

# Effects of Deep Breathing Exercises on Old Versus Young Patients Undergoing Valve Replacement Surgery

Deep Breathing Exercises on Old VS Young

Nashmiya Shahid, Munaza Arwa, Zunaira Arshad, Rehana Niazi, Nazeer Mehrvi and Abbas Jamil

## ABSTRACT

**Objective:** To determine the effects of deep breathing exercises in old versus young patients undergoing Valve Replacement Surgery.

**Study Design:** Quasi-Experimental Study

**Place and Duration of Study:** This study was conducted at the Hameed Latif Hospital, Gulab Devi Hospital, and Mayo Hospital Lahore from 15-03-2022 until 15-8-2022.

**Methods:** A sample of 66 patients was taken using a non-probability purposive sampling technique. The sample was divided into two groups of young (aged 18-45) and old patients (aged above 50) with 33 individuals in each group. Deep breathing exercises (diaphragmatic, pursed lip, and segmental breathing) were performed on each patient in 6 sessions, 3 per week. Each exercise was performed for 5-10 minutes with a 1-2 second pause. The oxygen saturation and functional capacity were measured using a pulse oximeter and dyspnea index before and after DBE.

**Result** There was a significant difference between oxygen saturation of old patients of VRS post-intervention with a mean value of  $-1.454 \pm 1.348$  with a p-value less than 0.005. However, the post-intervention oxygen saturation of young patients of VRS showed marked improvement as compared to the old patients with a mean value of  $-2.696 \pm 1.722$  with p value less than 0.005. **ts:**

**Conclusion:** The findings of the current study showed that deep breathing exercises were effective in improving oxygen saturation in both young and old patients with marked improvement in young patients undergoing valve replacement surgery.

**Key Words:** Deep breathing exercises, Valve replacement surgery, Oxygen saturation, Dyspnea Index.

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## INTRODUCTION

Valve replacement surgery has become the most commonly opted-for surgical treatment for patients with severe valvular heart disease. For these patients, mechanical and bioprosthetic heart valve replacements have been a common choice.<sup>(1)</sup> Nevertheless, there are hazards involved with heart surgery even if it incorporates the usage of cutting-edge technology to minimize the risks.<sup>(2)</sup>

Early in the postoperative phase, patients experience restrictive respiratory anomalies, including decreased

lung capacities and poor gas exchange. Complications include atelectasis, bronchospasm, dyspnea, cough, pneumonia, respiratory failure, and worsening of lung disease.<sup>(3)</sup>

Post-operative morbidity and mortality tend to increase in elderly patients undergoing valve replacement surgery. Although operative factors and excessive comorbid burdens play their part, age qualifies as the sole important risk factor for increased risk during and after valve replacement surgery.<sup>(4)</sup> In contrast, young patients display good morphologic and functional results according to follow-up reports by MRI and echocardiography.<sup>(5)</sup>

Different breathing exercises that may or may not require mechanical devices are suggested following cardiac surgery.<sup>(6)</sup> These breathing exercises are a part of the postoperative rehabilitation plan in hospitals to prevent postoperative pulmonary complications and their unwanted effects. Increasing the lung volume typically reduced in the postoperative period is the primary goal of deep breathing exercises. Although coughing and forced expiratory techniques are performed on patients in clinical settings to help them

Department of Physical Therapy, Rashid Latif, Medical College, (RLMC), Lahore.

Correspondence: Dr. Nashmiya Shahid, Physical Therapist, Department of Physical Therapy Rashid Latif Medical College (RLMC), Lahore.  
Contact No: 0314 8546239  
Email: nashmiya.s@yahoo.com

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with mucus clearance, no single exercise is considered the most appropriate deep breathing technique.<sup>(7)</sup>

**METHODS**

Purposive sampling with non-probability was used in this quasi-experimental investigation. The Institutional Review Board (IRB) of Rashid Latif Medical College provided the ethical permission (Certificate Reference Number IRB/2022/055). With 33 individuals in each group, a sample size of 66 was determined using the formula  $n = \frac{z_1^2 \sigma^2 (Z_{1-\alpha/2} + Z_{1-\beta})^2}{(\mu_0 - \mu_a)^2}$ . From 1503–2022 to 15–8–2022, the study was carried out in the Mayo Hospital in Lahore, the Gulab Devi Hospital, and the Hameed Latif Hospital. We obtained informed permission from each individual. There were two organizations established. Group B had elderly patients, whereas group A featured younger individuals. The requirements for participation were being older than eighteen and having valve replacement surgery. Patients with angina at rest prior to surgery, those requiring more than 15 hours of artificial ventilation following surgery, those receiving continuous positive airway pressure (CPAP) treatment, those receiving aorta balloon treatment, and those experiencing a pneumothorax necessitating drainage therapy were excluded from consideration.

Each patient had six sessions, spread over two weeks, of deep breathing exercises, which included segmental, pursed lip, and diaphragmatic breathing. Every exercise was done for 510 minutes, pausing every 1-2 seconds. Pre- and post-intervention functional ability and oxygen saturation of each patient were evaluated using the Dyspnea Index and Pulse Oximeter. Demographic information was recorded before the intervention plan was given. Every patient's hospital records was examined for surgical history and comorbidities. Two weeks later, the oxygen saturation and functional capacity were assessed once more, and the findings were recorded.

**Data Analysis:** Version 25 of SPSS for Windows was used to analyze the data. Frequency tables and percentages were used to display all qualitative factors. The McNemar Test was used to determine whether the data were normal. To measure the difference between the two groups, the parametric test (paired-T test), a

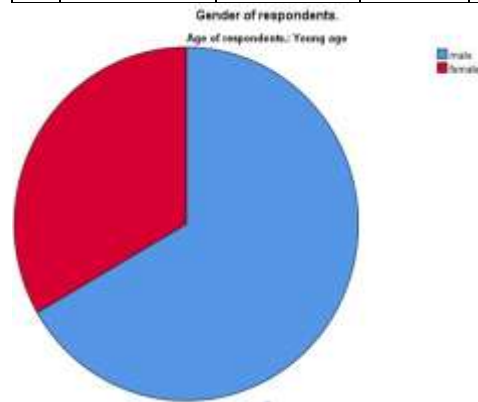
mean comparison test, was chosen. For graphical display, quantitative values were shown as mean + SD using a histogram.

**RESULTS**

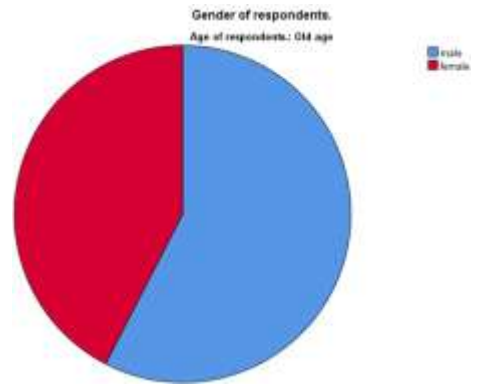
In total of 66 participants, 33 were young and 33 were old. The table for age of participants and the pie charts representing gender distribution for each group are as follows:

**Table No. 1: Age of respondents:**

		Frequency	Percent	Cumulative Percent
Valid	Young age	33	50.0	50.0
	Old age	33	50.0	100.0
	Total	66	100.0	



**Figure No. 1: Pie chart of young male and female patients**



**Figure No. 2: Pie chart of old male and female patients**

**Table No. 2: Oxygen Saturation**

			Mean	N	Std. Deviation	Significance
Pair 1	Young age	Before exercise (deep breathing) Oxygen saturation	91.4242	33	1.73260	0.000
		After exercise (deep breathing) Oxygen saturation.	94.1212	33	2.23268	
Pair 1	Old age	Before exercise (deep breathing) Oxygen saturation	91.2424	33	2.31881	0.000
		After exercise (deep breathing) Oxygen saturation.	92.6970	33	2.54319	

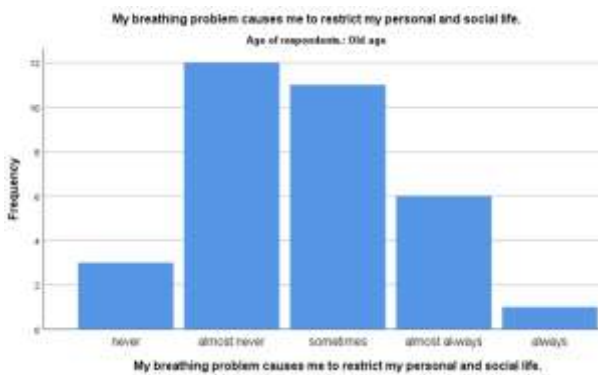
The paired sample t-test was used to measure any difference between pre- and post-values of oxygen saturation of young and old participants. It showed a significant difference between oxygen saturation values of young participants with valve replacement surgery without non-invasive ventilation after deep breathing exercises.

The Dyspnea Index (DI) was also recorded for each participant before and after the intervention.

The results also showed marked improvements in young participants as compared to older ones.



**Figure No. 3: The response of young patients to the Dyspnea Index**



**Figure No. 4: The response of old patients to the Dyspnea Index**

## DISCUSSION

In this study, deep breathing exercises were far more effective in young participants with valve replacement surgery as compared to the older participants. The mean scores given by paired sample t-test were significantly different in the young population pre- and post-intervention, while the older population showed no marked differences. The pre-and post-intervention responses of young patients according to the Dyspnea Index also showed marked improvement, but the differences between the pre-and post-intervention responses of older patients were not that significant. The clinical findings of this research show that deep breathing exercises are way more effective in improving the oxygen saturation of young patients after

valve replacement surgery as compared to older patients.

In a previous study that was conducted by Urell et al.<sup>(8)</sup> in 2011, the clinical efficacy of deep breathing exercises on patients of cardiac surgery was checked. The findings of this clinical trial confirmed that an interventional program of deep breathing exercises at a greater intensity improves pulmonary symptoms in the initial postoperative days. However, for my study, two age groups of patients undergoing valve replacement surgery were selected. This was performed to exhibit the marked differences in the effects of deep breathing exercises in young and old patients.

Another study headed by Renault et al.<sup>(9)</sup> explored the comparison of the effects of deep breathing exercises (DBE) and flow-oriented incentive spirometry in patients who underwent coronary artery bypass grafting (CABG). The study concluded that CABG patients who followed these interventions postoperatively did not exhibit significant improvement. In contrast, young patients with valve replacement surgery who performed deep breathing exercises showed significant improvement in my study.

To assess the effects that pre-and postoperative inspiratory muscle training can have on the length of hospital stay after surgery and the lung function of patients with cardiac surgery, a study was done in 2016 by Neto et al.<sup>(10)</sup> It was deduced that inspiratory muscle training is an effective pre- and postoperative intervention for patients with heart surgery. Comparatively, my study assessed the postoperative respiratory performance after DBE was performed in young and old patients with valve replacement surgery, and it found a substantial improvement in the young participants.

A randomized clinical trial carried out in 2014 by Kazem et al.<sup>(11)</sup> assessed the effects respiratory physiotherapy can have in reducing the risks of postoperative pulmonary problems, both pre-and post-operatively. The study concluded that it is advised to participate in a pulmonary physiotherapy program before cardiac surgery to minimize postoperative pulmonary complications. Conversely, my study explored the effects of DBE postoperatively in two different age groups with substantial improvement in the lung function of the young population.

Because of this study's limited sample size, it is impossible to generalize the findings to a larger population. Furthermore, there were unequal numbers of male and female participants in each of the two age groups. The fact that this study was limited to three settings and one city was another drawback. Patients' answers might have varied depending on their level of literacy and whether they were experiencing postoperative depression. Some participants may have over- or underreported their symptoms, which could have biased the clinical findings.

## CONCLUSION

The clinical findings of the current study showed that deep breathing exercises were effective in improving oxygen saturation in both young and old patients with marked improvement in young patients undergoing valve replacement surgery.

### Author's Contribution:

Concept & Design of Study: Nashmiya Shahid  
 Drafting: Munaza Arwa, Zunaira Arshad  
 Data Analysis: Rehana Niazi, Nazeer Mehrvi, Abbas Jamil  
 Revisiting Critically: Nashmiya Shahid, Munaza Arwa  
 Final Approval of version: Nashmiya Shahid

**Conflict of Interest:** The study has no conflict of interest to declare by any author.

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