International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 10 October 2024
DOI: 10.47191/ijcsrr/V7-i10-48, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

The Effectiveness of Deep Breathing Exercise Therapy on Oxygen Saturation among Patients with Ischemic Stroke

Yosi Suryarinilsih[1*], Netti[2]
[1,2] Health Ministry Polytechnic of Padang, West Sumatera, Indonesia

ABSTRACT: Ischemic stroke is an abnormality of central nervous system function in which blood flow decreases significantly, causing hypoxia. This systemic hypoxemia should be avoided; therefore oxygen saturation is monitored in the acute phase. One of the interventions that can be done in order to increase oxygen supply is by deep breathing exercise. The purpose of this study was to determine the effectiveness of deep breathing exercise therapy to increase oxygen saturation on patients with ischemic stroke. This study is a quasi-experimental study with one group pre-posttest design that has been implemented in the neural room of RSUP Dr. M. Djamil Padang with a sample of 16 patients with ischemic stroke who have fulfilled the inclusion criteria. Data was collected directly by measuring oxygen saturation of patients with ischemic stroke before and after a deep breathing exercise intervention. The data were processed by computer and analyzed as univariate and bivariate. Normality test results show the data is not normally distributed so that the analysis used is non-parametric test by using Wilcoxon test. The results showed that deep breathing exercise therapy was effective in increasing oxygen saturation level of patients with ischemic stroke with p = 0,000 so it can be recommended that this therapy can be used as one of the nursing interventions on patients with ischemic stroke to increase the oxygen saturation level.

KEYWORDS: Deep breathing exercise, Ischemic stroke, Oxygen saturation

INTRODUCTION

Indonesia is the country with the largest number of stroke patient in Asia and is the third deadly disease following heart attack and cancer. Prevalence of stroke in Indonesia based on Basic Health Research data (Riskesdas) of 2013 in the amount of 12.1 per mile was diagnosed by health personnel. In Padang the stroke is in the-15th which is equal to 8.4% (Kemenkes RI, 2014). Number of stroke patients admitted to the Nervous Inpatient Installation RSUP Dr. M. Djamil Padang has increased, in 2012 there were 65 patients with 16 patients (24.6%) died.

Stroke or cerebro vascular accident is an abnormality of central nervous system (CNS) function caused when the normal blood flow to the brain is disrupted (Smeltzer & Bare, 2008). Stroke is a disease or acute brain functional disorder focal and global due to inhibition of blood circulation to the brain. Circulatory brain disorders in the form of blockage or rupture of blood vessels in the brain. The brain that should get the supply of oxygen and nutrients to be disturbed. Lack of oxygen supply to the brain will cause the death of nerve cells (neuron). Clinical manifestations of stroke include: motor disorders, verbal communication disorders, perceptual disorders, impaired cognitive function and psychological disorders as well as bladder dysfunction (Smeltzer & Bare 2013). Physiological monitoring of acute phase stroke patients includes monitoring of blood pressure, oxygen saturation, positioning, blood glucose and body temperature. In the acute phase, intervention is needed to improve survival of stroke patients. One-third of stroke patients experience a neurological deterioration during the first few days (especially the first 24 hours) and over 25% experience progressing (progressive or permanent neurologic damage).

The development of neurological damage caused by intracerebral processes such as "ischaemic cascade" other than that associated with systemic hemodynamics, biochemistry and physiological disorders that allow it to be overcome. Normal brain function depends on the physiological mechanisms that ensure that the brain receives normal amounts and quality of blood. The amount of blood depends on autoregulation while the quality of blood depends on the levels of oxygen and blood glucose (Jones, Leathley, McAdam & Watkins, 2007). The oxygen saturation level of the pulse oximetry is an indicator of the percentage of haemoglobin saturated with oxygen at the time of examination. The oxygen saturation level indicates the oxygenation status (Wiegand & Carlson, 2005).

In acute stroke, there is a change in the blood flow of the brain. In areas that are ischemic, blood flow decreases significantly and causes hypoxia (Smeltzer & Bare 2008). If the brain's oxygen demand is not met then the metabolism will shift from aerobic to

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 10 October 2024
DOI: 10.47191/ijcsrr/V7-i10-48, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

anaerobic metabolism (Smeltzer & Bare 2008). Anaerobic metabolism results in a rapid increase in the amount of lactate that decreases the pH and increases the availability of local H + ions. In this condition produced lactic acid that stimulates the occurrence of headache (Arifin, 2008). Systemic hypoxemia and hypotension should be avoided. Therefore, oxygen saturation is monitored in the acute phase (Prasad, Kaul, Padma, Gorthi, Khurana, & Bakshi, 2011). Oxygen administration is often given in the acute phase of stroke (Jones, Leathley, McAdam & Watkins, 2007). Cerebral hypoxia is minimized by providing adequate blood oxygenation to the brain. The function of the brain depends on the availability of oxygen that delivered to the tissues. Providing supplemental oxygen and maintaining hemoglobin and hematocrit at acceptable levels will help in maintaining tissue oxygenation (Smeltzer & Bare 2013).

One of the interventions that can be done in order to increase oxygen supply is deep breathing exercise. Breathing exercises with deep breathing exercise techniques help improve pulmonary compliance to retrain respiratory muscles to perform properly and prevent respiratory distress (Ignatavicius & Workman, 2006). Improved pulmonary compliance that can help the ventilation to be more adequate so as to support tissue oxygenation. Deep breathing exercise can improve the function of ventilation and increase oxygenation (Westerdahl, et al, 2005).

Based on the results of study that was conducted by Priyanto (2010) about the Influence of Deep Breathing Exercises on Ventilation Oxygenation Pulmonary Function on Post Mechanical Ventilation concluded that there was a significant difference in Ventilation Oxygenation Pulmonary Function after conducting deep breathing exercise on days 4 and 5 (p=0.018, p=0.004). Then, study from Mirza S and Teguh A., (2015) concluded that there is an effect of deep breathing exercise on the change of peripheral oxygen saturation on asthmatic patients. Deep breathing exercise can be done independently by patients with ischemic stroke and can be taught to the patient. Currently there is no research in Dr. M. Djamil Padang which examined the effect of deep breathing exercise on oxygen saturation changes on patients with ischemic stroke. Based on the description above, the researchers are interested to conduct study on the effectiveness of deep breathing exercise therapy to increase oxygen saturation on patients with ischemic stroke at Dr M. Djamil Padang.

METHOD

The design of this study was a quasi-experimental study with one group pre-post test design (before and intervention design). This study was conducted to determine the difference of oxygen saturation level on patients with ischemic stroke before and after the deep breathing exercise intervention. Cause-effect testing is done by comparing the results at the time of pre test with post test. The population in this study was all patients with ischemic stroke treated in the neurology room of RSUP Dr. M. Djamil Padang,of sample is 16 peoples with inclusion criteria willing to be a respondent, medical diagnosis of ischemic stroke with awareness of compos mentis cooperative, and GCS 15, have normal blood pressure and not exceed 220/110 mmHg and mean artery pressure (MAP) should be normal (not exceed 100 mmHg), Blood Glucose Levels At any time within the normal range (<200 mg / dl) and do not have hypoglycemia (<60mg / dl), Normal Hb levels (Male 13-16 gr% and female 12 – 14 gr%).

The data were processed by computerized and analyzed univariate and bivariate. Univariate data analysis is using descriptive statistic include mean, standard deviation, minimum value and maximum value, meanwhile bivariate analysis was done in order to determine the effectiveness of deep breathing exercise on oxygen saturation among patient with ischemic stroke, to find the influence of independent variable on dependent variable with confident level 95% ($\alpha = 0,05$). After the normality data test is done by using Shapiro – wilk, results show that the data is not normally distributed so that the analysis used is non-parametric test by using Wilcoxon test. The result of analysis is stated to have effectiveness when the value of $p < \alpha$ ($\alpha = 0,05$).

RESULT

The results of the analysis of respondent's oxygen saturation measurement before and after therapy performed per day (for 4 days) are as follows:

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 10 October 2024
DOI: 10.47191/ijcsrr/V7-i10-48, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

Table 1. Respondent frequency distribution based on age and gender.

Characteristic	Frequency (f)	Percentage (%)
Age		
Early Adulthood (18-40 years old)	1	6,25
Mature Adults (41-60 years old)	12	75
Elderly (> 60 years old)	3	18,75
Gender		
Male	7	43,8
Female	9	56,2

Table 2. Respondet's average distribution based on oxygen saturation measurement result before and after the Deep Breathing Exercise (day 1)

Variable (SaO2)	Mean Median	SD	Min – Max	95 % cl
Before therapy	90,00 88,00	3,18329	87,00 – 95,00	88,3 – 91,7
After therapy	91,00 89,5	3,2249	87,00 – 96,00	89,28 – 92,7

Table 3. Respondet's average distribution based on oxygen saturation measurement result before and after the Deep Breathing Exercise (day 2)

Variable (SaO2)	Mean Median	SD	Min – Max	95 % cl
Before therapy	90,3 89,5	3,28	87,00 – 95,00	88,56 – 92,06
After therapy	91,88 92,00	3,30	88,00 – 97,00	90,11 – 93,64

Table 4. Respondet's average distribution based on oxygen saturation measurement result before and after the Deep Breathing Exercise (day 3)

Variable (SaO2)	Mean Median	SD	Min – Max	95 % cl
Before therapy	93,19 94	2,81	88,00 – 97,00	91,69 – 94,68
After therapy	95,13 95,5	2,42	90,00 – 98,00	93,84 – 96,41

Table 5. Respondet's average distribution based on oxygen saturation measurement result before and after the Deep Breathing Exercise (day 4)

Variable (SaO2)	Mean Median	SD	Min – Max	95 % cl
Before therapy	95,94 96,00	2,11	91,00 – 98,00	94,82 – 97,06
After therapy	98,25 99,00	1,00	96,00 – 99,00	97,70 – 98,78

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 10 October 2024
DOI: 10.47191/ijcsrr/V7-i10-48, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

Table 6. Respondet's average distribution based on oxygen saturation measurement result before the Deep Breathing Exercise (day 1) and after the Deep Breathing Exercise (day 4)

Variable	Mean Median	SD	Min – Max	95 % cl
Oxygen Saturation level before Deep Breathing	90,00 88,00	3,18329	87,00 – 95,00	88,3 – 91,7
Oxygen Saturation level after Deep Breathing	98,3125 99,000	0,94648	96,00 – 99,00	97,8 – 98,82

Based on Table 6 can be seen that the mean value of respondent's oxygen saturation before and after therapy. The mean before intervention is given 90,00% become 98,3125% after the intervention, with initial median 88,00 % become 99,00%.

Bivariate Analyysis

The efectiveness of Deep Breathing Exercise before the therapy and after the therapy.

Table 7. the difference of respondent's oxygen saturation mean value before and after Deep Breathing Exercise

Variable	Mean	SD	p value
Pre-Test	90,00	3,183	0,000
Post-Test	98,00	1,000	

Based on Table 7 can be seen that the difference of mean oxygen saturation before the intervention was 90,00% with standard deviation 3,183 and after the intervention become 98,00% with standard deviation 1,00. The result of statistical test shows p=0,000 which means that there was a significant difference between the mean oxygen saturation before and after the Deep Breathing Exercise.

DISCUSSION

The mean oxygen saturation of patient with ischemic stroke before deep breathing exercise was 90,00% with standard deviation 3.18, meanwhile after deep breathing exercise, the mean oxygen saturation become 98,3125% with standard deviation 0,95. The result of statistical test obtained p = 0,000 which means that at alpha 5% there is a significant difference of mean oxygen saturation when deep breathing exercise therapy has been performed than before deep breathing exercise therapy was performed. It means that deep breathing exercise is effective to increase oxygen saturation level on patients with ischemic stroke.

The results of this study are in accordance with theory that proposed by Westerdahl, 2005 stated that Deep Breathing Exercise can increase the function of ventilation and increase oxygenation, with this exercise improved pulmonary compliance that can help the ventilation to be more adequate so as to support tissue oxygenation. The study results are also in line with the study conducted by Priyanto (2010) about The Influence of Deep Breathing Exercises on Ventilation Oxygenation Pulmonary Function concluded that there was a significant difference in Ventilation Oxygenation Pulmonary Function after conducting deep breathing exercise on days 4 and 5 (p=0.018, p=0.004). The results of this study are in accordance with study conducted by Mirza S and Teguh A (2015) concluded that there is an effect of deep breathing exercise on the change of peripheral oxygen saturation on asthmatic patients.

Oxygen saturation level is a level that indicates the status of oxygenation in the blood circulation (tissue) (Wiegand & Carlson, 2005), and one of the most important indicators in oxygen supply in the body is oxygen saturation. In patients with ischemic stroke, especially in the acute phase, oxygen saturation measurements need to be monitored. Ischemic stroke is a clinical symptom of focal cerebral deficits with rapid onset and lasts more than 24 hours and tends to cause death. Stroke is a disease or acute brain functional

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 10 October 2024
DOI: 10.47191/ijcsrr/V7-i10-48, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

disorder focal and global due to inhibition of blood circulation to the brain, consequently the brain that should get the supply of oxygen and nutrients to be disturbed.

Normally every minute the brain requires 800 cc of oxygen and 100 mg of glucose as a source of energy. To maintain adequate oxygenation of the brain requires a balance between oxygen supply and oxygen demand. Brain tissue is particularly vulnerable to impaired oxygen supply. Reduced or lost blood supply to the brain within a few minutes will cause a disruption in brain tissue that varies from mild to severe such as brain cell death (Guyton, A.C & Hall, J. E, 2006). In ischemic stroke, blood flow decreases significantly and causes hypoxia, so brain's oxygen demand is not met and this can cause metabolism will shift from aerobes to anaerobic metabolism and this can lead to a variety of brain disorders one of which is severe pain in the brain or even brain cell death (Smeltzer & Bare, 2013) & (Arifin, 2008), so in stroke patients, systemic hypoxemia should be avoided. Cerebral hypoxia is minimized by providing adequate blood oxygenation to the brain (Smeltzer & bare, 2008). One of the interventions that can be done in order to increase oxygen supply to the brain is by deep breathing exersice therapy where deep breathing exercise can improve the function of ventilation and increase oxygenation (Westerdahl, et al, 2005).

Deep breathing Exercise is a breathing exercise with slow and deep breathing techniques, using diaphragm muscles, allowing the abdomen to lift slowly and full-blown chest (Smelzer, et, al, 2008). The purpose of deep breathing exercise is to achieve a more controlled and efficient ventilation and reduce respiratory work, increase maximal alveolar inflation, muscle relaxation and eliminate anxiety, prevent useless pattern of respiratory muscle activity, slowing the frequency of breathing, reducing the trapped air and reducing the work of breathing (Smeltzer, et al, 2013). Thus, from the results of this study, explained that deep breathing therapy is effective in increasing oxygen saturation of patients with ischemic stroke.

Normal Oxygen Saturation is 95 - 100%. In stroke patients, oxygen saturation monitoring is a must. This monitoring is performed on patients with ischemic stroke, with a target of oxygen saturation> 95% so that the patient is spared from more severe conditions. In this study it can be seen that the mean oxygen saturation before deep breathing therapy on patient with ischemic stroke is 90,00 with median 88.00 and it indicates that the patient is in a condition of oxygen deprivation. Once being given deep breathing therapy regularly every day, it shows an increase in oxygen saturation level which can be seen on the first day after the implementation of patient saturation therapy is measured, an increase in mean SaO2 become 91.00%. On the second day, before SaO2 therapy, it was measured beforehand and the patient's mean SaO2 was 90.3125 and mean SaO2 91.875 after therapy. On the third day, the patient's mean O2 saturation level before the therapy had increased to 93,188 and after therapy, the patient's mean SaO2 level was 95.125. On the fourth day, before the therapy, the patient's SaO2 was measured and the patient's mean SaO2 level was 95,938 and after the therapy, the patient's mean SaO2 level increased to 98.3125 with a minimum value of 96.00 and a maximum value of 99%. This suggests that regular deep breathing therapy on patients with ischemic stroke can increase the oxygen saturation level> 95%. So deep breathing therapy can be recommended as one of the nursing interventions to increase oxygen saturation of patients with ischemic stroke.

CONCLUSION

There was a significant difference between the mean SaO2 on patients with ischemic stroke before and after deep breathing Exercise. And with p value 0,00 stated that deep breathing exercise therapy is effective in increasing oxygen saturation level of patients with ischemic stroke. As well as through this study, Module / SOP therapy has been made and submitted to the patient and also to the nurse

REFERENCES

1. Arifin, M.Z. (2008). Korelasi antara Kadar Oxygen Delivery Dengan Length of Stay pada Pasien Cedera Kepala Sedang. Program Pendidikan Bedah Dasar Bagian Bedah FK Unpad.
2. Depkes RI.(2011). Standar Pelayanan Unit Stroke. Jakarta : Depkes RI.
3. Ignatavicius, D.D. & Workman, M.L. (2006). Medical surgical nursing ; critical thinking for collaborative care; fifth edition, volume 2, Elsevier Saunders, Westline Industrial Drive, St. Louis, Missouri.
4. Jones, S. P., Leathley, M. J., McAdam, J. J., & Watkins, C. L. (2007). Physiological monitoring in acute stroke: a literature review. *Journal of Advanced Nursing*, 60 (6), 577–594.

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 10 October 2024
DOI: 10.47191/ijcsrr/V7-i10-48, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

5. Kementerian Kesehatan Republik Indonesia. (2014). Laporan Hasil Riset KesehatanDasar Indonesia (Riskesdas) 2013.
6. Misbach, J., Airiza, A., Lyna, S., Jofizal, J., Salim, H., Silvia, L., Al, R. & Enny, M. (2007). Pandangan Umum mengenai Stroke. Jakarta: Balai Penerbit FKUI
7. Sylvia, A. P., and Lorraine M. W. (2006). Patofisiologi : Konsep Klinis Proses-Proses Penyakit, Volume 2, Edisi 6, Penerbit Buku Kedokteran EGC, Jakarta
8. Prasad, K., Kaul, S., Padma, M. V., Gorthi, S. P., Khurana, D., & Bakshi, A. (2011). Stroke management. *Ann Indian Acad Neurol*, 14 (1), S82-S96.
9. Priyatno.(2010). Pengaruh *Deep Breathing Exercise* Terhadap Fungsi Ventilasi Oksigenasi Paru Pada Klien Post Ventilasi Mekanik. Thesis. FIK UI
10. Smeltzer, S.C., Bare, B.G., Hincle, J.I., Cheever, K.H. (2013). Textbook of medical surgical nursing; brunner & suddart. eleventh edition, Lipincott Williams & Wilkins, a Wolter Kluwer Business.
11. Westerdahl, E., Linmark, B., Ericksson, T., Friberg, O., Hedenstierna, G. & Tenling, A. (2005). Deep breathing exercises reduce atelectasis and improve pulmonary function after coronary artery bypass surgery. http://chestjournal.chestpubs.org/content/128/5/3482.full.html.
12. Wiegand, D.J.L.M. & Carlson, K.K. (2005). Procedure manual for critical care.Fifth Edition.
13. Elsevier Saunders. 11830 Westline Industrial Drive, St. Louis Missouri 63146.