

# COMPARATIVE OUTCOME FOLLOWING INTRODUCTION OF CHEST PHYSIOTHERAPY AT HOSPITAL SETTING AFTER MAJOR ABDOMINAL SURGERY

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### Abstract

**Background:** Postoperative respiratory complications are still a matter of 'folds in forehead' for surgeons. Though optimum pre-operative preparation and good surgical technique, we always observe that there are some sorts of post-operative chest complications after major abdominal surgery. Now-a-days, chest physiotherapy is usually advised by the surgeons in the immediate postoperative period. But still it is not in a constructive way. There is no well-documented study regarding the effectiveness of chest physiotherapy in an immediate post-operative period of major upper abdominal surgery. So, this is a time demanding study in this regard.

**Objectives:** To evaluate the effectiveness of chest physiotherapy during the immediate postoperative period among patients undergoing elective major abdominal surgery.

**Methods:** All patients who underwent major abdominal surgery were selected by purposive sampling. Thereafter, they were scrutinized according to eligibility criteria and 100 patients were finalized. Among them, 50 were enrolled under control group and rest 50 were enrolled under study group. This experimental study was conducted in department of Surgery, Dhaka Medical College Hospital, Dhaka, from March 2017 to December 2017.

**Results:** The mean age of the participants in control and study groups were 49.73±15.91 year and 53.77±12.21 year respectively. The female to male ratio in these groups was 1:2.13 and 1:3.17 respectively. Two groups presented similar levels of pain before and after surgery. The group receiving chest physiotherapy presented a lower pain score on the immediate postoperative day. The preoperative spirometry values (expressed as a percentage of the predicted values) were almost similar in two groups and presented average decreases of 20% in FVC, FEV, and PEF on the 1<sup>st</sup> post-operative day. It was observed that the measurements of oxygen-hemoglobin saturations were different for the control (96.7±1.6 vs 95.2±1.8; p=0.005) and study group (97.3±1.8 vs 94.6±2.5; p=0.03). Respiratory distress was not significantly higher in control group but interestingly there were statistically significant differences observed between the control and study group regarding fever, Surgical site infection (SSI) and mean hospital stay.

**Conclusion:** Chest physiotherapy in major abdominal surgery shows an excellent outcome that accelerates the overall recovery.

**Key words:** Chest physiotherapy, Major abdominal surgery.

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### Introduction

The abdominal surgery where general anesthesia is used are usually termed as major abdominal surgery. It is the mainstay of treatment of different clinical conditions. Thoracic and abdominal surgeries result in the highest incidence of postoperative respiratory complications as compared to peripheral surgery.

The complications are sequelae to changes in lung volumes that occur in response to respiratory muscle dysfunction and significantly contribute to peri-operative morbidity and mortality affecting 25–50% of patients as well as increased patient discomfort, increased consumption of resources, longer length of stay and thus overall increased health care costs<sup>1</sup>.

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Major abdominal surgery especially upper abdominal surgeries are associated with a high risk of postoperative pulmonary complications. 75% of all postoperative complications are pulmonary complications<sup>2</sup>.

Chest physiotherapy may include preoperative assessment and instruction. After the operation, treatment usually consists of at least some form of breathing exercises and coughing. In addition, techniques such as postural drainage, percussion or vibrations to the chest wall, and methods such as incentive spirometry, intermittent positive-pressure breathing (IPPB) and continuous positive airway pressure (CPAP) may be incorporated. The rationale for employing breathing exercises or devices that encourage deep breathing after operation is that normal or improved respiratory patterns will be promoted, thus improving the distribution of ventilation. The use of postural drainage, percussion, vibrations and coughing are believed to enhance the clearance of excessive or retained pulmonary secretions from the conducting airways, thus preventing or reversing areas of atelectasis and decreasing the incidence of lung infection. If these aims are achieved, it is possible to document enhanced ventilatory function and pulmonary gas exchange by demonstrating decreased incidence of pulmonary complications, increased rate of postoperative recovery and improved clinical course of postoperative pulmonary complications<sup>3</sup>.

### Methods

Total 100 patients were selected. There were 2 groups, one control and the other was study group.

The study group patients were those in which chest physiotherapy was implemented after major abdominal surgery whereas the control group was those patients who usually would not.

The control group was evaluated on the day before surgery and on the postoperative days. Anamnesis, physical examination, pulse oximetry and spirometry tests were performed

before and after surgery. They did not receive any chest physiotherapy.

Before and after spirometry the patients were asked to subjectively describe their pain using a visual analogue pain scale (VAPS), which comprised numbers from 0 (no pain) whatsoever to 10 (worst possible pain)<sup>4</sup>.

The study group underwent anamnesis, physical examination, pulse oximetry on the day before surgery and after surgery and spirometry tests on the 14th postoperative day. The protocol was breathing exercise for 30 minutes including passive and localized exercises, deep diaphragmatic breathing and chest wall expansion exercise<sup>5</sup>.

Patients of both groups were asked to come for follow up visit one month after surgery and regarding their experience of any post-operative pulmonary complications such as coughing, dyspnea, fever, sputum in airways and any need for additional medications<sup>6</sup>.

#### *Inclusion criteria:*

Patients who were scheduled for elective upper abdominal surgery.

- Age range: 20 – 60 year.
- All patients were undergone surgery under general anesthesia.
- ASA grading, I and II.

#### *Exclusion Criteria:*

Patients who will undergo laparoscopic surgery.

- ASA grade III and above.
- Patients who were transferred to ICU immediately after surgery or face any emergency situation.
- Smokers.

### Results

Out of 50 patients in each group, the highest 42% belonged to age group 50-59 year are in control group whereas 34% in 40-49 year in the study group. The mean age of the participants in control and study groups were 49.73±15.91 years and 53.77±12.21 years respectively (Table I).

**Table- I**

*Demographic Characteristics of the patients (n=100)*

Age Group	Control group (n <sub>1</sub> = 50)	Study group (n <sub>1</sub> = 50)
20-29	3(6%)	9(18%)
30-39	6(12%)	8(16%)
40-49	15(30%)	17(34%)
50-59	21(42%)	15(30%)
>60	5(10%)	1(2%)
Mean age ± SD	49.73 ± 15.91	53.77 ± 12.21

Table II shows that two groups presented similar levels of pain before and after surgery. The group receiving chest physiotherapy presented a lower pain score on the immediate postoperative day. There was no statistically significant difference considering the use of analgesics for both groups.

**Table II**

*Distribution of patients according to preoperative and postoperative VAS score (N=100)*

VAS status	Control Group (n <sub>1</sub> = 50)	Study Group (n <sub>1</sub> = 50)	P-value
Preoperative	3.0(2.0-3.7)	3.0(1.3-4.5)	>0.05
1st POD	3.0(2.0-6.9)	2.0(2.0-6.5)	>0.3
2nd POD	3.0(2.0-3.8)	3.0(1.3-3.9)	>0.05

\*Data presented as median and interquartile range (25% - 75%)

Distribution of different types of surgery encountered both in control and study group. Here it was revealed that 26% patients in control group underwent abdomin-perineal resection whereas 28% patients in study group underwent anterior resection and sigmoid colectomy. The other categories included here were open cholecystectomy with choledocholithotomy, splenectomy and so on (Table III).

**Table III**

*Distribution of patients according to surgery encountered (N=100)*

Surgery encountered	Control Group (n <sub>1</sub> = 50)	Study Group (n <sub>1</sub> = 50)
Lower radical gastrectomy	8 (16%)	10 (20%)
Esophagectomy	2 (4%)	1 (2%)
Hemicolectomy	7 (14%)	12 (24%)
Abdominoperineal resection	13 (26%)	6 (12%)
Anterior resection/sigmoid colectomy	11 (22%)	14 (28%)
Others	9 (18%)	7 (14%)

Preoperative spirometry values (expressed as a percentage of the predicted values) were almost similar in two groups and presented average decreases of 20% in FVC, FEV1 and PEF on the 14<sup>th</sup> postoperative day (Table IV)

**Table IV**

*Distribution of patients according to comparison of spirometry and peak expiratory flow rate (N=100; 50 in each group)<sup>7</sup>*

	Control Group n (%)			Study Group n (%)		
	Pre-op	Post-op	P-value	Pre-op	Post-op	P-value
FVC (%)	83.6±16.9	63.1±17.8	<0.001	96.3±18.7	79.0±27.3	<0.007
FEV1 (%)	89.3±17	68.17±14.12	<0.01	96.7±18.6	79.8±25.2	<0.003
FEV1/FVC (%)	107.1±13.6	108.7±14.9	0.53	101.3±11.3	103.012.6	>0.05
PEF (Litres/min)	362.4±119.1	259.1±86.1	<0.01	388.8±118.7	290.0±99.1	<0.001

P-value was calculated by Student's t-test

**Table V***Distribution of patients according to oxygen-hemoglobin saturation (N=100; 50 in each group)*

SpO <sub>2</sub> (%)	Control Group n (%)			Study Group n (%)		
	Pre-op	Post-op	P-value	Pre-op	Post-op	P-value
	96.7±1.6	95.2±1.8	0.005	97.3±1.8	94.6±2.5	0.03

SD = Standard Deviation, P-value was calculated by Student's t-test, P-value was significant at <0.05.

**Table VI***Distribution of patients according to outcome of chest physiotherapy (N=100)*

Outcome	Control Group (n <sub>1</sub> = 50)	Study Group (n <sub>1</sub> = 50)	P-value
Postoperative pulmonary complications	8 (16%)	6 (12%)	>0.05
Fever (≥36.8 °C)	17 (34%)	9 (18%)	0.029
Surgical Site Infection (SSI) (no. of pt)	21 (42%)	8 (16%)	0.003
Length of hospital stay (in days)	14.19±2.1	10.13±1.3	0.03

P-value was calculated by chi-square test P-value was significant at <0.05

Oxygen-hemoglobin saturations found from preoperative and postoperative measurements where it was observed that the measurements were different for the control (96.7±1.6 vs 95.2±1.8; p=0.005) and study group (97.3±1.8 vs 94.6±2.5; p=0.03)<sup>9</sup> (Table V).

Respiratory distress was not significantly higher in control group but interestingly there were statistically significant differences observed between the control and study group regarding fever, SSI and mean hospital stay (Table VI).

### Discussion

The main aim of this study was to evaluate the effectiveness of chest physiotherapy during the immediate postoperative period among patients undergoing elective upper abdominal surgery<sup>10</sup>.

Conventional risk factors for abdominal surgery are generally related to demographics such as age, smoking habits, comorbidities such as diabetes, chronic obstructive pulmonary disease and heart disease etc. Cardiorespiratory fitness is a strong independent predictor in older patients undergoing abdominal surgery. Moreover, in older patients undergoing abdominal surgery, physical fitness and activity are significantly and strongly associated with the postoperative outcomes such as mortality,

length of stay and functional recovery. Apart from a predictive factor, physical fitness is also a modifiable and treatable factor during the preoperative phase. If there is a cause-effect relationship with the postoperative course, patients will benefit from preoperative interventions to improve their physical fitness. The evidence is accumulating that inspiratory muscle training decreases the incidence of Post-Operative Pulmonary Complications like atelectasis, pneumonia after abdominal surgery. Moreover, preoperative aerobic exercise training is associated with the improved physical fitness of patients before and improved functional recovery after abdominal and thoracic surgery<sup>11</sup>.

There is no significant difference in the chest physiotherapy group regarding reduction of pain after surgery. It seems that mobilization may increase pain intensity after abdominal surgery<sup>12</sup>. Nonetheless, it can be said that not only analgesic treatment but also physiotherapy for abdominal and thoracic surgery can reduce the hospital stay and improve recovery

The postoperative spirometry results presented in this study by the two groups did not show any significant differences. Spirometry as a means of quantifying lung function is

controversial. Its best results may not be achieved after abdominal surgery since patients are unable to perform at their best or even to make a moderate effort to reach total pulmonary capacity or produce maximal forced expirations. The results from this study may add to other authors' investigations, to suggest that there is no evidence that spirometry has any predictive value with regard to postoperative pulmonary complications other than what is supplied by clinical evaluation, considering the short observation period.

In the present study, the oxygen-hemoglobin saturation increased after physiotherapy. It is of interest to notice that, comparing the times before and after physiotherapy, the saturation increased even with the decay on the second day after surgery. Since these values did not last two days, it is reasonable to suggest that patients would benefit from additional chest exercises during and after their postoperative stay.

Respiratory problem was almost similar between the control and study group but interestingly there were statistically significant differences observed between the control and study group regarding fever, SSI and mean hospital stay.

### Limitation

- This was a single blinded, single centered study.
- Duration was short.
- The sample size was small.

### Recommendation

- A multicentered study in the divisional/tertiary hospitals of whole Bangladesh can reveal the real picture.
- A guided and observatory chest physiotherapy system as a perioperative management in major abdominal surgery is recommended. So that the study outcome may be more precise in their aspect.

### Conclusion

We conclude that this participatory, preventive, predictive and preferably personalized perioperative exercise training intervention might be a valuable asset to concepts like 'strong for surgery'. Implementation should be guided

by proper monitoring of the effects in the real-life context of the care system. Chest physiotherapy in major abdominal surgery shows an excellent outcome that can accelerate the overall recovery.

### Ethical Issue

Ethical clearance was taken from the ERC of DMCH.

### Disclosure

Nothing declared.

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