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Effect of Buteyko Method as a Respiratory Rehabilitation Technique on Patients' Lungs Capacities after Stroke

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Abstract--- *Cerebrovascular disorders is an umbrella term that refers to a functional abnormality of the central nervous system (CNS) that occurs when the normal blood supply to the brain is disrupted. Stroke is the primary Cerebrovascular disorder in the United States, and it is the third leading cause of death after heart disease and cancer. A Study and Control Groups Pre-Test and Post-Test Quasi Experimental Design used to study the effect of Buteyko Method on lungs capacities of stroke patients, from the period of 15th October, 2017 to 9th September, 2018.A non-probability (purposive sample) of (50) stroke patients are included in the study. The sample distributed as study and control groups (30 patients for the study group and 20 patients for the control group). The study is conduct in Al-Najaf City/ Al-Najaf Al-Ashraf Health Directorate/ Middle Euphrates Neuroscience Center. The data are collected by using questionnaire developed by the researchers to determine the effect of the Buteyko method on patients' lungs capacities. questionnaire, which consists of three parts (1) Patients' Demographic data. (2) Patients' clinical data. (3) Lungs volumes. validity of the study instrument achieved through a panel of expert. While the reliability of the spirometery achieved through standardized the used spirometery with the spirometery used in the hospital. The data described statistically and analyzed through use of the descriptive and inferential statistical analysis procedures. The findings of the present study indicate that there is an improvement in the study group lungs' capacities compared with the control group patients'. The study concluded that the Buteyko method is an effective respiratory rehabilitation technique in improving the stroke patients' lungs capacities. The study recommends to an intensive comprehensive wide population-based (national level) studies could be conducted to determine the effectiveness of the nursing rehabilitation methods in improve the patients' health status and reduce the complications especially for patients with stroke.*

Keywords--- *Effect, Buteyko Method, Respiratory Rehabilitation, Lungs Capacities, Stroke.*

I. INTRODUCTION

Cerebrovascular disorders is an umbrella term that refers to a functional abnormality of the central nervous system (CNS) that is occur when the normal blood supply to the brain is disrupted. Stroke is the primary Cerebrovascular disorder at United States, it is one of the main cause of death after heart disease and cancer [1].

In addition, Stroke is known as the sudden or gradually defect in function of neurological [2.] Furthermore, Stroke is a worldwide health defect and cause of disability[3]. And it refers to the second main cause of death around world[4]. It consider the four major cause of Indian mortality, in India, mortality approximately 0.6/1000[5]. Globally in 2005,

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thirty five million deaths occurred to chronic non transmitted diseases, stroke was lead to 5.7 million deaths, and 87% of these deaths occurred in low and middle income countries[4]. According to the World Health Organization (WHO), stroke will become to cause of both disability and death universally in 2020, with the number of mortalities predictable to over twenty million and by 2030 to over twenty four million a year[6.]

Stroke it can be either Ischemic that are resulted from a local thrombus formation or by embolic phenomenon that leads to occlusion of a cerebral artery or Hemorrhagic that include subarachnoid hemorrhage, intracerebral hemorrhage and subdural hematomas which are resulted from a blood vessel rupture due to high blood pressure or an arteriovenous malformation (AVMs) or an intracranial aneurysm rupture[7]. Though hemorrhagic stroke is less common than ischemic stroke it is more lethal with a 30-day case-fatality rates that are two to six times higher. Stroke has been found to be associated with hypertension, diabetes, hyperlipidemias and many metabolic syndromes[8].Stroke is one of common health problems in the United Kingdom(UK).

It accounted for over 56,000 deaths in England and Wales in 1999, which represent 11% of all deaths. Most people survive a first stroke, but often have significant morbidity. Each year in England, approximately 110,000 people have a first or recurrent stroke and a further 20,000 people have a Transient ischemic attack(TIA). More than 900,000 people in England are living with the effects of stroke, with half of these being dependent on other people for help with everyday activities[9].

Stroke is one of the major leading causes of death in the United States (US). Patients survive with stroke often suffer from medical complications and disability for long time[4]. Disturbances in respiratory system function and complication interacting with the respiratory system commonly related to stroke. The severity and region of neurological defect interact with the nature of these disorders. Change in breathing control, breathing pattern and respiratory mechanics are common and may cause gas exchange abnormalities or the need for mechanical ventilation, CVA can cause disturbance in sleep breathing like, aspiration pneumonia, a central or obstructive sleep apnea, deep vein thrombosis and swallowing abnormalities, all of the above complication are most common respiratory system in the patient with stroke. Close monitoring for stroke patient and implementation of prevention measures can prevent many of this abnormalities and less morbidity and large mortality[10].

Stroke is the third most frequent cause of life lost in the Western world (after heart disease and cancer), and is responsible for about 20% of all deaths in old age. Strokes are the most common reason for neurological damage leading to permanent handicap[11].

A new statistic, issued by the Saudi Society of Stroke, that the incidence of stroke up to about 20 thousand cases a year in the Kingdom. During a stroke workshop at King Abdul Aziz University Hospital in Jeddah, Saudi Arabia reported that between 50 and 100 stroke cases were reported daily. Saudi Arabia records about 20,000 new cases each year, of which 4,000 cases result in death, and 8,000 cases cause motor and neurological disabilities that affect the patient's mental functions. 69% of stroke cases occur in the form of blood clots in the brain, Preventing oxygen from reaching some of its parts, and thus depriving it of normal functioning[12].

In Iraq, stroke is increasing as a common health problem. The number of patients who are admitted to Iraqi hospitals and according to Ministry of Health, Annual Report for the year, 2013 was 23442 and this number

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increased in 2014 to 28876 patients. In Al-Najaf City, the numbers of patients who were admitted to the hospitals in 2013 was 1263, even with the efforts of the Ministry of health in Iraqi the number still 1264 [13].

Rehabilitation it's a scientific and ongoing process, through which the nurses are play an important role in management of stroke patients, and they able to decreasing complication after stroke and improving the patient health status. Also, they able to improve the patients self-management through translate skills in therapy into meaningful activities[14].

II. MATERIALS AND METHODS

Design of the Study

A Study and Control Groups Pre-Test and Post-Test Quasi-Experimental Design used to study the effect of Buteyko Method on lungs capacities of stroke patients, from the period of 15th October, 2017 to 9th September, 2018.

Setting of the Study

The study is conduct in Al-Najaf City/ Al-Najaf Al-Ashraf Health Directorate/ Middle Euphrates Neuroscience Center

Sample of the Study

A non-probability (purposive sample) of (50) stroke patients are included in the study. The sample distributed as study and control groups (30 patients for the study group and 20 patients for the control group).

Including Criteria

1. Adult patients
2. Orient patients
3. Patients from Arabic Nationally
4. Free from psychological or intellectual disorder.
5. Stable patients as reported verbally by the physician

Study Instrument

An assessment tool is developed by the researchers to determine the effect of the Buteyko method on patients' lungs capacities. The final copy consists of the following parts:

Part I: Patient's demographic data form consists of (7) items, which include age, gender, level of education, monthly income, residence, marital status and occupational status.

Part II: Patient's clinical data form consists of (2) subparts, which include:

A- Present history: includes type of stroke, body side is affected by stroke, recurrence of stroke, duration of stroke, and complication of stroke.

B- Past history: includes associated diseases, smoking, and Alcohol consumption.

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Part III: Lungs volumes (Forced Expiratory Volume FEV1/ liters, and percentage of Forced Expiatory Volume FEV %, Forced vital capacity FVC, Peak expiratory flow PEF) By using spirometry. The researcher use the FEV, FEV%, FCV, and PEF as a respiratory capacity indicator based on the previous scientific references such as[15.]

Data Collection

The data were collected through the utilization of the developed questionnaire, and by means of structured interview technique with the subjects who were individually interviewed, by using the Arabic version of the questionnaire. While the lungs capacities assessed through the lungs volumes that collected by using the Spirometry before and after using of Buteyko method.

Statistical Analysis

The data were analyze through application of the descriptive and inferential data analysis methods, included:

1. Descriptive Data Analysis:

a. Tables (Frequencies, and Percentages).
b. Statistical figures (Bar Charts).
c. Statistical mean and standard deviation.
d. Pearson's Correlational Coefficient (r).

2. Inferential Data Analysis

a. Independent sample t-test determine the mean difference between the case and control groups.
b. Paired t-test determine the mean difference between pre-test and post-test for control group.
c. ANOVA: To compare difference in the mean values of three or more independent groups simultaneously.

III. STUDY RESULTS AND FINDINGS

Table 1: Summery Statistics of the Study and Control Groups Demographic Data

Demographic Data	Rating And Intervals	Study group		Control group	
		Freq.	%	Freq.	%
Age / Years	20-29	1	3.3	0	0.0
	30 - 39	1	3.3	3	10
	40 - 49	4	13.3	3	10
	50 - 59	11	36.7	9	30
	60 And More	13	43.3	15	50
	Total	30	100.0	30	100
Gender	Male	20	66.7	21	70
	Female	10	33.3	9	30
	Total	30	100.0	30	100
Level of education	Illiterate	5	16.7	6	20
	Able to read and write	9	30.0	6	20
	Primary school graduated	9	30.0	3	10
	Secondary school graduated	1	3.3	6	20
	Institute graduated	3	10.0	6	20
	College or post-graduate graduated	3	10.0	3	10

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	Total	**30**	**100.0**	**30**	**100**
Monthly income	**Sufficient**	**23**	**76.7**	**12**	**40**
	Sufficient to some extent	**7**	**23.3**	**18**	**60**
	Total	**30**	**100.0**	**30**	**100**
Residency	**Rural**	**10**	**33.3**	**12**	**40**
	Urban	**20**	**66.7**	**18**	**60**
	Total	**30**	**100.0**	**30**	**100**
Marital status	**Single**	**1**	**3.3**	**0**	**0**
	Married	**29**	**96.7**	**30**	**100**
	Total	**30**	**100.0**	**30**	**100**
Occupational status	**Governmental employee**	**10**	**33.3**	**3**	**10**
	Private	**9**	**30.0**	**12**	**40**
	Retired	**3**	**10.0**	**6**	**20**
	Disable	**1**	**3.3**	**0**	**0**
	House wife	**7**	**23.3**	**6**	**20**
	Jobless	**0**	**0**	**3**	**10**
	Total	**30**	**100.0**	**30**	**100**

This table, illustrates the demographic distribution of the study and control groups. The study results indicate that the majority of the study group are 60 years old and more (43.3 %), male (66.7 %), able to read and write and primary school graduated (30.0%), have sufficient monthly income (76.7 %), urban residents (66.7 %), married (96.7 %) and governmental employee (33.3%). While the majority of the control group are 60 years old and more (50%), male (70%), illiterate (20%), able to read and write(20%), secondary school graduated (20%), institute graduated (20%), have sufficient monthly income to some extent (60%),urban residents (60%), married (100%) and private occupational status (40%).

Table 2: Summery Statistics of the Study and Control Groups present Medical History

Medical history	**Rating And Intervals**	**Study group**		**Control group**	
		Freq.	**%**	**Freq.**	**%**
Stroke type	**Ischemic**	**23**	**76.7**	**24**	**80**
	Hemorrhagic	**7**	**23.3**	**6**	**20**
	Total	**30**	**100.0**	**30**	**100**
Stroke side	**Right**	**15**	**50.0**	**9**	**30**
	Left	**15**	**50.0**	**21**	**70**
	Total	**30**	**100.0**	**30**	**100**
Stroke recurrence	**Yes**	**8**	**26.7**	**3**	**10**
	No	**22**	**73.3**	**27**	**90**
	Total	**30**	**100.0**	**30**	**100**
Number of recurrent stroke	**No recurrence**	**22**	**73.3**	**27**	**90**
	Once	**6**	**20.0**	**3**	**10**
	Twice	**2**	**6.7**	**0**	**0**
	Total	**30**	**100.0**	**30**	**100**
Duration of stroke / day	**1-3**	**17**	**56.7**	**0**	**0**
	4 - 6	**5**	**16.7**	**6**	**20**
	7 - 9	**2**	**6.7**	**21**	**70**
	10 - 12	**3**	**10.0**	**3**	**10**
	13+	**3**	**10.0**	**0**	**0**
	Total	**30**	**100.0**	**30**	**100**

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Table (2) illustrates the present medical history of the study and control groups. The study results indicate that the majority of the study groups are the ischemic stroke (76.7%), both stroke side (50%), the patient have no stroke recurrence (73.3%), and the duration of stroke per day is 1-3 days (56.7%). While the majority of control group are the ischemic stroke (80%), left side of stroke (70%), the patient have no stroke recurrence, and the duration of stroke per day is 7-9 days (70%).

Table 3: Summery Statistics of the Study and Control Groups according to the Present Medical History / Stroke Related Problems and Complications

Problems and complications	Rating And Intervals	Study group		Control group	
		Freq.	%	Freq.	%
Pneumonia	Yes	9	30.0	3	10
	No	21	70.0	27	90
	Total	30	100.0	30	100
Epileptic seizure	Yes	1	3.3	0	0
	No	29	96.7	30	100
	Total	30	100.0	30	100
Deep vein thrombosis	Yes	1	3.3	0	0
	No	29	96.7	30	100
	Total	30	100.0	30	100
Painful shoulder	Yes	10	33.3	9	30
	No	20	66.7	21	70
	Total	30	100.0	30	100
Pressure sore	Yes	2	6.7	3	10
	No	28	93.3	27	90
	Total	30	100.0	30	100
Urinary tract infection	Yes	10	33.3	12	40
	No	20	66.7	18	60
	Total	30	100.0	30	100
Constipation	Yes	6	20.0	3	10
	No	24	80.0	27	90
	Total	30	100.0	30	100
Joint Contractures	Yes	17	56.7	9	30
	No	13	43.3	21	70
	Total	30	100.0	30	100
Hemiplegia	Yes	22	73.3	18	60
	No	8	26.7	12	40
	Total	30	100.0	30	100
Hemiparesis	Yes	11	36.7	12	40
	No	19	63.3	18	60
	Total	30	100.0	30	100
Visual deficit	Yes	3	10.0	3	10
	No	27	90.0	27	90
	Total	30	100.0	30	100
Pulmonary embolism	Yes	0	0	0	0
	No	30	100.0	30	100
	Total	30	100	30	100
Dysphagia	Yes	11	36.7	15	50
	No	19	63.3	15	50
	Total	30	100.0	30	100
Sensory loss	Yes	7	23.3	9	30
	No	23	76.7	21	70
	Total	30	100.0	30	100
Ataxia	Yes	14	46.7	21	70
	No	16	53.3	9	30
	Total	30	100.0	30	100
Vertigo	Yes	13	43.3	18	60
	No	17	56.7	12	40
	Total	30	100.0	30	100

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Table (3) illustrates the present medical history (stroke related problem and complications) of the study and control groups. The study result indicate that the majority of the study group have no (pneumonia 70%, epileptic seizure 96.7%, deep vein thrombosis 96.7%, painful shoulder 66.7%, pressure sore 93.3%, urinary tract infection 66.7%, constipation 80.0%, hemiparesis 63.3%, visual deficit 90.0%, pulmonary embolism 100%, dysphagia 63.3%, sensory loss 76.7%, ataxia 53.3% and vertigo 56.7%). While they have (joint contraction 56.7%, hemiplegia 73.3%). Regarding the control group, the study results indicate that the majority of them have no (pneumonia 90%, epileptic seizure 100%, deep vein thrombosis 100%, painful shoulder 70%, pressure sore 90%, urinary tract infection 60%, constipation 90%, joint contractures 70%, hemiparesis 60%, visual deficit 90%, pulmonary embolism 100%, dysphagia 50% and sensory loss 70%). And they have (hemiplegia 60%, dysphagia 50%, ataxia 70%, vertigo 60%).

Table 4: Summery Statistics of the Lungs Volumes of Study Group through Three Periods of Measurements

Lungs volumes	Periods of measurement	Statistical parameters	N	Mean	Std. Deviation
FEV	Pre-test	Predicted	30	2.8313	.49294
		Actual	30	1.5833	.36600
	Post-test 1 (immediate)	Predicted	30	2.8313	.49294
		Actual	30	1.9057	.41779
	Post-test 2 (after one week)	Predicted	30	2.8313	.49294
		Actual	30	2.3837	.42488
FEV%	Pre-test	Predicted	30	81.4633	1.94324
		Actual	30	69.5000	15.74848
	Post-test 1 (immediate)	Predicted	30	81.4633	1.94324
		Actual	30	77.2700	13.12933
	Post-test 2 (after one week)	Predicted	30	81.4633	1.94324
		Actual	30	84.2900	9.87073
FVC	Pre-test	Predicted	30	3.5023	.62073
		Actual	30	2.2847	.32631
	Post-test 1 (immediate)	Predicted	30	3.5023	.62073
		Actual	30	2.4740	.36105
	Post-test 2 (after one week)	Predicted	30	3.5023	.62073
		Actual	30	2.8333	.41033
PEF	Pre-test	Predicted	30	7.1597	1.19538
		Actual	30	1.9180	.85517
	Post-test 1 (immediate)	Predicted	30	7.1597	1.19538
		Actual	30	2.4380	.89422
	Post-test 2 (after one week)	Predicted	30	7.1597	1.19538
		Actual	30	3.1673	.98919

Table (4) shows that the levels of all of the lungs' volumes are below the predicted levels at the pre-test and it increased at the post-test1 and post-test2 (i.e. there is an improvement in the patients lungs' volumes).

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Table 4: Analysis of Variance (ANOVA) of the Lungs Volumes of Study Group through Three Periods of Measurements

lungs volumes	periods of measurement	N	Mean	Std. Deviation	F-value	p-value
FEV	Pre-test	30	1.5833	.36600	29.843	0.001 HS
	Post-test1 (immediate)	30	1.9057	.41779		
	Post-test2 (after one week)	30	2.3837	.42488		
	Total	90	1.9576	.51833		
FEV%	Pre-test	30	69.5000	15.74848	9.513	0.001 HS
	Post-test1 (immediate)	30	77.2700	13.12933		
	Post-test2 (after one week)	30	84.2900	9.87073		
	Total	90	77.0200	14.33974		
FVC	Pre-test	30	2.2847	.32631	17.251	0.001 HS
	Post-test1 (immediate)	30	2.4740	.36105		
	Post-test2 (after one week)	30	2.8333	.41033		
	Total	90	2.5307	.42941		
PEF	Pre-test	30	1.9180	.85517	14.126	0.001 HS
	Post-test1 (immediate)	30	2.4380	.89422		
	Post-test2 (after one week)	30	3.1673	.98919		
	Total	90	2.5078	1.04077		

This table shows that there is a high significant difference in the study group lungs' volumes through three periods of measurement (pre-test, post-test1, and post-test2) at p-value less than 0.01 (i.e. the intervention used in the study it's an effective way to improve the lungs volumes.

Table 5: Differences between the Two Levels of Measurements of the Control Group Lungs Volumes

Lungs volumes	Pairs	Mean	N	Std. Deviation	T-value	d.f.	p-value
FEV	Pre-test	1.6720	20	.39730	2.248	19	.037 NS
	Post-test	1.5900	20	.34201			
FEV%	Pre-test	75.6300	20	10.80449	0.376	19	.711 NS
	Post-test	76.4300	20	13.14583			
FVC	Pre-test	2.2020	20	.35782	1.422	19	.171 NS
	Post-test	2.0960	20	.33126			
PEF	Pre-test	1.8810	20	.55601	0.980	19	.339 NS
	Post-test	1.9830	20	.62853			

Table (5) shows that there is a non-significant difference in the control group lungs' volumes through two periods of measurement (pre-test and post-test) at p-value more than 0.01.

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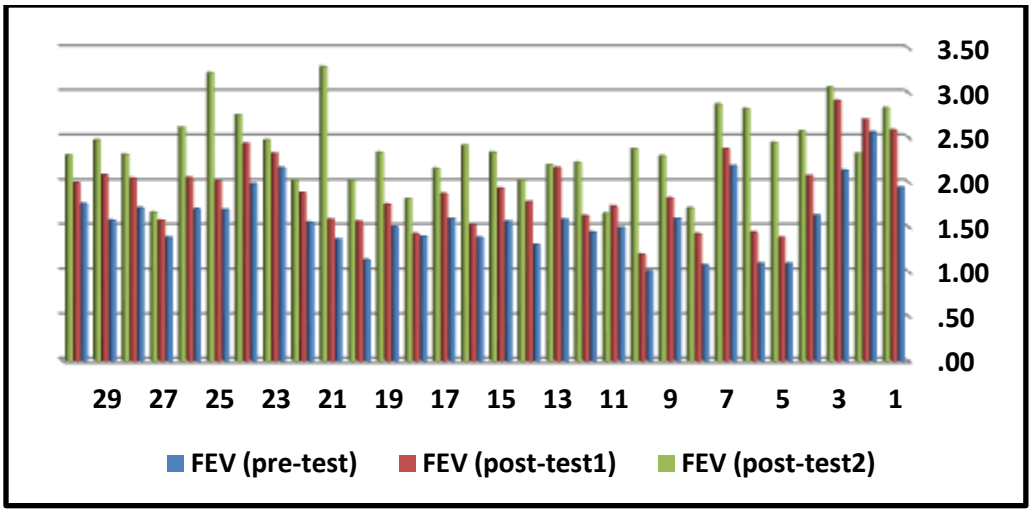

Figure 1: Assessment of FEV for the Study Group at the Pre-test and Two Post-test Trials

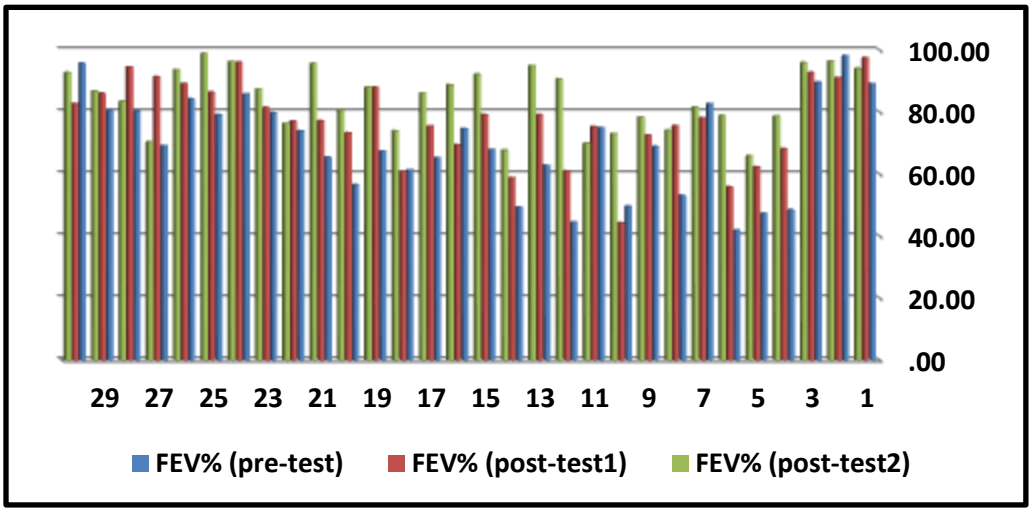

Figure 2: Assessment of FEV% for the Study Group at the Pre-test and Two Post-test Trial

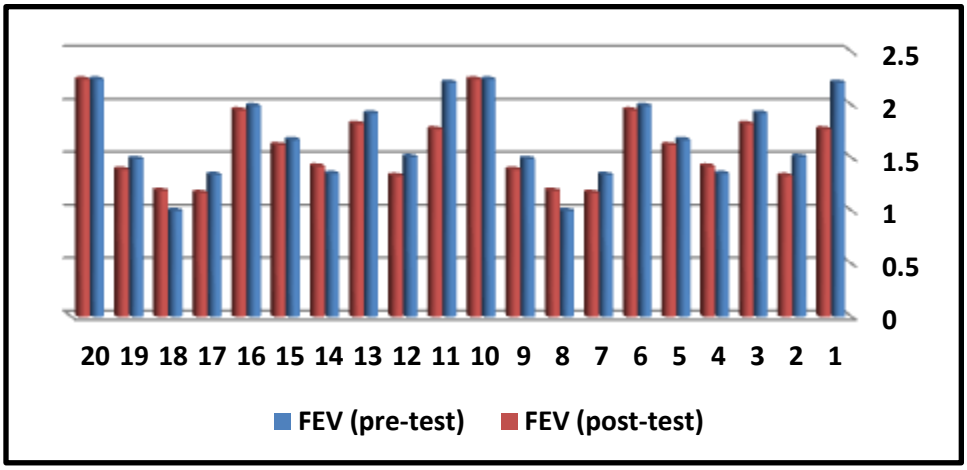

Figure 3: Assessment of FEV for the Control Group at the Pre-test and Post-test Trial

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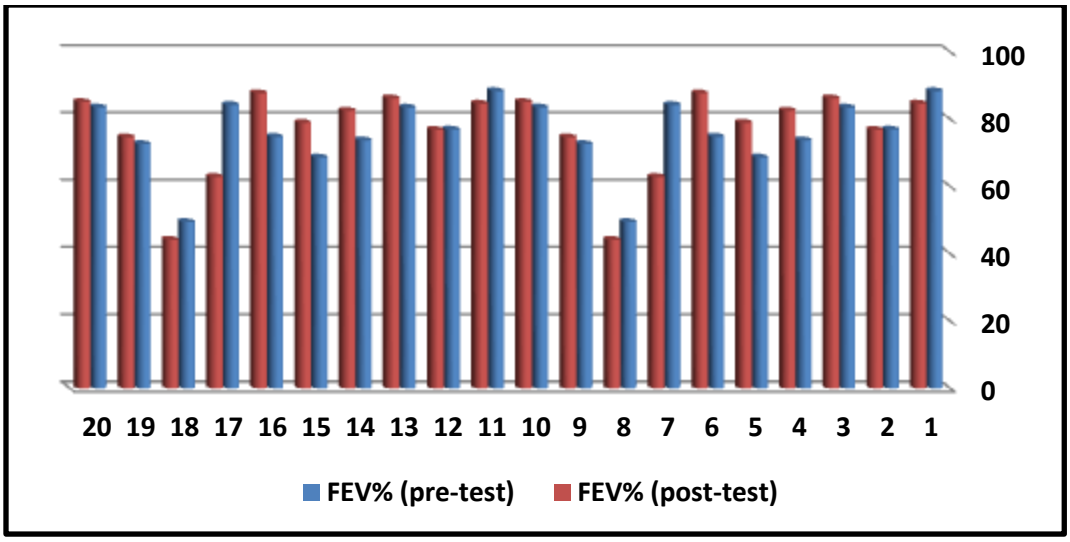

Figure 4: Assessment of FEV% for the Control Group at the Pre-test and Post-test Trial

IV. Discussion

Cerebrovascular disorders is an umbrella term that refers to any functional abnormality of the central nervous system (CNS) that occurs when the normal blood supply to the brain is disrupted. Stroke is the primary cerebrovascular disorder in the United States and in the world. Although preventive efforts have brought about a steady decline in incidence over the last several years, stroke is still the third leading cause of death. Approximately 500,000 people experience a new stroke, 100,000 experience a recurrent stroke, and approximately 160,000 die of a stroke each year. Stroke is the leading cause of serious, long-term disability in the United States.

Patients' education and training are a fundamental component of rehabilitation, and ample opportunity for learning about stroke, its causes and prevention, and the rehabilitation process should be provided. In both acute care and rehabilitation facilities, the focus is on teaching patients to resume as much self-care as possible[15].

The present study conducts to use the Buteyko method as a respiratory rehabilitation technique to improve the stroke patients' lungs capacities. As well as, improve the patients' respiratory status and prevent the respiratory complications associated with stroke. In addition, the patients' self-care abilities also improved because that method can be easily applied by stroke patients.

V. Conclusion

Based on the Study Results the Study Concluded the Following

The study concluded that the Buteyko method is an effective respiratory rehabilitation technique in improving the stroke patients' lungs capacities.

VI. Recommendations

Based on the study results and conclusion, the study recommend that:

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The study recommends to an intensive comprehensive wide population-based (national level) studies could be conducted to determine the effectiveness of the nursing rehabilitation methods in improve the patients' health status and reduce the complications especially for patients with stroke. Establishment of special policies deal with the monitoring conditions that require rehabilitation as a continued process in patients management and specifying the process of patients rehabilitation methods in the patients discharge plan.

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