate after MVM respectively. On the other hand, the minority reported nausea on 15 minute and 30 minutes after modified Valsalva maneuver.

This result is supported with **Harris & Sahay (2022)** who mentioned that nausea was observed on 17% of patients with SVT, also this result is accepted by **Qureshi et al., (2021)** who stated that gastro-cardiac syndrome including nausea are found to be associated with cardiac symptoms like shortness of breath, chest pain, palpitations and arrhythmias. This finding was in contrast with **Yetkin et al., (2020)** who mentioned that nausea is rare during episodes of SVT attack.

Regarding dyspnea level throughout periods of intervention, the findings of the current study revealed that the patient reported a decline in severity of dyspnea on both groups. On admission, about one third of control group and near half of the study group's patients reported severe dyspnea. In addition, the findings revealed that, severity of dyspnea was decreased among control group was managed by routine care, these results showed that significant improvement and decrease in severity of dyspnea among study group. The current study findings are in line with observations of study results conducted by **Yetkin et al., (2020)** concluded that dyspnea was the most observed symptom in more than half of the studied patients presented to emergency department suffering from SVT. The decline of the severity of dyspnea may be due to regain of sinus rhythm in nearly three quarter of patient in study group and one quarter of patient in control group.

Conclusions

Based on the results of this study, it could be concluded that postural modification to the standard Valsalva maneuver (modified Valsalva maneuver) was highly effective and had positive effects on clinical outcomes for patients with SVT. Modified Valsalva maneuver return 75% of patients with SVT to sinus rhythm. This difference resulted in a substantial reduction in the number of patients needing other emergency treatments, particularly adenosine. Fewer patients treated with the modified Valsalva maneuver needed further emergency department treatment, compared with the control group that received routine care for reversion of SVT

Modified VM therapy also indirectly reduced severity of associated symptoms

of nausea and dyspnea. In addition, MVM regained OR maintained pulse rate, respiratory rate, blood pressure, and saturation into normal values.

Recommendations, based on the finding of the current study, the following recommendations are derived and suggested:

1. **Recommendation for clinical practice:**
   • Modified Valsalva maneuver (MVM) should be carried out as a first-line vagal maneuver and routine care in subjects presenting with SVT in the emergency room
2. **Recommendations for administration:**
   • Development of in-service training program for nursing staff in cardiac care units about modified Valsalva maneuver to improve clinical out-comes and decrease complications.
3. **Recommendations for further research studies: -**
   • To generalize the findings more broadly, the study could be done with bigger sample size and different cardiac care units.
   • Further studies are needed to increase follow up period post application of MVM for patients with supraventricular tachycardia.
   • Future work should assess the implementation and dissemination of this technique and its performance in routine practice. Studies comparing MVM with the fully supine Valsalva maneuver

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