

Frequency of Respiratory Complications in Post COVID-19 Patients After Coronary Artery Bypass Grafting

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ABSTRACT

Objective: To determine the frequency of post-operative pulmonary complications after (coronary artery bypass grafting) CABG surgery and to compare the respiratory complications of post COVID and comparison group

Study Design: Analytical Cross-sectional study

Study Place and Duration: Study was conducted in Adult Intensive Care Unit, Armed Forces Institute of Cardiology, Rawalpindi Pakistan, from Sep 2021 to Mar 2022.

Methodology: 40 patients were selected, and divided into two groups using non-Probability consecutive sampling. Group-A had history of COVID-19 infection and Group-B was a comparison group and had no history of COVID-19 infection. Patients presenting for elective On-Pump (coronary artery bypass grafting) CABG surgery and known history of COVID-19 were included in our study. Patients of age ranging 30 to 70 years irrespective of gender were included in the study. Any patient who had cardiopulmonary bypass time of more than 120 min, respiratory illness like asthma or Chronic Obstructive Pulmonary Disease (COPD), history of smoking, or requiring post-operative re-ventilation due to cardiac or neurological complication, were excluded from the study. After patients were received from Operation theatre, they were monitored for the respiratory complications and both groups were compared.

Results: A total of 40 patients were included in this study having mean age 57.9 ± 7.62 years. Most of the patient population was male 31(77.5%) and only 09(22.5%) were female patients. Study population was equally divided into two groups i.e., 20(50%) in comparison group and 20(50%) in post COVID-19 group. There was no significant difference in age ($p=0.714$), ventilation time ($p=0.068$), gender ($p=1.000$), and re-ventilation ($p=0.451$) of both groups. While Intensive Care Unit stay ($p<0.0001$) and non-invasive ventilation (NIV) were found to be significant ($p=0.007$).

Keywords: CABG, Post COVID-19, Respiratory complications

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INTRODUCTION

Virus emerging from Wuhan, China turned into a global pandemic which stressed medical setups globally. Elective procedures were stopped in many hospitals, however, emergencies cannot be curtailed. Studies are being conducted to understand the impact of the disease so as to counter its effects as it causes a wide spectrum of diseases; from acute symptoms as in acute respiratory distress syndrome,¹ to long term pulmonary complications,² to extra respiratory complications like gastrointestinal, cardiac, renal, hepatic, hematological etc.³

Since COVID-19 primarily affects lungs, so it can be easily speculated that it will cause post operative respiratory complications, leading to increase

ventilator timing, requirement of BiPAP and increased length of stay in hospital. Though some studies have argued that COVID-19 had minimal impact on post operative morbidity and mortality in emergency general surgery cases,⁴ but other studies have showed that post operative pulmonary complications occurred in more than half of the cases,⁵ resulting in higher mortality.

COVID-19 affects patients more who are elderly, have diabetes, hypertension or obesity⁶ and ischemic heart diseases are also more prevalent in these patients. CABG in itself, causes post operative respiratory complications.⁷ Pulmonary complications do occur,⁸ with frequency of 51.2% patients developing pulmonary complications which resulted in mortality rate of 38%.⁹ Some studies have mentioned that around 40% of patients re-admitted to ICU have respiratory failure as the cause for re-admission.¹⁰

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So far we could not find any research being focused on Post-COVID patients who had to undergo CABG. Keeping in view the respiratory effects of COVID 19 and CABG, we decided to see gravity of respiratory complications after CABG surgery in Post COVID-19 patients, by focusing on ventilator timing, requirement of BiPAP and length of stay in Intensive Therapy Unit (ITC).

METHODOLOGY

This cross sectional study was conducted in Adult ITC, Armed Forces Institute of Cardiology over a period of 06 months. Approval was obtained from Hospital ethical committee (IERB Letter# 25/4/R&D/2022/166) for this study.

Sample Size: 40 patients were selected by taking 2-16% prevalence of pulmonary complications after CABG surgery¹¹, and divided into two groups using non-probability consecutive sampling.

Inclusion Criteria: Male and female patients with age range of 30 to 70 were included in the study and the patients presented for elective On-Pump CABG and had known history of COVID-19, except for Comparison group which had no history of COVID-19 were included. COVID-19 PCR positive record was checked for the patients. And their Post-COVID duration was also noted.

Exclusion Criteria: Any patient who had cardiopulmonary bypass time of more than 120 min as it increases the systematic inflammatory response, respiratory illness like asthma or COPD, history of smoking, or requiring post-operative re-ventilation due to cardiac or neurological complication, were excluded from the study.

After patients were received from Operation theatre, they were placed on ventilator. Hospital protocols for extubation were followed for both groups in similar manner. Our primary outcomes were: Duration of ventilation, Non-invasive ventilation requirement (minimal 8 hourly, moderate 6 hourly, marked 4 hourly), if these patients were re-ventilated due to pulmonary reasons (which were determined on the basis of Chest Xray and/or Arterial blood gases and/or clinical condition as determined by specialist incharge of ITC), and duration of stay in ICU.

Data Analysis: SPSS version 24 was used for analysis of data. Age, weight, height, BMI and core and axillary temperatures were compared using independent samples t-test. Frequency of shivering was compared

using pearson’s chi square test. p -value <0.05 was taken as significant.

RESULTS

A total of 40 patients were included in this study having mean age of 57.9 ± 7.62 years. Most of the patient population was male 31(77.5%) and only 09(22.5%) female patients. Study population was equally divided into two groups i.e., 20(50%) in comparison group and 20(50%) in post COVID group. Out of 09(22.5%) re-ventilated patients, 06(66.6%) were from post COVID group and 03(33.3%) were from comparison group (p -value=0.451). There was no significant difference in age ($p=0.714$) and ventilation time ($p=0.068$) of both groups as mentioned in Table-I. While ICU stay had significant findings between two groups ($p=<0.0001$).

Table-I: Comparison of Both Groups with Numeric Variables

Variables	Group		p-value
	Post COVID (Group-A)	Comparison (Group-B)	
Age (years)	58.35±7.05	57.45±8.3	0.714
Ventilation time (min)	546.3±94.8	486.5±106.9	0.068
ICU stay (hr)	121±32.7	67.7±28.9	<0.0001

As shown in Table-II gender and re-ventilation were not found significant ($p=1.000$ and $p=0.451$ respectively).

Table-II: Comparison of Both Groups with Categorical Variables

Variables		Group		Total	p-value
		Post COVID (Group-A)	Comparison (Group-B)		
Gender	Male	16	15	31	1.000
	Female	4	5	9	
Re-ventilation	Yes	6	3	9	0.451
	No	14	17	31	
Requirement of NIV	Mild	7	7	14	0.007
	Moderate	5	3	8	
	Severe	8	2	10	
	Nil	0	8	8	

Non-invasive ventilation

NIV was found to be significant by having majority of participants in mild NIV (n=14) group and severe NIV (n=10) group ($p=0.007$).

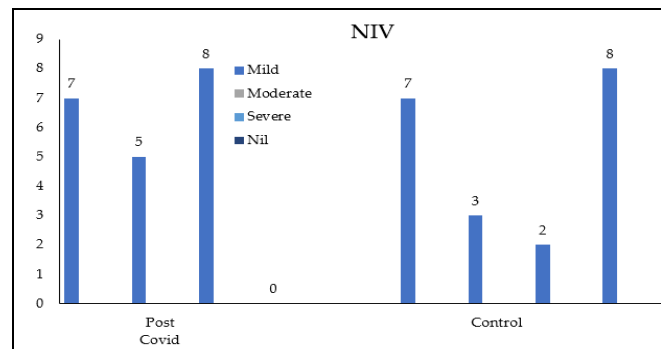


Figure: Comparison of NIV Status of Group-A (Post-COVID) and Group-B (Comparison Group)

DISCUSSION

Multiple studies have stated that frequency of complications and mortality is higher in patients having COVID-19.¹¹ Initially the recommendations were to keep high threshold for surgery,¹² but this cannot be the case forever as in many cases delaying surgery in itself will increase mortality. With millions of people already having contacted the disease, main challenge in times to come would be Post-COVID patients who present for surgery. This will require a change in our approach to these patients, starting from pre-anaesthesia assessment.¹³ This is because elective surgeries can be done safely if Patient's respiratory status is not compromised,¹⁴ whereas COVID-19 patients have issues in respiratory physiology. This has resulted in researchers shifting their focus on development of evidence based framework for evaluating Post-COVID patients.¹⁵

COVID-19 increases the frequency of Post operative respiratory failure in patients.¹⁶ This resulted in formulation of guidelines like postponing surgery for minimum of 7 weeks after diagnosis of COVID if patient is stable and asymptomatic, and longer if patient had symptoms.¹⁷ Other studies have refined the duration by advocating delaying elective surgery for 4 weeks after diagnosis of COVID-19 in asymptomatic patient, 6 weeks for symptomatic non-hospitalized patient, 8 to 10 week for patient having comorbidity or hospitalization and 12 weeks if the patient required intensive care unit.¹⁸ However, these studies don't focus on cardiac surgeries where the procedure in itself has post operative respiratory complications. This highlights the significance of our study as we will be receiving a lot of patients in future who had COVID-19 infection in the past.

In our study, we had made two groups, each consisting of 20 patients. Our main observation in regards to ventilation time was that patients who were Post-COVID, required ventilation for longer period of time, 546.3 ± 94.87 min as compared to 410.5 ± 134.89 min for comparison group. This difference was statistically significant. Though studies suggest that mechanical ventilation helps the patients achieve better weaning parameters; and other studies have quoted that pulmonary functions improve earlier in patients who had severe COVID and were ventilated mechanically. However, the difference between the two groups may be due to respiratory effects of CABG, smaller sample size (one of the limitations of this study) or due to the

fact that post COVID duration before the surgery was not taken into account due to smaller sample size. More studies will be required in future to focus on these aspects.

In our study, Post-COVID patients required more Non-Invasive ventilation as compared to Non-Post-COVID patients. In our study, 8 out of 20 Post COVID patients required Marked NIV requirement, 5 requiring moderate NIV and 7 requiring minimal NIV support. On the other hand, in Non-Post-COVID group, 2 patients needed marked NIV support, 3 patients required moderate NIV support and 7 requiring mild NIV support, and 8 patients did not need NIV support. This difference is statistically significant as well.

Frequency of re-ventilation was higher in Post-COVID group, 6 patients were re-ventilated in post-COVID group as compared to 3 patients in comparison group. However, the difference between the two groups was insignificant statistically.

As a result, Post-COVID patients stayed in ICU for longer period of time (121 ± 32.75 hours) as compared to patients in comparison group (67.7 ± 28.90 hours).

LIMITATIONS OF STUDY

Main limitation of study was small sample size. This was because number of Post-COVID patients reporting for elective CABG surgery is limited currently. These results may well change if study is conducted on larger number of patients across country. This limitation also handicapped us to find if increasing the post-COVID duration would result in decreasing the side effects, for example, Ventilation time, requirement for NIV and ICU stay may be less if duration is more. Another issue was that post-COVID patients could not be grouped according to HRCT score in different categories effectively.

CONCLUSION

It is concluded from the study that Post COVID-19 patients undergoing CABG surgery had higher frequency of respiratory complications. But keeping in view limitations mentioned above, we suggest that study be conducted on multi center basis to find more about post-COVID patients so that guidelines can be formulated especially in regards to post COVID duration and classification on the basis of HRCT score. This will help physicians prepare for their cases in better way.

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Conflict of Interest: None.

Author Contribution

Following authors have made substantial contributions to the manuscript as under:

SARAS: Manuscript writing, study design, proof reading

SMHK: Idea, critical revision and statistical analysis, and interpretation

SAH: Intellectual contribution, critical revision

HK: Data analysis, editing, data collection

SAHK: Intellectual contribution, review of article, critical review

RJ: Manuscript writing, data collection, analysis

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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