"A PROSPECTIVE STUDY COMPARING POSTOPERATIVE SPIROMETRY AFTER LAPAROSCOPIC CHOLECYSTECTOMY AND LAPAROSCOPIC APPENDICECTOMY SURGERIES"

Dissertation submitted to

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

In partial fulfillment for the award of the degree of

DOCTOR OF MEDICINE IN
ANAESTHESIOLOGY
BRANCH X

INSTITUTE OF ANAESTHESIOLOGY AND CRITICAL CARE
MADRAS MEDICAL COLLEGE
CHENNAI- 600003

APRIL 2016

CERTIFICATE

This is to certify that the dissertation entitled, **"A PROSPECTIVE STUDY COMPARING POSTOPERATIVE SPIROMETRY AFTER LAPAROSCOPIC CHOLECYSTECTOMY AND LAPAROSCOPIC APPENDICECTOMY SURGERIES"** submitted by **Dr. SATHISHKUMAR .A.P**, in partial fulfilment for the award of the degree of Doctor of Medicine in Anaesthesiology by the Tamil Nadu Dr. M.G.R. Medical University, Chennai., is a bonafide record of the work done by him in the INSTITUTE OF ANAESTHESIOLOGY AND CRITICAL CARE, Madras Medical College and government hospital, during the academic year 2013-2016.

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CERTIFICATE BY THE GUIDE

This is to certify that the dissertation entitled, **"A PROSPECTIVE STUDY COMPARING POSTOPERATIVE SPIROMETRY AFTER LAPAROSCOPIC CHOLECYSTECTOMY AND LAPAROSCOPIC APPENDICECTOMY SURGERIES"** submitted by **Dr. SATHISHKUMAR .A.P** , in partial fulfilment for the award of the degree of Doctor of Medicine in Anaesthesiology by the Tamil Nadu Dr. M.G.R. Medical University, Chennai., is a bonafide record of the work done by him in the INSTITUTE OF ANAESTHESIOLOGY AND CRITICAL CARE, Madras Medical College and government hospital, during the academic year 2013-2016.

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DECLARATION

I hereby, solemnly declare that this dissertation entitled **"A PROSPECTIVE STUDY COMPARING POSTOPERATIVE SPIROMETRY AFTER LAPAROSCOPIC CHOLECYSTECTOMY AND LAPAROSCOPIC APPENDICECTOMY SURGERIES"** is a bonafide record of the work done by me in the Institute of Anaesthesiology and Critical Care, Madras Medical College and Government General Hospital, Chennai, during the period of 2013 – 2016 under the guidance of **DR.M.VELLINGIRI M.D., D.A.,** Professor of anaesthesiology, Institute of Anaesthesiology and Critical Care, Madras Medical College, Chennai – 3 and submitted to **The Tamil Nadu Dr. M.G.R. Medical University, Guindy, Chennai – 32**, in partial fulfilment for the requirements for the award of the degree of M.D. Anaesthesiology (Branch X), examinations to be held on April 2016.

I have not submitted this dissertation previously to any university for the award of degree or diploma.

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Place: Chennai
Date:

ACKNOWLEDGEMENT

I am extremely thankful to **DR.R.VIMALA M.D.,** Dean, Madras Medical College & Rajiv Gandhi Govt. General Hospital, for her permission to carry out this study.

I am immensely grateful to **Prof .DR. B.KALA, M.D., D.A.,** Director, Institute of Anaesthesiology and Critical Care, for her concern and support in conducting this study.

I am extremely grateful and indebted to my guide **Prof .DR .M.VELLINGIRI M.D. , D.A,** Professor of Anaesthesiology, Institute of Anaesthesiology & Critical Care, for his concern, inspiration, meticulous guidance, expert advice and constant encouragement in preparing this dissertation.

I am very grateful to express my sincere gratitude to the Professors, Dr. ESTHER SUDHARSHINI RAJKUMAR M.D.D.A., Dr. S.ANANTHAPPAN M.D.D.A., Dr. SAMUEL PRABAKARAN M.D. D.A. and Dr. PANKAJAVALLI M.D. D.A., Institute of Anaesthesiology & Critical Care, for their constant motivation and valuable suggestions.

I express my hearty thanks to my co-guide DR.MARIAM SHIRIN M.D., Senior Assistant Professor for the constant monitoring and guidance throughout the course of this study.

I express my humble thanks to my teachers, DR.CATHERINE RATHNASAMY M.D., Senior Assistant Professor, DR.KANTHIMATHY M.D., D.A Senior Assistant Professor, DR.G.K.KUMAR M.D., Professor, DR.SUGANTHALAKSHMI M.D., Assistant Professor, DR.SUMATHI M.D., Assistant Professor, DR.GANESH M.D., Assistant Professor, DR.SHANMUGAPRIYA M.D., Assistant Professor for their continuous support during the period of study.

I express my deepest gratitude to all my department colleagues who have helped me for following up the patients from assessment room, operation theatre up to the post-operative ward without which this study would not have been possible.

I am thankful to the Institutional Ethical Committee for their guidance and approval for this study.

My sincere thanks to the statistician, who has played an important role during my study.

I am thankful to all my colleagues, family and friends for their moral support, help and advice in carrying out this dissertation.

Last but not the least; I thank all the patients for willingly submitting themselves for this study.

Above all I pay my gratitude to the Lord Almighty for blessing me to complete this work.

ABBREVIATIONS

CXR	:	Chest X-ray
ECG	:	Electrocardiogram
SPO2	:	O2 saturation of Haemoglobin by pulseoximetry
Group CHOLE	:	group cholecystectomy
Group APPEND	:	group appendicectomy
BMI	:	Body mass index
CVS	:	Cardiovascular system
RS	:	Respiratory system
RR	:	Respiratory rate
BHT	:	Breath holding time
PFT	:	Pulmonary function testing
FVC	:	Forced vital capacity
FEV1	:	Forced expiratory volume in the first second
PEFR	:	Peak expiratory flow rate
Pre-op	:	Preoperative
Post-op	:	Postoperative
NSAIDS	:	Non steroidal anti-inflammatory drugs
VAS	:	Visual Analog Scale

TABLE OF CONTENTS

ABSTRACT

Background

Patients undergoing laparoscopic cholecystectomy were found to have significant post-operative pulmonary dysfunction compared with lower abdominal procedures like laparoscopic appendicectomy. This study aims to measure the extent of decrease in lung volumes and capacities by spirometry. Importance of site of surgery is determined by maintaining other parameters like anaesthesia, analgesia similar in both the groups.

Methods

Two groups were formed with 20 patients each for lap-cholecystectomy and lap-appendicectomy with comparable profile. Pre-operative spirometry done for all of them and baseline values recorded. Post-operatively spirometry was done twice 6 hrs and 24 hrs following surgery. All surgeries were done under general anaesthesia. Adequate pain relief was given to attain a VAS score of less than 40. Spirometry values were compared and analysed for statistical significance.

Results

Reduction in FVC, FEV1, PEFR was found to be more in cholecystectomy group during initial post-operative period and did not return to pre-op levels by 24 hrs. Where as in appendicectomy group though there was a reduction in lung

volumes during initial post-operative period FVC, FEV1, PEFR values returned almost to the pre-operative levels.

Conclusion

Anatomical site of surgery is a more important factor determining post-operative lung dysfunction than patient position, pain, anesthesia related factors.

Key words

Laparoscopic cholecystectomy, laparoscopic appendicectomy, post-op spirometry, site of surgery

INTRODUCTION

Cholecystectomy is one of the common surgeries performed by laparoscopic technique worldwide. The laparoscopic technique has been preferred over open technique due the advantages like less post-operative pain, early mobility, decreased hospital stay etc. Even though laparoscopic cholecystectomy has distinct advantages over open cholecystectomy it is not entirely devoid of intra-operative and post-operative complications.

Among the post-operative complications, pulmonary dysfunction is one of the most important requiring close monitoring and management. Many studies have been conducted about this aspect and revealed that those patients developed restrictive type of ventilatory defect. Laparoscopic procedures involving lower abdomen tend to produce less severe pulmonary dysfunction and found to recover much earlier compared to laparoscopic cholecystectomy.

Laparoscopic appendicectomy is one of the common procedures done involving lower abdomen where the post-operative lung dysfunction was found to be less severe and of shorter duration. The possibility of anatomical location of surgery playing a determining role in the post-operative lung dysfunction is strongly contemplated.

TITLE OF THE STUDY

"A PROSPECTIVE STUDY COMPARING POST-OPERATIVE SPIROMETRY AFTER LAPAROSCOPIC CHOLECYSTECTOMY AND LAPAROSCOPIC APPENDICECTOMY SURGERIES."

AIM OF THE STUDY

The aim of the study is to compare the post-op pulmonary dysfunction following laparoscopic cholecystectomy and laparoscopic appendicectomy using spirometry and asses its statistical significance. The purpose of the study is to compare two abdominal surgeries performed by laparoscopy, using similar device, type of anesthesia, in similar type of subjects, after comparable analgesia to identify whether site of surgery is an important determinant in deciding the post-op lung dysfunction. Effort has been taken to compare the duration of pneumoperitoneum and its effects on post-op lung dysfunction.

LAPAROSCOPIC SURGERY

Historically laparoscopic procedure[72] can be traced back to 1901 when George Killing of Germany inserted a cystoscope into the abdomen of a live dog. He did that after creating pneumoperitoneum using air. Later on the concept of using carbon dioxide for creating pneumoperitoneum was introduced. Surgeons were performing some diagnostic procedures and minor surgical procedures since 1960. In 1988 Frenchman Mouret performed first laparoscopic cholecystectomy. He removed gallbladder using small multiple incisions instead of Kocher's incision which revolutionised the field of laparoscopic surgery.

Laparoscopy has become much advanced now and being utilised for surgeries involving abdomen, thorax and other closed spaces of body. Laparoscopic surgery is distinct from open surgery due to three aspects namely creation of pneumoperitoneum using carbon dioxide, image production using camera and light source and laparoscopic instruments.[72]

Patients are assessed pre-operatively for anaesthetic fitness and preparation like any other surgical procedure. General anaesthesia is preferred for the laparoscopic procedures involving

abdomen. Controlled mode of ventilation is preferred which helps the anaesthesiologist to maintain carbon dioxide levels within acceptable limits. Laparoscopic appendicectomy is usually performed in head down position with slight left side tilt. Laparoscopic cholecystectomy is usually performed in a head up position with left side tilt.[68]

Access into the peritoneum, creation of pneumoperitoneum and introduction of ports are the initial steps of laparoscopic surgery. These steps may result in important complications like extra-peritoneal gas insufflation, vascular injury and bowel injury. These make 30% of all complications involving laparoscopic surgical procedures.[72]

After confirmation of entry into the peritoneum gas insufflation should be done at a rate of 4-6 litres/min. The intra-abdominal pressure should be maintained between 12-14 mm of Hg ideally.[68]

Pneumoperitoneum may also be created by other inert gases like Helium and Argon where the adverse effects of carbon dioxide may be avoided but the impact of increased IAP remains.[68]

Physiological changes that occur following pneumoperitoneum have a great anaesthetic significance. Patient

positioning with head up or head down may grossly affect the diaphragmatic function compounded by increased intra abdominal pressures due to pneumoperitoneum. Venous return from lower limbs may be decreased resulting in decreased cardiac output which may be aggravated by positive pressure ventilation. Systemic vascular resistance may be increased which prevents a fall in blood pressure. The renal function may be affected due to decrease in renal blood flow and GFR.[68]

PULMONARY FUNCTION TESTING

Pulmonary function testing is an umbrella terminology which includes all the available tests evaluating lung function. Spirometry is one such testing which helps us to measure the mechanical function of lungs in terms of volumes and capacities. There are various types of spirometry available in the market but there are standardisation guidelines issued by ATS (American Thoracic Society) and ERS (European Respiratory Society) as well.

The commonly performed spirometry tests are slow vital capacity, Forced vital capacity, Maximal voluntary ventilation etc. The important difference between spirometry and any other testing is it is patient's effort dependent. The success of testing depends

upon the good acceptable effort by the patient. In this context we have to understand that a normal spirometry implies a normally functional lung but vice versa is not true. A poor effort by a patient on performing spirometry will result in false abnormal values.

FVC-(FORCED VITAL CAPACITY) [69]

FVC is the maximal volume of air exhaled with maximally forced effort from a maximal inspiration, i.e. vital capacity performed with a maximally forced expiratory effort, expressed in litres at body temperature and ambient pressure saturated with water vapour (BTPS).

FEV1 (FORCED EXPIRATORY VOLUME IN FIRST SECOND) [69]

It is the maximal volume of air exhaled in the first second of a forced expiration from a position of full inspiration, expressed in litres at BTPS.

PEFR (PEAK EXPIRATORY FLOW RATE) [69]

It is the point of expiratory phase where the flow rates are at the maximum expressed in litres per min.

ACCEPTABILITY AND REPRODUCIBILITY CRITERIA [71]

Acceptability criteria

1) Free from artifacts like cough, slow start, early cutoff, sub maximal effort

2) Good start with extrapolated volume < 5% of FVC

3) Satisfactory exhalation for a duration of > 6 seconds

Reproducibility criteria

1) Variation between two greatest FVC values should not be > 150 ml

2) Variation between two greatest FEV1 values should not be >150 ml

Test Procedure [70]

Patient preferably should sit in upright position, both inspiration and forceful expiration should be done through mouth, where the mouthpiece should be held air tight with closed lips. The mouthpiece with flow sensor is connected to spirometry analyser. Patient should take a deep inspiration to the maximum possible extent followed by a blast of forceful expiration which should be as fast and as long as possible. The duration of expiration should be at least 6 seconds for patients aged 10 and above.

INTERPRETATION OF PFT [71]

Normal

FEV1/FVC > 0.7

FVC > 80%

FEV1 >80%

Obstructive pattern

FEV1/FVC < 0.7

FEV1 < 80%

FVC Usually normal or slightly reduced

Restrictive pattern

FEV1/FVC > 0.7

FVC < 80%

FEV1 < 80%

Obstructive Lung Diseases

1) Chronic bronchitis

2) Chronic emphysema

3) Bronchial asthma

Restrictive Lung Diseases

1) Fibrosis of lung

2) Fibrosis of pleura

3) Kyphoscoliosis

4) Ankylosing spondylitis

5) ARDS

6) Pulmonary edema

REVIEW OF LITERATURE

In 1983 Simonneau,Vivien, Sartene et al, studied the effects of upper abdominal surgery on diaphragm function. They have conducted a study on 5 patients determining the diaphragmatic contraction following upper abdominal surgeries. Observations were made both during quiet breathing and maximum inspiratory efforts. Significant dysfunction was observed during first POD. Epidural analgesia using opioids did not modify the effects. Changes gradually reversed spontaneously over seventh post-operative day. They have concluded that post-operative analgesia did not modify diaphragmatic dysfunction.[37]

In 1983 Gordon, Clarence, Peter cruse, William Whitelaw et al have studied 15 patients to assess the respiratory function and diaphragmatic function following upper abdominal surgery using CXR, ABG, PFT, electromyography for diaphragm. They found hypoxia, atelectasis and decreased vital capacity which may be related to diaphragmatic malfunction.[15]

In 1985 Dureil, Viires, Desmonts, Cantineau, Dureuil et al studied five patients undergoing upper abdominal surgical procedures were studied to assess the contractility of diaphragm in the post operative period. They have concluded that the diaphragm dysfunction observed

was secondary to reflex inhibition by decreased efferent through phrenic nerve. There was no primary contractile dysfunction of diaphragm.[10]

In 1992 Johnson, David, Litwin, Demetrius, Osachoff, Jennifer, et al have studied 31 patients who were operated upon by laparoscopy for gallbladder removal. The lung function was studied before and after procedure by spirometry. They have concluded that the post surgical lung dysfunction is lesser in laparoscopically operated patients compared to open cholecystectomy patients.[43]

In 1992 Joris, Cigarini, Legrand, Lamy have conducted a study on patients underwent both laparoscopy and open cholecystectomy procedures were studied fifteen each for changes in respiratory system and metabolic responses. The metabolic and acute phase reactants were increased more in the open cholecystectomy group. The cortisol and catecholamine levels were similar in both groups.[21]

In 1996 Karayiannakis AJ, Makri GG et al, studied on postoperative pulmonary function after laparoscopic and open cholecystectomy surgeries. In this study they have compared 42 patients undergoing laparoscopic cholecystectomy and 40 undergoing open cholecystectomy to determine if lap. Cholecystectomy results in less respiratory impairment and fewer respiratory complications. They

concluded that postoperative pulmonary function was less impaired after laparoscopic cholecystectomy than after open cholecystectomy.[23]

In 1997 Joris J, Kaba A et al have studied 30 patients undergoing laparoscopic abdominal procedures. They have compared post-operative lung functions following laparoscopic procedures involving upper and lower abdomen .They have concluded that post-op pulmonary function was less impaired after gynaecological laparoscopy than laparoscopic cholecystectomy. This study suggested that the site of surgery is an important determinant of lung dysfunction after laparoscopy.[1]

In 2003 Von Ungern- Sternberg BS, A. Regli et al studied the effect of obesity and site of surgery on perioperative lung volumes. They have studied the impact of surgery and obesity on lung volumes measured by spirometry. They prospectively studied 161 patients having either breast surgery or lower abdominal laparotomy. They have concluded that Postoperative reduction in spirometric volumes was related to BMI. Obesity had more effect on VC than the site of surgery.[40]

In 2005 S.M.Ravimohan, Lileswar Kaman, Rajinder singh have studied a total number of 55 subjects undergoing cholecystectomy divided into 2 groups (lap-cholecystectomy 40 patients and open-cholecystectomy15 patients). Post operative lung dysfunction and

respiratory complications have been measured using spirometry values FVC, FEV1, PEFR and post-operative CXR & SPO2.They have concluded that post operative respiratory dysfunction and complications are higher in Open Cholecystectomy group than in Lap Cholecystectomy group.[32]

In 2010 W. Tiefenthaler et al studied the effects of TIVA and Balanced anaesthesia with sevoflurane on postoperative lung function in patients undergoing surgery in prone position. They have studied sixty patients aged 21-60 yrs undergoing elective lumbar disc surgery in prone position with randomisation into TIVA group and balanced anaesthesia group. Irrespective of type of anaesthesia lung function parameters decreased after surgery and the decrease in FVC was greater after TIVA than after balanced anaesthesia with sevoflourane.[41]

MATERIALS AND METHODS

1) Spirometer for pulmonary function testing (EasyWarePro)

2) Pulse oximeter for measuring SPO2

SPIROMETRY SPECIFICATIONS

EasyWarePro

Product of ndd Medizintechnik AG

Software version 1.9.0.18

Configuration version 1.2.5.0

TEST SPECIFICATIONS

Value selection Best trial

System interpretation GOLD 2008 / HARDIE

Predicted KNUDSON 83

Peadiatric predicted POLGAR

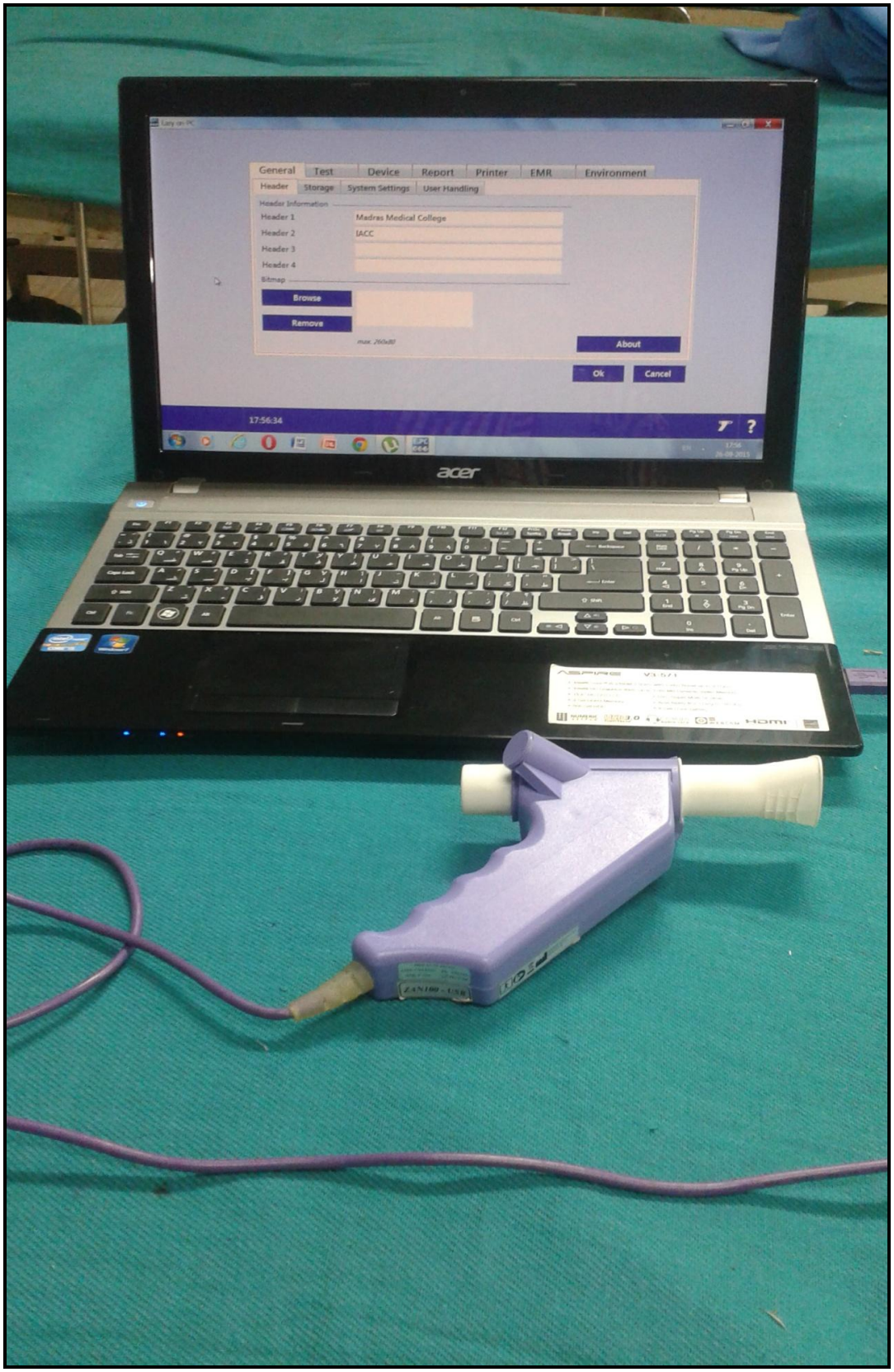
ETHNIC CORRECTION

African-88%

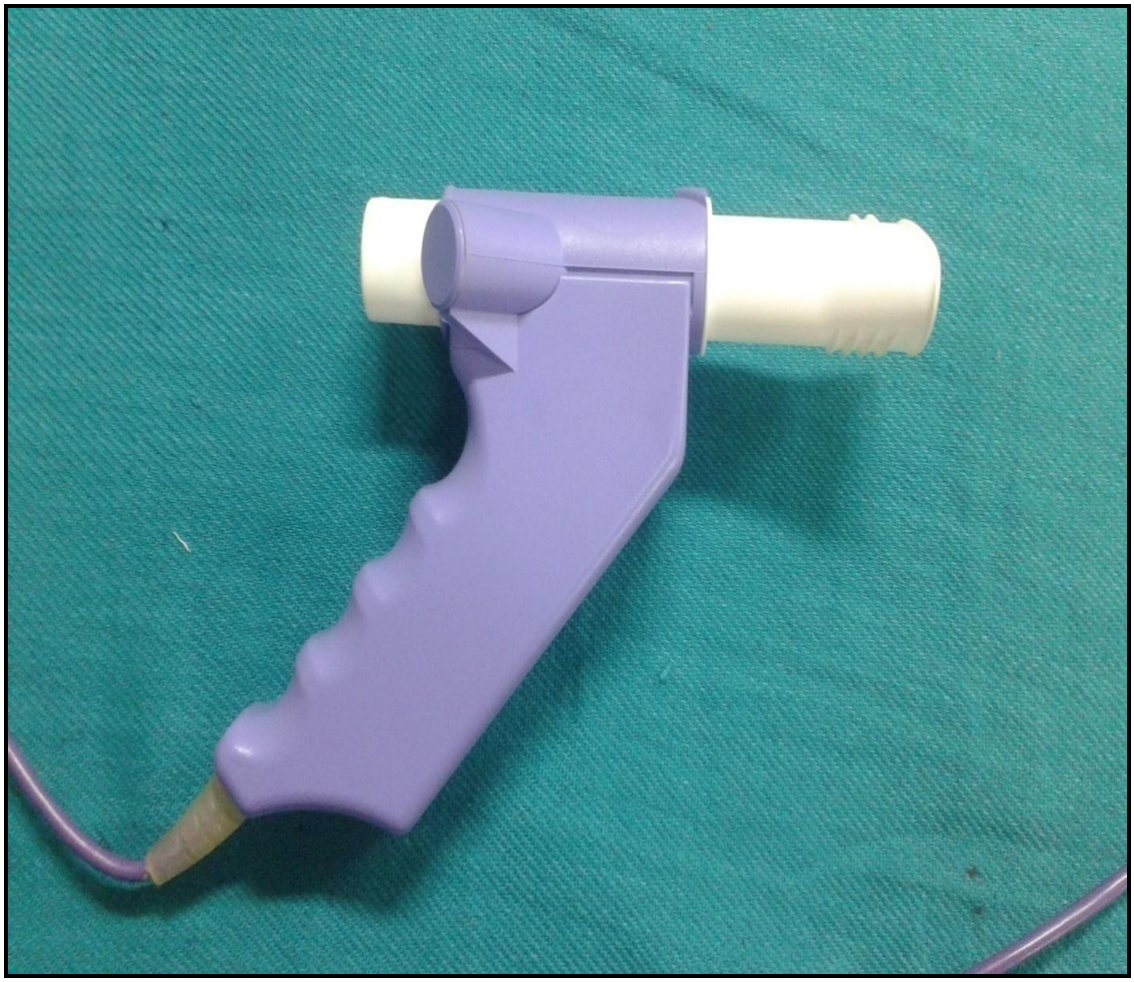
Asian -87%

Hispanic – 100%

Others -100%



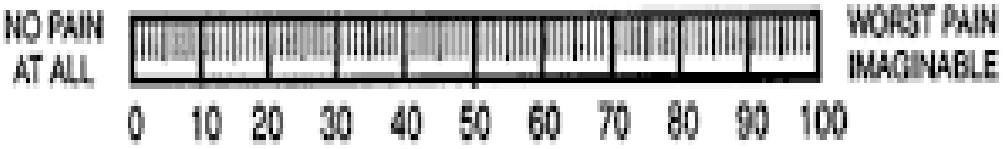
Easywarepro Spirometer



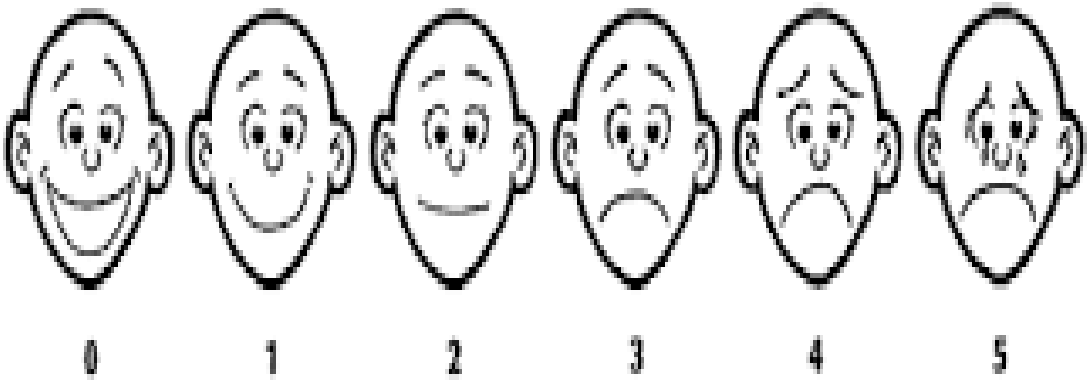
HANDPIECE OF EASYWAREPRO SPIROMETER

BEDSIDE SPIROMETRY

VISUAL ANALOG SCALE



HAPPY FACE - SAD FACE SCALE



METHODOLOGY

This study of measuring post op pulmonary dysfunction following laparoscopic cholecystectomy and laparoscopic appendicectomy has been conducted at Rajiv Gandhi Government General Hospital attached to Madras Medical College Chennai-3 during March 2015- June 2015.The two group of patients who were compared for post-op pulmonary dysfunction were GROUP-CHOLE and GROUP-APPEN having 20 patients each.

The patients who have participated in this study have been chosen when they come for pre anaesthetic check-up at central assessment room. Patients coming for assessment for elective laparoscopic cholecystectomy and laparoscopic appendicectomy are evaluated. Both inclusion and exclusion criteria are strictly applied so that the abnormal spirometry values due to confounding factors (e.g obesity, old age, lung diseases, BMI can be eliminated. Patients coming for elective surgeries alone included for obvious reasons. Pre-op screening included History, Physical examination BMI, ECG, CXR, SPO2, BHT were done.

INCLUSION CRITERIA

- Age : 18 years to 60 years
- Weight : BMI < 30 Kg/m2
- ASA : I& II
- Surgery : Elective
- Who have given valid informed consent

EXCLUSION CRITERIA

- Not satisfying inclusion criteria.
- Patients posted for emergency surgery
- Patients with acute cholecystitis
- Patients with acute appendicitis
- Patients with acute respiratory infections
- Patients with cardio-respiratory diseases
- Lack of written informed consent
- Patients with smoking history

Patients have been explained about the study aim, benefits, importance of post-op lung function etc and the need to do a spirometry in the immediate post operative period. Patients who were willing to participate in the study were requested to sign an informed consent. Then the pre-op spirometry performed to record the baseline values. Those who were not able to perform acceptable manoeuvre were excluded from the study in the initial stage itself. Patients who had normal FVC, FEV1, PEFR values only were included in the study. The pre-op values were kept as baseline values to calculate post-op changes in lung volumes and capacities.

All the cases are done under General Anaesthesia with inj.glycopyrrolate as premedication. Inj.fentanyl at adose of 2 microgm/kg body wt used for obtunding intubation response and intra-op analgesia. Additional intra-op analgesia at a dose of 25 micro gm if surgery duration exceeded one hour. Adequate plane of anaesthesia maintained with sevoflurane as volatile agent titrated as per patients need. Adequate muscle relaxation attained by using inj. atracurium in standard prescribed dosage. ETCO2 monitoring was done for all patients to ensure adequate ventilation and CO2 elimination.

All the cases were done under standard laparoscopic instruments with three ports, one for camera and two for instrumentation. Intra peritoneal insufflations of gases were done using CO2 maintaining IAP between 12-14 mm of Hg. Duration of pneumoperitoneum recorded. At the end of procedure abdomen compressed to release the residual gas from peritoneum. Inj.tramadol im was given for post op analgesia at a dose of 1 mg/kg body wt for all the patients.

Patients were followed up to post-op ward where first post-op spirometry done 6 hrs after assessing the pain scale. VAS (visual analaog scale from 10-100) was used to assess the pain score . VAS score less than 40 was taken as acceptable score since it indicates minimal pain which won't affect the performance of spirometry.[14] When pain scores were more than 30 i.v paracetamol was given at a dose of 15 mg/kg body wt over 20 min as infusion. Once pain score is within acceptable limits post-op spirometry was performed at the bedside.

Both pre-op and post-op spirometry was performed with EASY WARE PRO software pc based spirometer which is easy to carry and perform bedside spirometry. First post operative PFT was done 6 hrs after the surgery at the bedside after giving adequate

analgesia so that VAS score was 30 or less so that pain is not a confounding factor for a reduced post op lung volumes. Second post-op PFT done was 24 hrs after surgery and values recorded. Same procedure followed for both the groups. PFT values were recorded and analysed

RESULTS

Patients between the two groups in cholecystectomy and appendicectomy were comparable as evidenced by insignificant difference in terms of BMI and other factors laid out for inclusion and exclusion. All the patients had a normal pre-op study as per ERS criteria[71] for spirometry interpretation.

DATA ANALYSIS

The patients were divided into two groups.

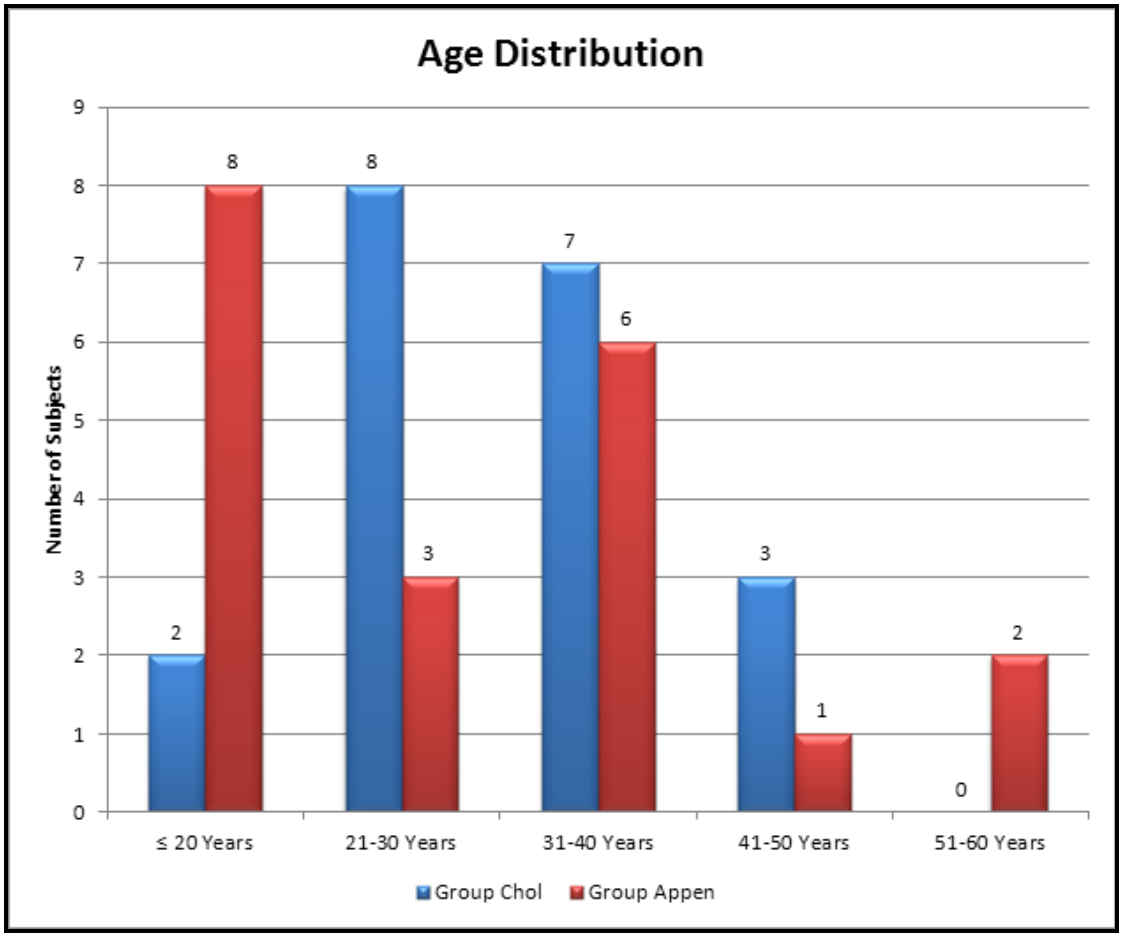
- Group CHOLE – Elective Laparoscopic Cholecystectomy
- Group APPEND - Elective Laparoscopic Appendicectomy

Descriptive statistics was done for all data and were reported in terms of mean values and percentages. Suitable statistical tests of comparison were done. Continuous variables were analysed with the unpaired t test and ANOVA. Categorical variables were analysed with the Chi-Square Test and Fisher Exact Test. Statistical significance was taken as $P < 0.05$. The data was analysed using SPSS version 16 and Microsoft Excel 2007.

AGE

Age Distribution	Group CHOLE	%	Group APPEND	%
≤ 20 Years	2	10.00	8	40.00
21-30 Years	8	40.00	3	15.00
31-40 Years	7	35.00	6	30.00
41-50 Years	3	15.00	1	5.00
51-60 Years	0	0.00	2	10.00
Total	20	100	20	100

Age Distribution	Group CHOLE	Group APPEND
N	20	20
Mean	31.55	29.60
SD	8.34	11.16
P Value Unpaired t Test		0.5355

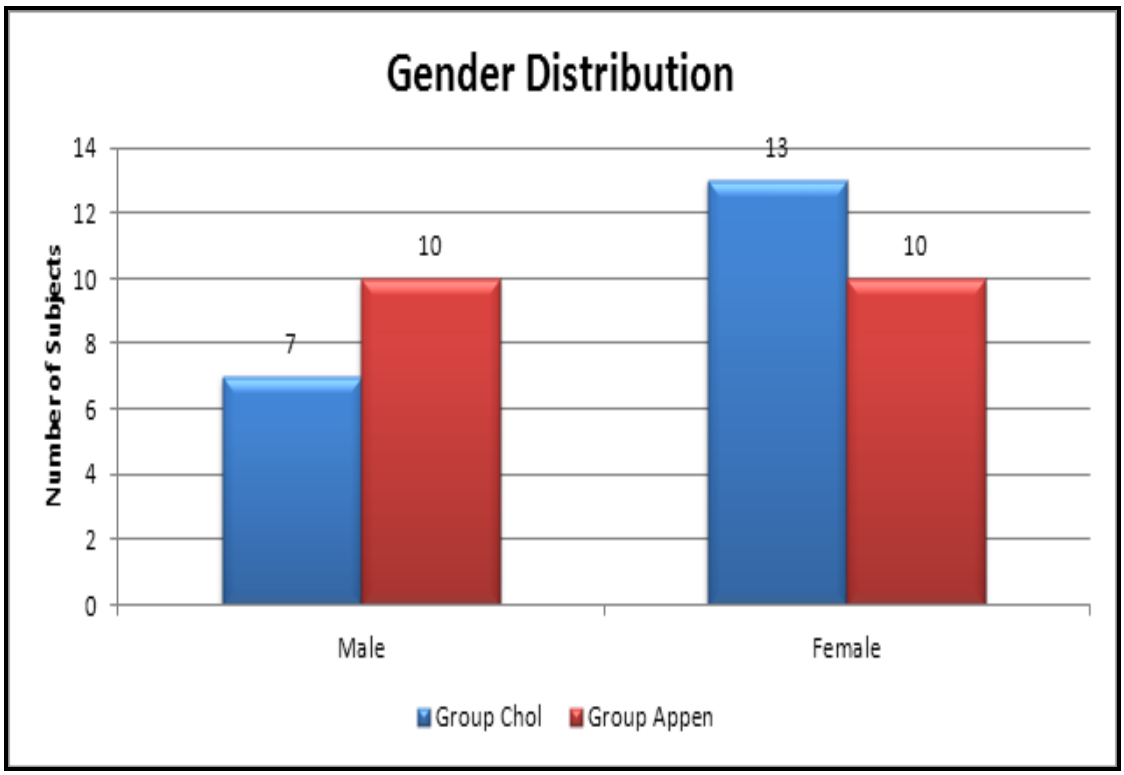


Majority of the group CHOLE patients belonged to the 21-30 years age class interval (n=8, 40%) with a mean age of 41.55 years. In the group APPEND patients, majority belonged to the ≤ 20 Years age class interval (n=8, 40%) with a mean age of 29.60 years. The association between the intervention groups and age distribution is considered to be not statistically significant since $p > 0.05$ as per 2 tail unpaired t test.

GENDER

Gender Distribution	Group CHOLE	%	Group APPEND	%
Male	7	35.00	10	50.00
Female	13	65.00	10	50.00
Total	20	100	20	100
P Value Fishers Exact Test			0.5231	

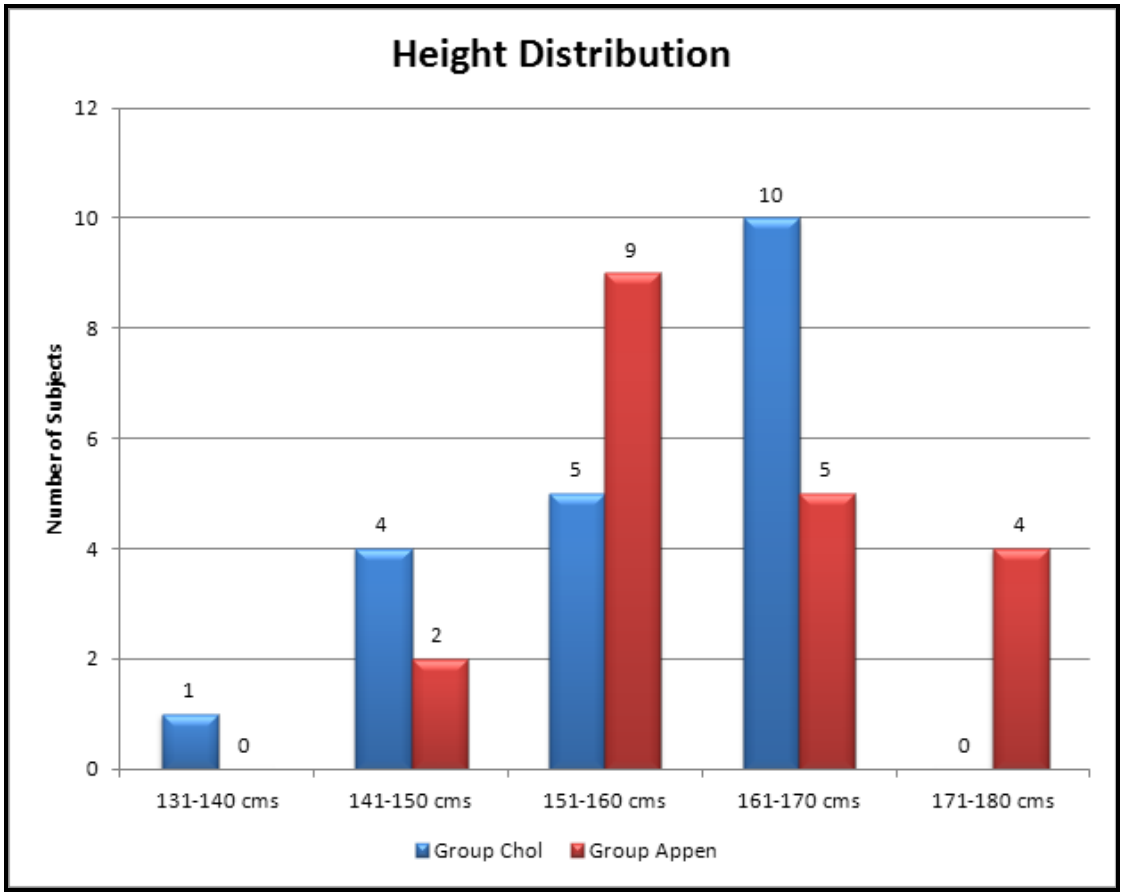
Majority of the group CHOLE patients belonged to the female gender group (n=13, 65%). In the group APPEND patients, majority belonged to the female gender group (n=10, 50%). The association between the intervention groups and gender distribution is considered to be not statistically significant since $p > 0.05$ as per fishers exact test


Gender Distribution
Number of Subjects
14
12
10
8
6
4
2
0
7
10
13
10
Male
Female
Group Chol
Group Appen

HEIGHT

Height Distribution	Group CHOLE	%	Group APPEND	%
131-140 cms	1	5.00	0	0.00
141-150 cms	4	20.00	2	10.00
151-160 cms	5	25.00	9	45.00
161-170 cms	10	50.00	5	25.00
171-180 cms	0	0.00	4	20.00
Total	20	100	20	100

Height Distribution	Group CHOLE	Group APPEND
N	20	20
Mean	157.95	160.25
SD	8.94	9.24
P Value Unpaired t Test		0.4285

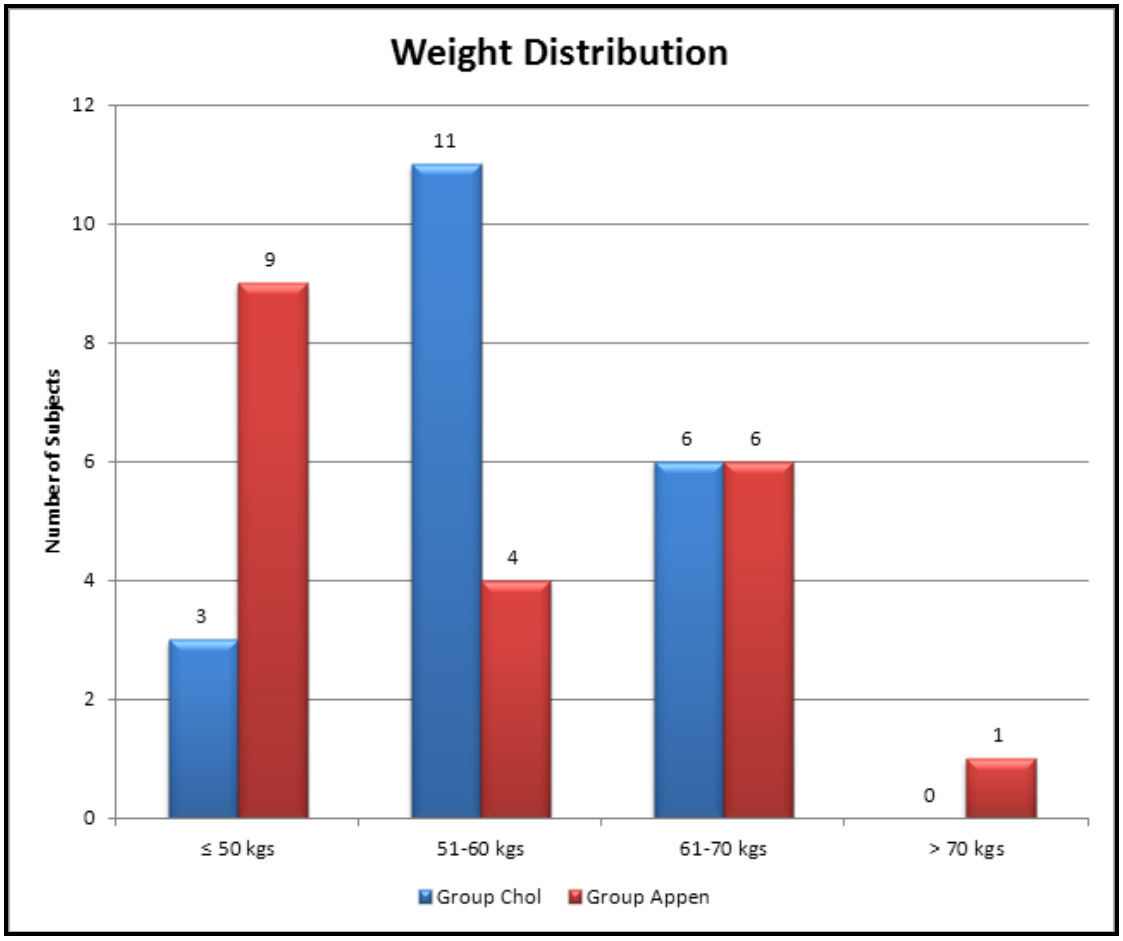


Majority of the group CHOLE patients belonged to the 161-170 cms height class interval (n=10, 50%) with a mean height of 157.95 cms. In the group APPEND patients, majority belonged to the 161-170 cms height class interval (n=9, 45%) with a mean height of 160.25 cms. The association between the intervention groups and height distribution is considered to be not statistically significant since $p > 0.05$ as per 2 tail unpaired t test.

WEIGHT

Weight Distribution	Group CHOLE	%	Group APPEND	%
≤ 50 kgs	3	15.00	9	45.00
51-60 kgs	11	55.00	4	20.00
61-70 kgs	6	30.00	6	30.00
> 70 kgs	0	0.00	1	5.00
Total	20	100	20	100

Weight Distribution	Group CHOLE	Group APPEND
N	20	20
Mean	57.85	55.00
SD	6.98	11.26
P Value Unpaired t Test		0.3431

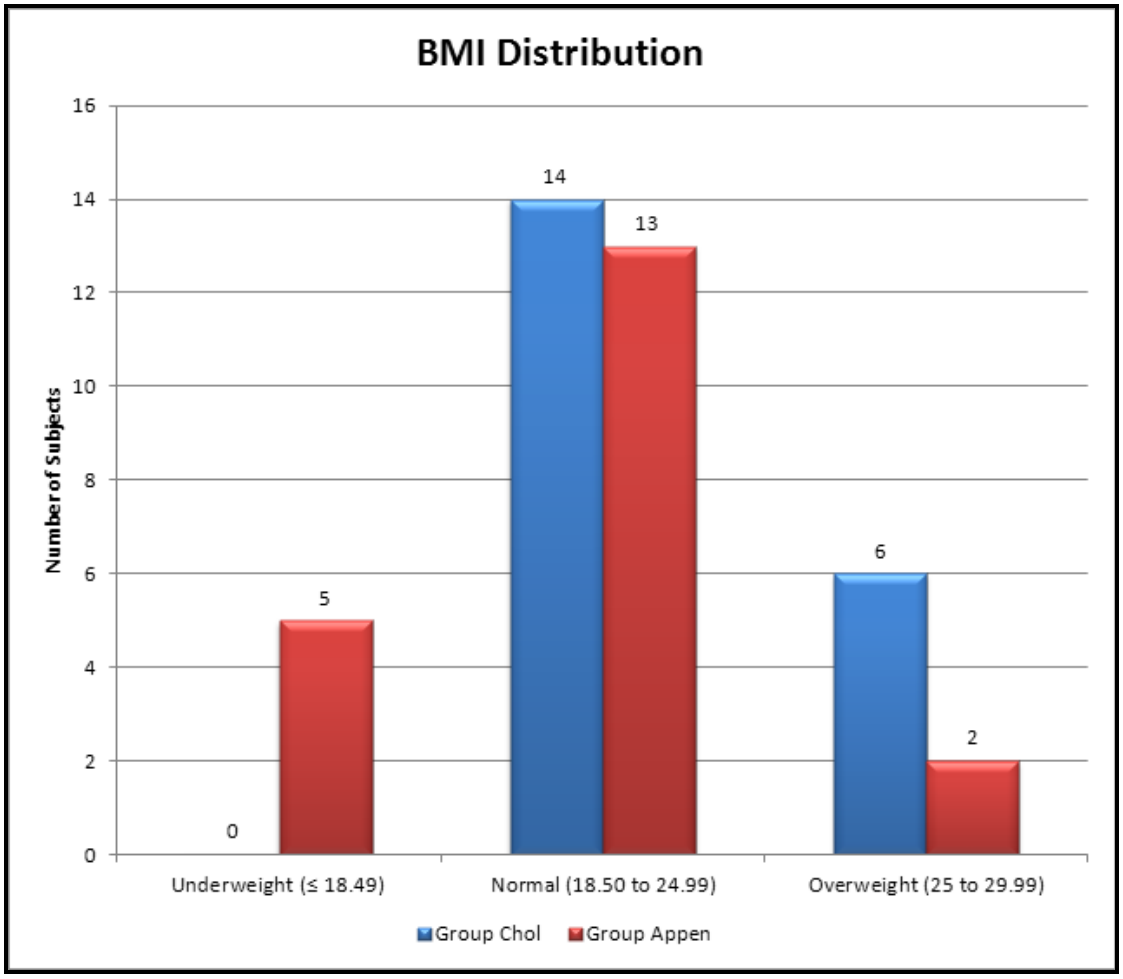


Majority of the group CHOLE patients belonged to the 51-60 kgs weight class interval (n=11, 55%) with a mean weight of 57.85 kgs. In the group APPEND patients, majority belonged to the ≤ 50 kgs weight class interval (n=9, 45%) with a mean weight of 55 kgs. The association between the intervention groups and weight distribution is considered to be not statistically significant since $p > 0.05$ as per 2 tail unpaired t test.

BMI

BMI Distribution	Group CHOLE	%	Group APPEND	%
Underweight (≤ 18.49)	0	0.00	5	25.00
Normal (18.50 to 24.99)	14	70.00	13	65.00
Overweight (25 to 29.99)	6	30.00	2	10.00
Obese	0	0.00	0	0.00
Total	20	100	20	100

BMI Distribution	Group CHOLE	Group APPEND
N	20	20
Mean	23.30	21.31
SD	3.22	3.36
P Value Unpaired t Test		0.0635

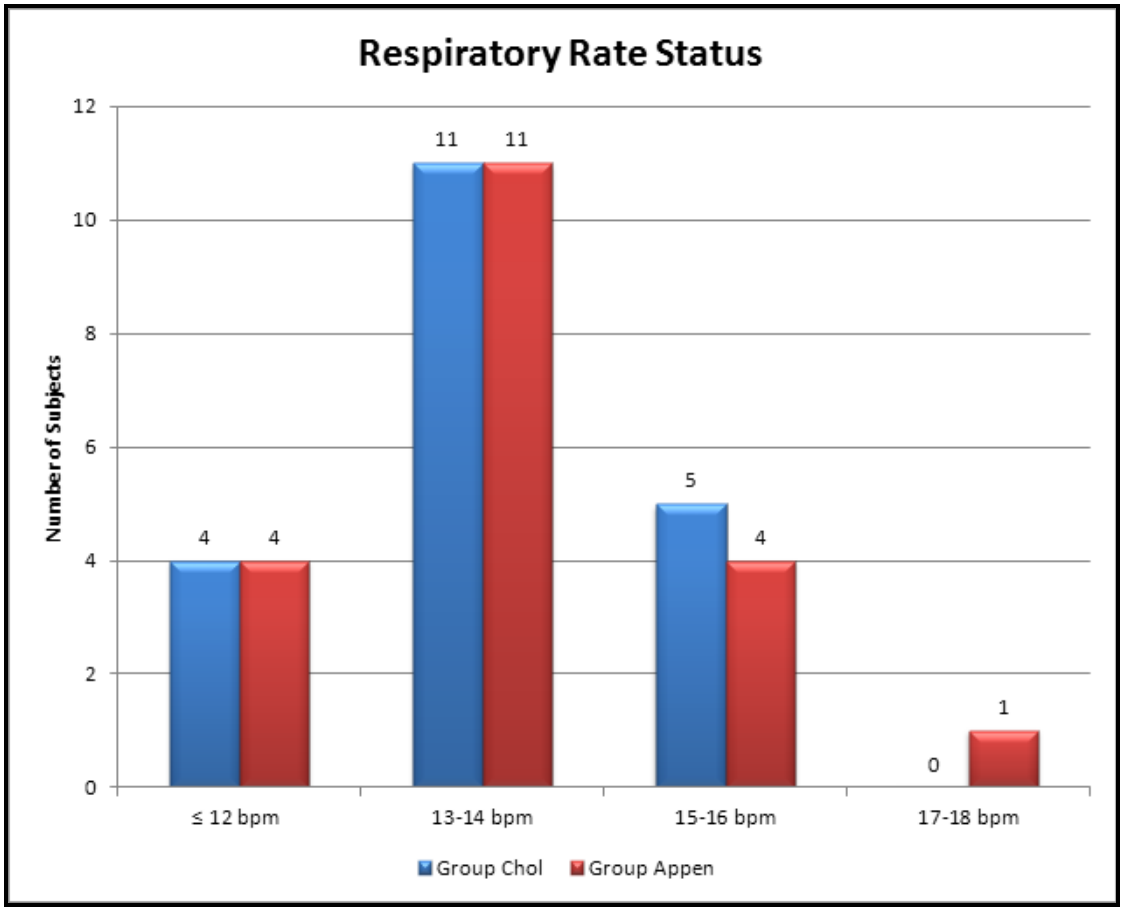


Majority of the group CHOLE patients belonged to the normal BMI class interval (n=14, 70%) with a mean BMI of 23.30. In the group APPEND patients, majority belonged to the normal BMI class interval (n=13, 65%) with a mean BMI of 21.31. The association between the intervention groups and BMI distribution is considered to be not statistically significant since $p > 0.05$ as per 2 tail unpaired t test.

RESPIRATORY RATE

Respiratory Rate Status	Group CHOLE	%	Group APPEND	%
≤ 12 bpm	4	20.00	4	20.00
13-14 bpm	11	55.00	11	55.00
15-16 bpm	5	25.00	4	20.00
17-18 bpm	0	0.00	1	5.00
Total	20	100	20	100

Respiratory Rate Status	Group CHOLE	Group APPEND
N	20	20
Mean	13.65	13.70
SD	1.09	1.38
P Value Unpaired t Test		0.8995

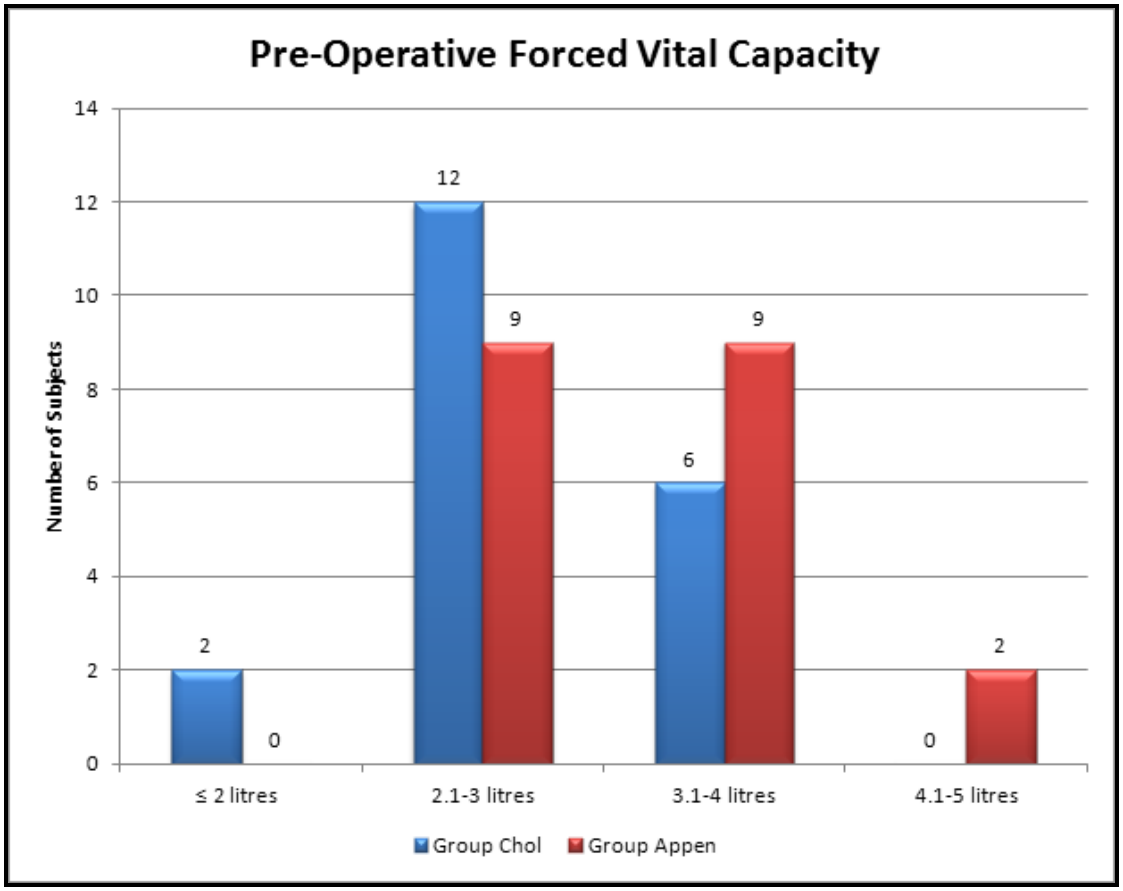


Majority of the group CHOLE patients belonged to the 13-14 bpm respiratory rate class interval (n=11, 55%) with a mean respiratory rate of 13.65 bpm. In the group APPEND patients, majority belonged to the 13-14 bpm respiratory rate class interval (n=11, 55%) with a mean respiratory rate of 13.70 bpm The association between the intervention groups and respiratory rate status is considered to be not statistically significant since $p > 0.05$ as per 2 tail unpaired t test.

PRE-OPERATIVE FORCED VITAL CAPACITY

Pre-Operative Forced Vital Capacity	Group CHOLE	%	Group APPEND	%
≤ 2 litres	2	10.00	0	0.00
2.1-3 litres	12	60.00	9	45.00
3.1-4 litres	6	30.00	9	45.00
4.1-5 litres	0	0.00	2	10.00
Total	20	100	20	100

Pre-Operative Forced Vital Capacity	Group CHOLE	Group APPEND
N	20	20
Mean	2.76	3.17
SD	0.60	0.59
P Value Unpaired t Test		0.1371

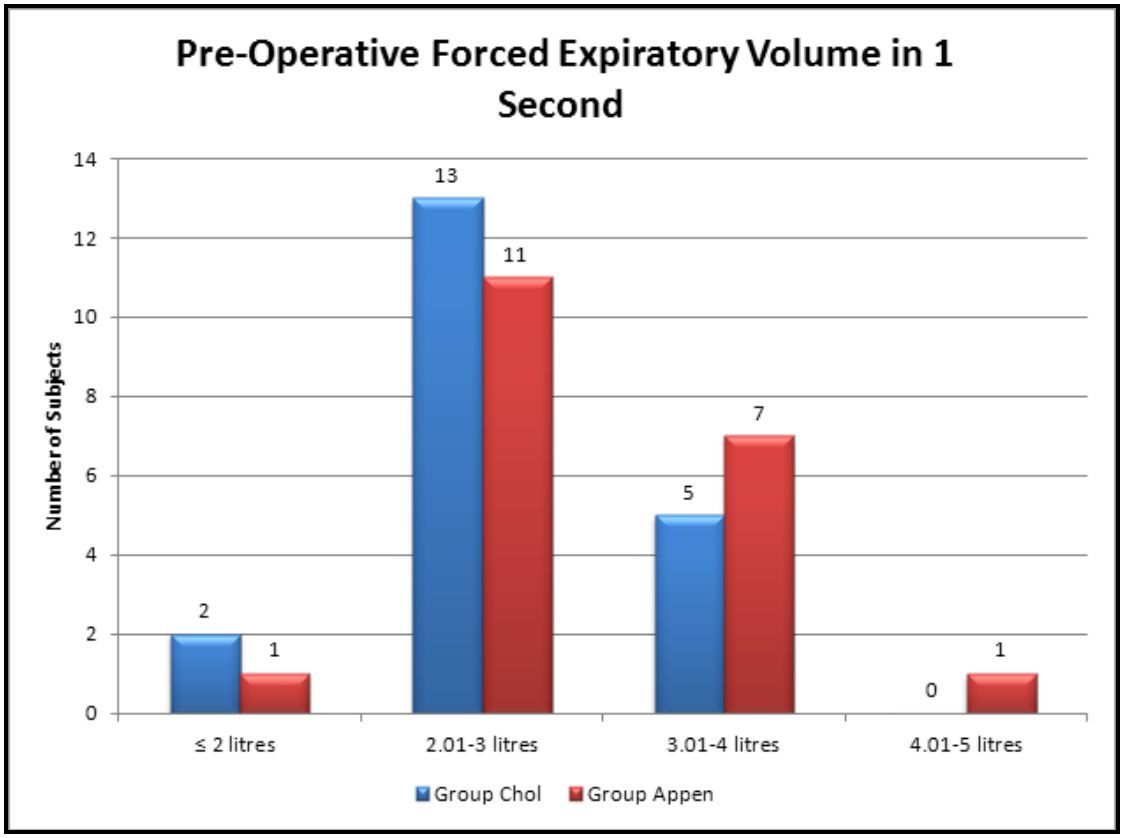


Majority of the group CHOLE patients belonged to the 2.1-3 litres Pre-Operative FVC class interval (n=12, 60%) with a mean pre-op FVC of 2.76 litres. In the group APPEND patients, majority belonged to the 2.1-3 litres Pre-Operative FVC class interval (n=9, 45%) with a mean pre-op FVC of 3.17 litres. The association between the intervention groups and Pre-Operative FVC is considered to be not statistically significant since $p > 0.05$ as per 2 tail unpaired t test.

PRE-OPERATIVE FORCED EXPIRATORY VOLUME IN 1 SECOND

Pre-Operative Forced Expiratory Volume in 1 Second	Group CHOLE	%	Group APPEND	%
≤ 2 litres	2	10.00	1	5.00
2.01-3 litres	13	65.00	11	55.00
3.01-4 litres	5	25.00	7	35.00
4.01-5 litres	0	0.00	1	5.00
Total	20	100	20	100

Pre-Operative FEV in 1 Second	Group CHOLE	Group APPEND
N	20	20
Mean	2.47	2.80
SD	0.48	0.52
P Value Unpaired t Test		0.1436

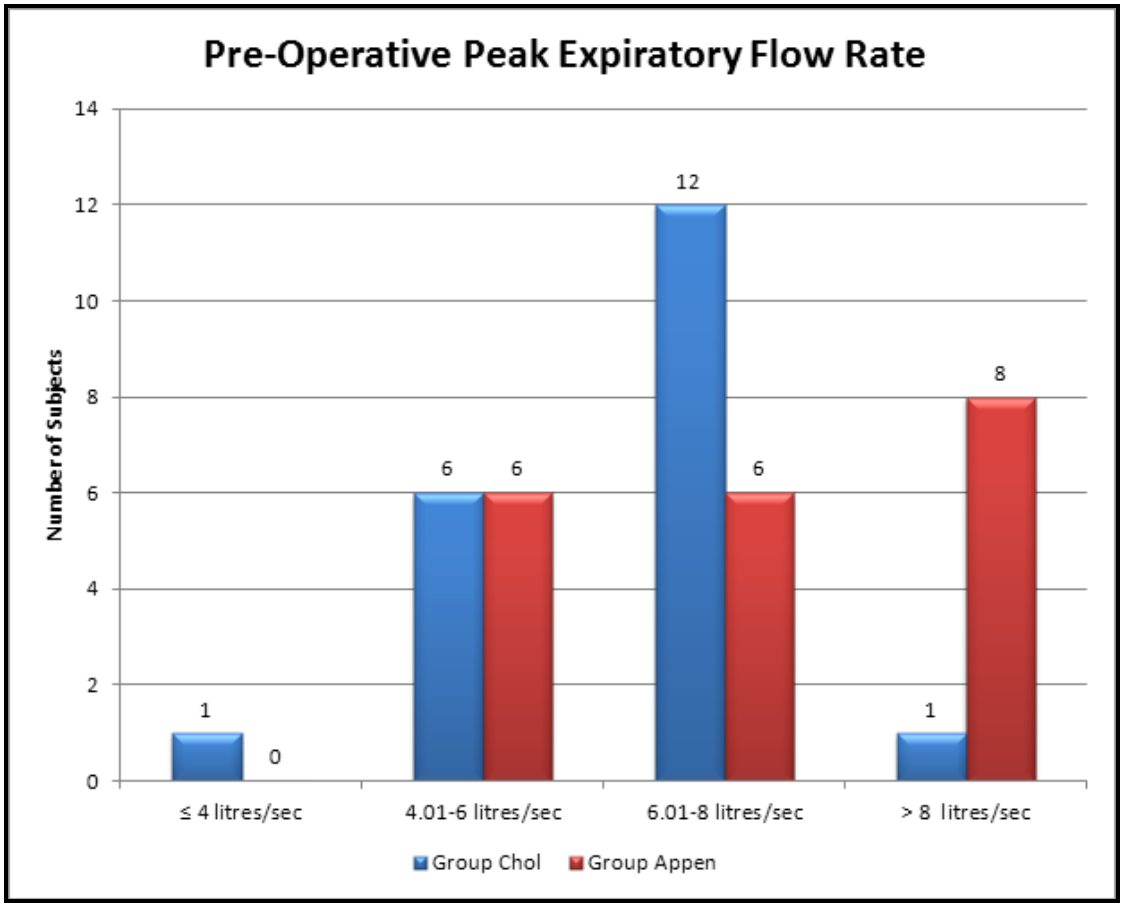


Majority of the group CHOLE patients belonged to the 2.1-3 litres Pre-Operative FEV1 class interval (n=13, 65%) with a mean pre-op FEV1 of 2.47 litres. In the group APPEND patients, majority belonged to the 2.1-3 litres Pre-Operative FEV1 class interval (n=11, 55%) with a mean pre-op FEV1 of 2.80 litres. The association between the intervention groups and Pre-Operative FEV1 is considered to be not statistically significant since $p > 0.05$ as per 2 tail unpaired t test.

PRE-OPERATIVE PEAK EXPIRATORY FLOW RATE

Pre-Operative PEFR	Group CHOLE	%	Group APPEND	%
≤ 4 litres/sec	1	5.00	0	0.00
4.01-6 litres/sec	6	30.00	6	30.00
6.01-8 litres/sec	12	60.00	6	30.00
> 8 litres/sec	1	5.00	8	40.00
Total	20	100	20	100

Pre-Operative PEFR	Group CHOLE	Group APPEND
N	20	20
Mean	6.50	7.07
SD	1.17	1.31
P Value Unpaired t Test		0.1555

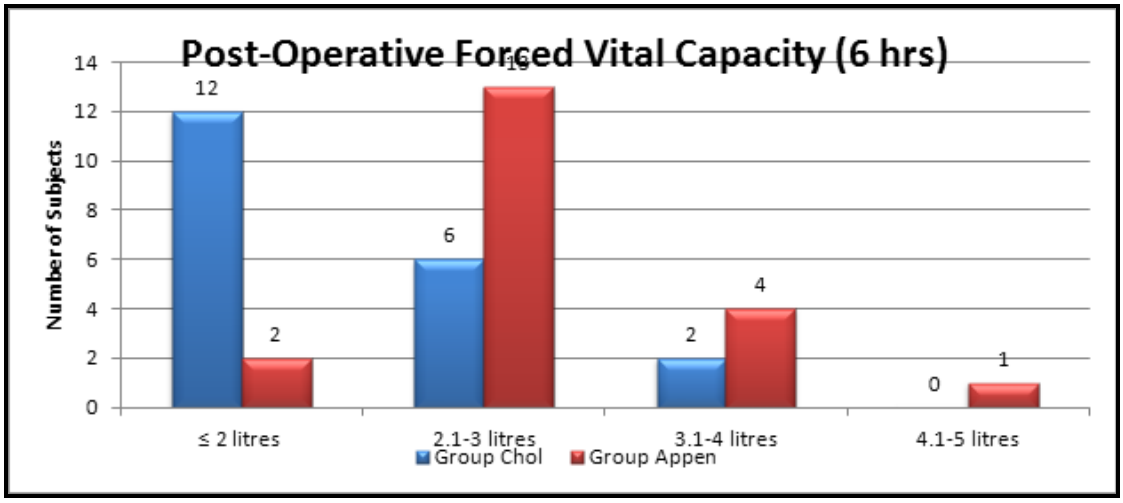


Majority of the group CHOLE patients belonged to the 6.01-8 litres/sec Pre-Operative PEFR class interval (n=12, 60%) with a mean pre-op PEFR of 2.47 6.50 litres/sec. In the group APPEND patients, majority belonged to the > 8 litres/sec Pre-Operative PEFR class interval (n=8, 40%) with a mean pre-op PEFR of 7.07 litres/sec. The association between the intervention groups and Pre-Operative PEFR is considered to be not statistically significant since $p > 0.05$ as per 2 tail unpaired t test.

POST-OPERATIVE FORCED VITAL CAPACITY (6 HRS)

Post-Operative FVC (6 hrs)	Group CHOLE	%	Group APPEND	%
≤ 2 litres	12	60.00	2	10.00
2.1-3 litres	6	30.00	13	65.00
3.1-4 litres	2	10.00	4	20.00
4.1-5 litres	0	0.00	1	5.00
Total	20	100	20	100

Post-Operative FVC(6 hrs)	Group CHOLE	Group APPEND
N	20	20
Mean	2.03	2.65
SD	0.64	0.57
P Value Unpaired t Test		0.0027*

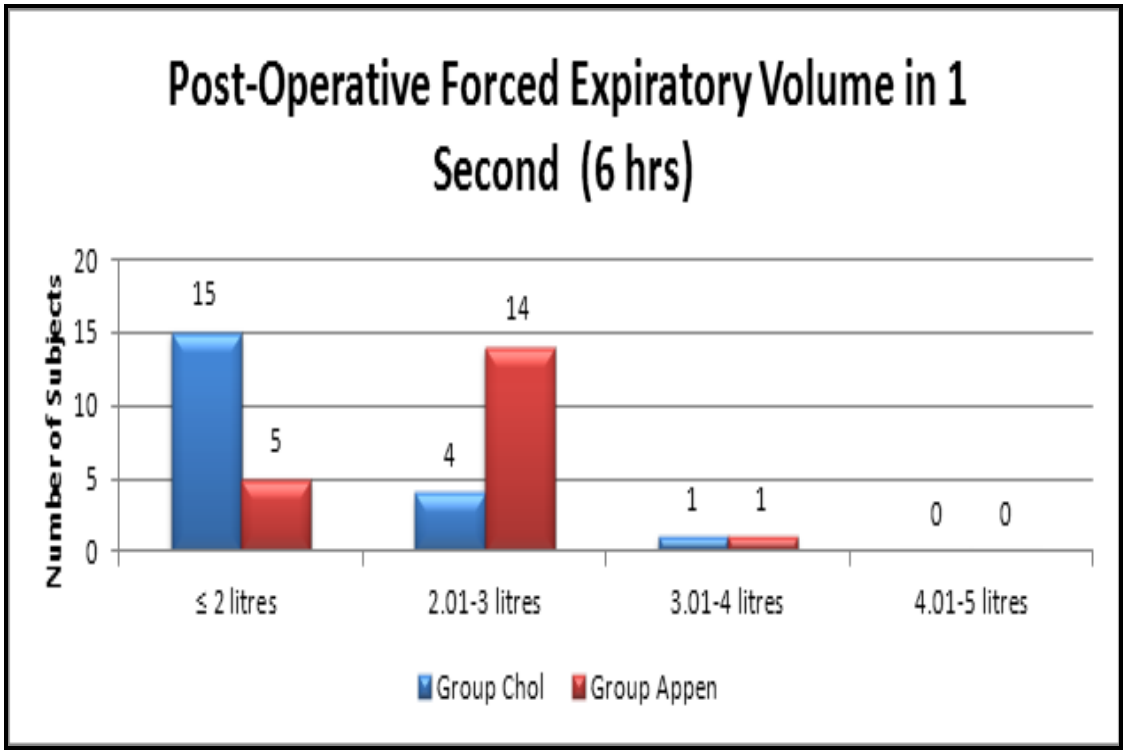


In patients belonging to group CHOLE, the mean 6 hours Post-Operative FVC is 2.03 litres. In group APPEND, the mean 6 hours Post-Operative FVC is 2.65 litres. The decrease in the mean of 6 hours Post-Operative FVC measurement in group CHOLE compared to the group APPEND is statistically significant as the p value is 0.0027 as per unpaired t- test indicating a true difference among study groups. The mean of 6 hours Post-Operative FVC measurement was meaningfully less in group CHOLE compared to group APPEND by 0.62 litres. This significant difference of 23% decrease in mean 6 hours Post-Operative FVC measurement in group CHOLE compared to group APPEND is true and has not occurred by chance. In this study we can safely conclude that the mean 6 hours Post-Operative FVC measurement is significantly more impaired in patients undergoing elective laparoscopic Cholecystectomy compared to patients undergoing elective laparoscopic Appendicectomy.

POST-OPERATI VE FEV1 (6 HRS)

Post-Operative FEV1 (6 hrs)	Group CHOLE	%	Group APPEND	%
≤ 2 litres	15	75.00	5	25.00
2.01-3 litres	4	20.00	14	70.00
3.01-4 litres	1	5.00	1	5.00
4.01-5 litres	0	0.00	0	0.00
Total	20	100	20	100

Post-Operative FEV1 (6 hrs)	Group CHOLE	Group APPEND
N	20	20
Mean	1.85	2.35
SD	0.60	0.58
P Value Unpaired t Test		0.0096*



In patients belonging to group CHOLE, the mean 6 hours Post-Operative FEV1 is 1.85 litres. In group APPEND, the mean 6 hours Post-Operative FEV1 is 2.35 litres. The decrease of 6 hours Post-Operative FEV1 measurement in group CHOLE compared to the group APPEND is statistically significant as the p value is 0.0096 as per unpaired t- test indicating a true difference among study groups. The mean Post-Operative FEV1 measurement was meaningfully less in group cholecystectomy compared to group appendicectomy by 0.51 litres.

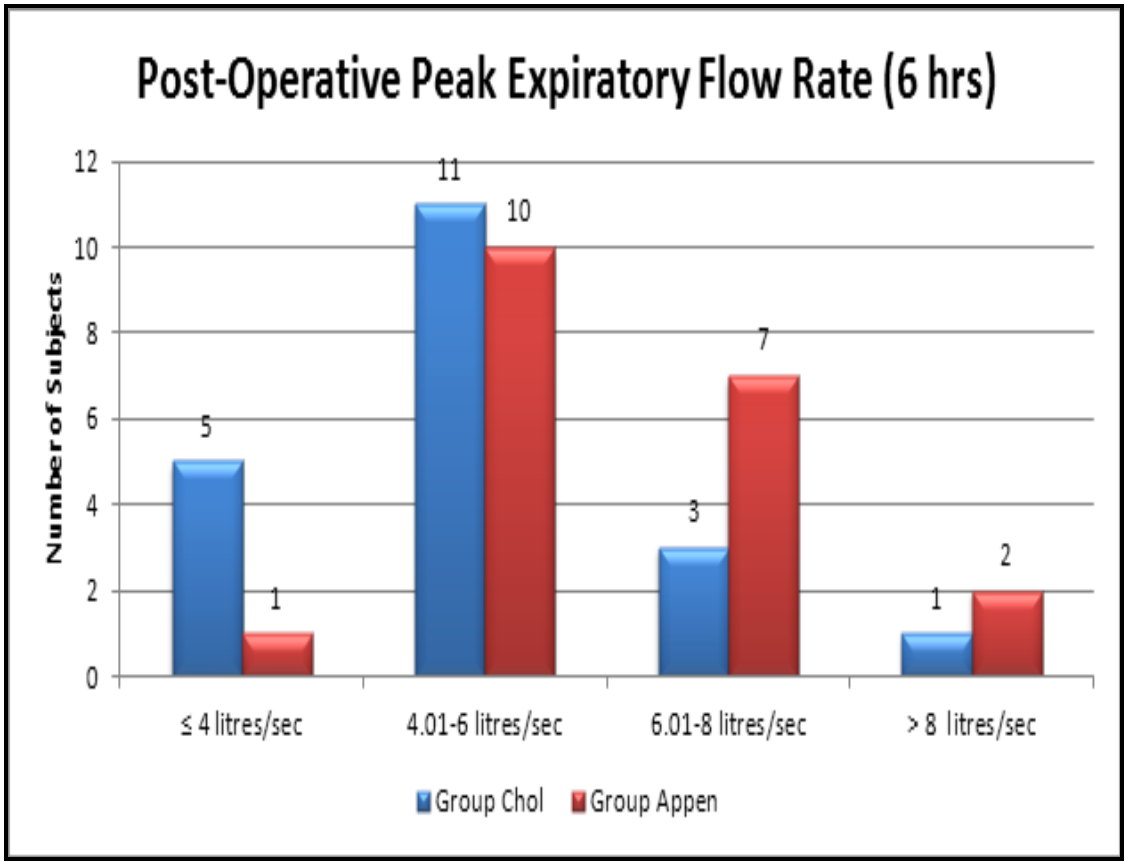
This significant difference of 21% decrease in mean 6 hours Post-Operative FEV1 measurement in group cholecystectomy

compared to group appendicectomy is true and has not occurred by chance. In this study we can safely conclude that the mean 6 hours Post-Operative FEV1 measurement is significantly more impaired in patients undergoing Elective Laparoscopic Cholecystectomy compared to patients undergoing Elective Laparoscopic Appendicectomy.

POST-OPERATIVE PEFR (6 HRS)

Post-Operative PEFR (6 hrs)	Group CHOLE	%	Group APPEND	%
≤ 4 litres/sec	5	25.00	1	5.00
4.01-6 litres/sec	11	55.00	10	50.00
6.01-8 litres/sec	3	15.00	7	35.00
> 8 litres/sec	1	5.00	2	10.00
Total	20	100	20	100

Post-Operative PEFR (6 hrs)	Group CHOLE	Group APPEND
N	20	20
Mean	4.92	5.96
SD	1.31	1.53
P Value Unpaired t Test		0.0272*



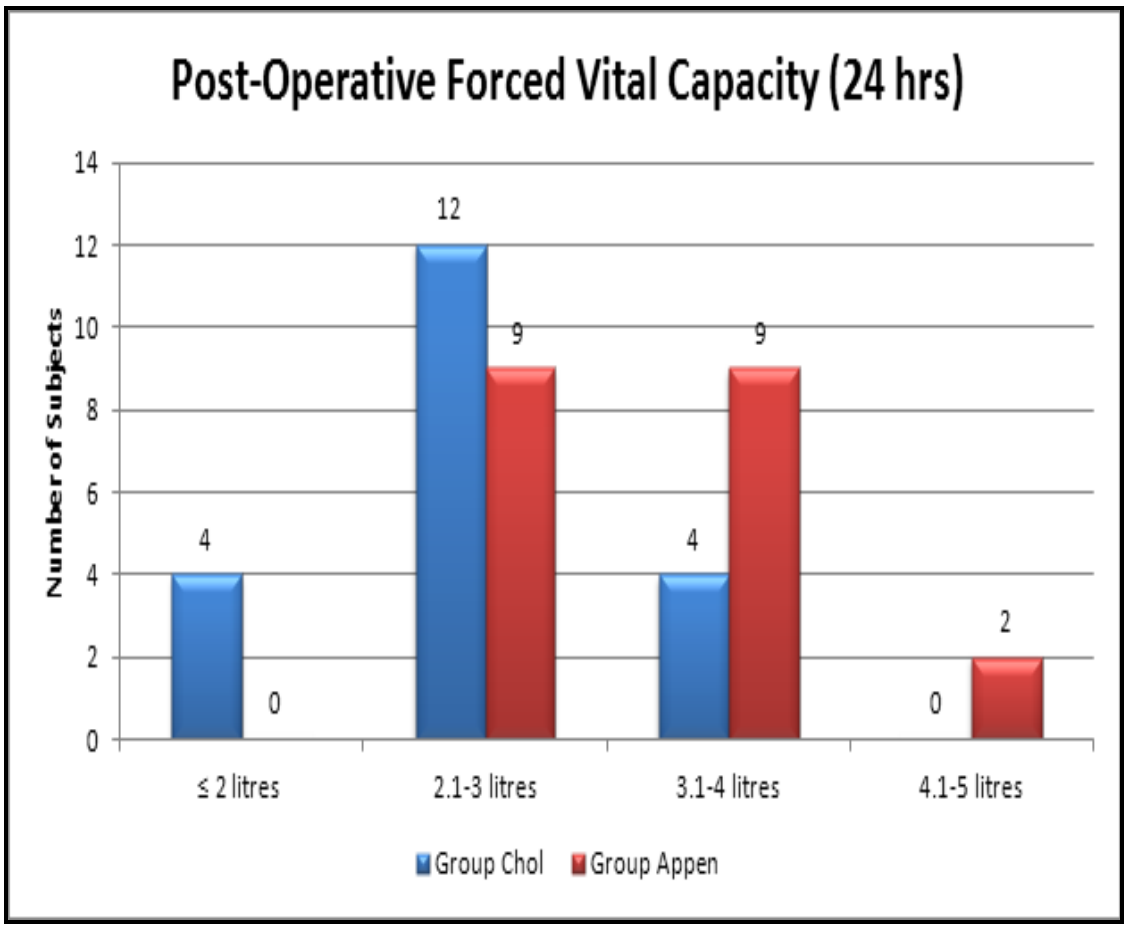
In patients belonging to group CHOLE, the mean 6 hours Post-Operative PEFR is 4.92 litres/sec. In group APPEND, the mean 6 hours Post-Operative PEFR is 5.96 litres/sec. The decrease in the mean of 6 hours Post-Operative PEFR measurement in group CHOLE compared to the group APPEND is statistically significant as the p value is 0.0272 as per unpaired t- test indicating a true difference among study groups. The mean Post-Operative PEFR measurement was meaningfully less in group CHOLE compared to group APPEND by 1.04 litres/sec. This significant difference of 17% decrease in mean 6 hours Post-Operative PEFR measurement

in group CHOLE compared to group APPEND is true and has not occurred by chance. In this study we can safely conclude that the mean 6 hours Post-Operative Peak Expiratory Flow Rate measurement is significantly more impaired in patients undergoing Elective Laparoscopic Cholecystectomy compared to patients undergoing Elective Laparoscopic Appendicectomy.

POST-OPERATIVE FVC (24 HRS)

Post-Operative FVC (24 hrs)	Group CHOLE	%	Group APPEND	%
≤ 2 litres	4	20.00	0	0.00
2.1-3 litres	12	60.00	9	45.00
3.1-4 litres	4	20.00	9	45.00
4.1-5 litres	0	0.00	2	10.00
Total	20	100	20	100

Post-Operative FVC (24 hrs)	Group CHOLE	Group APPEND
N	20	20
Mean	2.46	3.08
SD	0.57	0.56
P Value Unpaired t Test		0.0014*



In patients belonging to group CHOLE, the mean 24 hours Post-Operative FVC is 2.46 litres. In group APPEND, the mean 24 hours Post-Operative Forced Vital Capacity is 3.08 litres. The decrease in the mean 24 hours Post-Operative FVC measurement in group CHOLE compared to the group APPEND is statistically significant as the p value is 0.0014 as per unpaired t- test indicating a true difference among study groups.

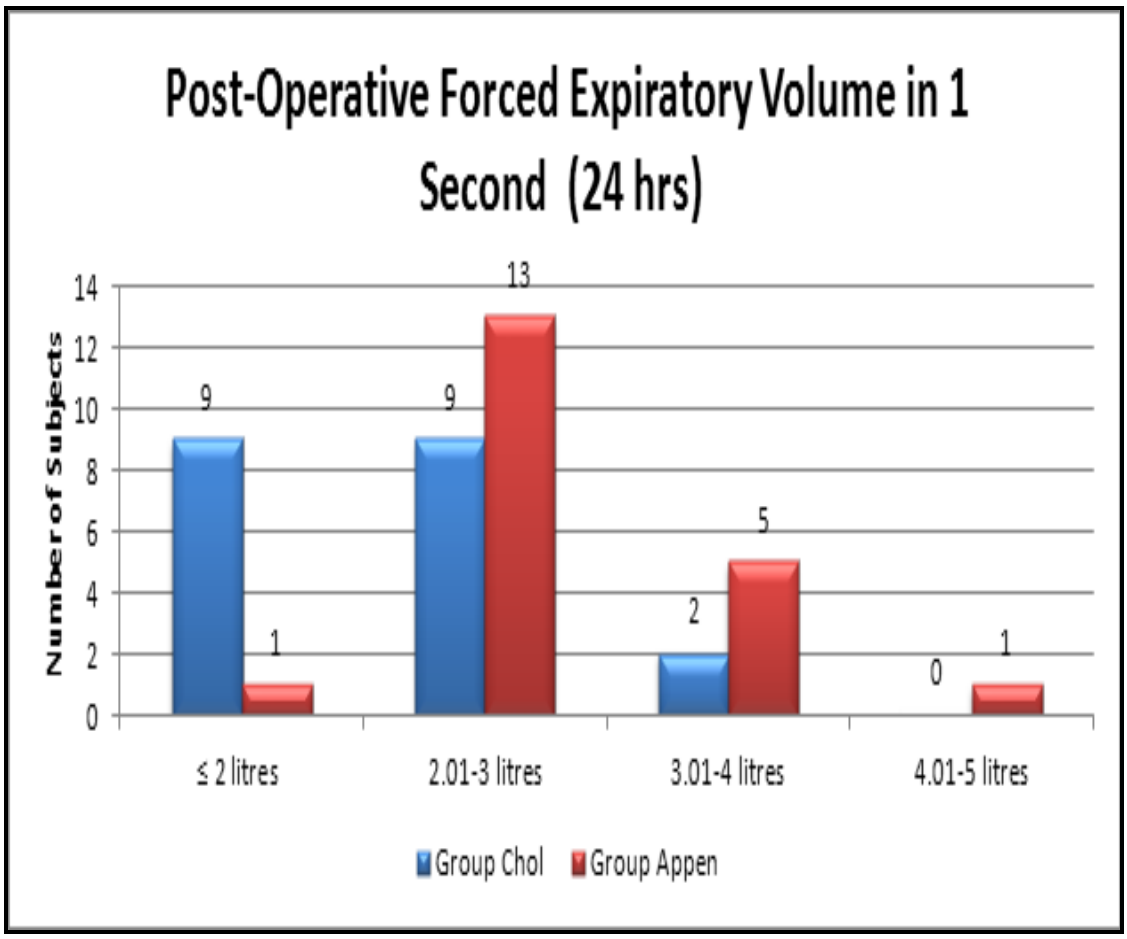
The mean 24 hours Post-Operative FVC measurement was meaningfully less in group CHOLE compared to group APPEND by 0.62

litres. This significant difference of 20% decrease in mean 24 hours Post-Operative FVC measurement in group CHOLE compared to group APPEND is true and has not occurred by chance. In this study we can safely conclude that the mean 24 hours Post-Operative FVC measurement is significantly more impaired in patients undergoing Elective Laparoscopic Cholecystectomy compared to patients undergoing Elective Laparoscopic Appendicectomy.

POST-OPERATIVE FEV1 (24 HRS)

Post-Operative FEV1 (24 hrs)	Group CHOLE	%	Group APPEND	%
≤ 2 litres	9	45.00	1	5.00
2.01-3 litres	9	45.00	13	65.00
3.01-4 litres	2	10.00	5	25.00
4.01-5 litres	0	0.00	1	5.00
Total	20	100	20	100

Post-Operative FEV1 (24 hrs)	Group CHOLE	Group APPEND
N	20	20
Mean	2.21	2.78
SD	0.51	0.52
P Value Unpaired t Test		0.0014*



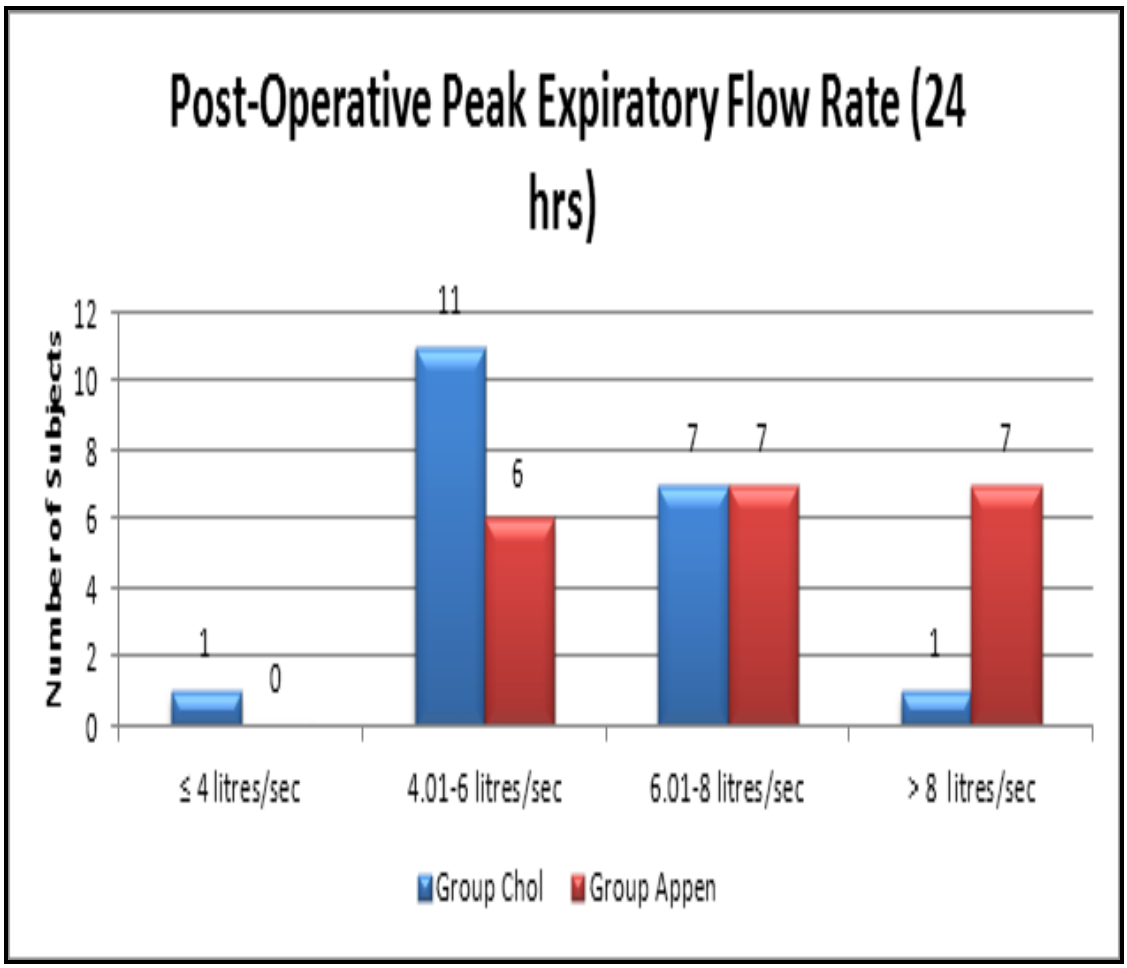
In patients belonging to group CHOLE, the mean 24 hours Post-Operative FEV1 is 2.21litres. In group APPEND, the mean 24 hours Post-Operative FEV1 is 2.78 litres. The decrease in the mean of 24 hours Post-Operative FEV1 measurement in group CHOLE compared to the group APPEND is statistically significant as the p value is 0.0014 as per unpaired t- test indicating a true difference among study groups. The mean 24 hours Post-Operative FEV1 measurement was meaningfully less in group CHOLE compared to group APPEND by 0.57 litres. This significant difference of 20% decrease in mean 24 hours Post-Operative FEV1 measurement in

group CHOLE compared to group APPEND is true and has not occurred by chance. In this study we can safely conclude that the mean 24 hours Post-Operative Forced Expiratory Volume in 1 Second measurement is significantly more impaired in patients undergoing Elective Laparoscopic Cholecystectomy compared to patients undergoing Elective Laparoscopic Appendicectomy.

POST-OPERATIVE PEAK EXPIRATORY FLOW RATE (24 HRS)

Post-Operative Peak Expiratory Flow Rate (24 hrs)	Group CHOLE	%	Group APPEND	%
≤ 4 litres/sec	1	5.00	0	0.00
4.01-6 litres/sec	11	55.00	6	30.00
6.01-8 litres/sec	7	35.00	7	35.00
> 8 litres/sec	1	5.00	7	35.00
Total	20	100	20	100

Post-Operative Peak Expiratory Flow Rate (24 hrs)	Group CHOLE	Group APPEND
N	20	20
Mean	5.67	6.77
SD	1.20	1.35
P Value Unpaired t Test		0.0100*



In patients belonging to group CHOLE, the mean 24 hours Post-Operative PEFR is 5.67 litres/sec. In group APPEND, the mean 24 hours Post-Operative PEFR is 6.77 litres/sec. The decrease in the mean 24 hours Post-Operative PEFR measurement in group CHOLE compared to the group APPEND is statistically significant as the p value is 0.0100 as per unpaired t- test indicating a true difference among study groups.

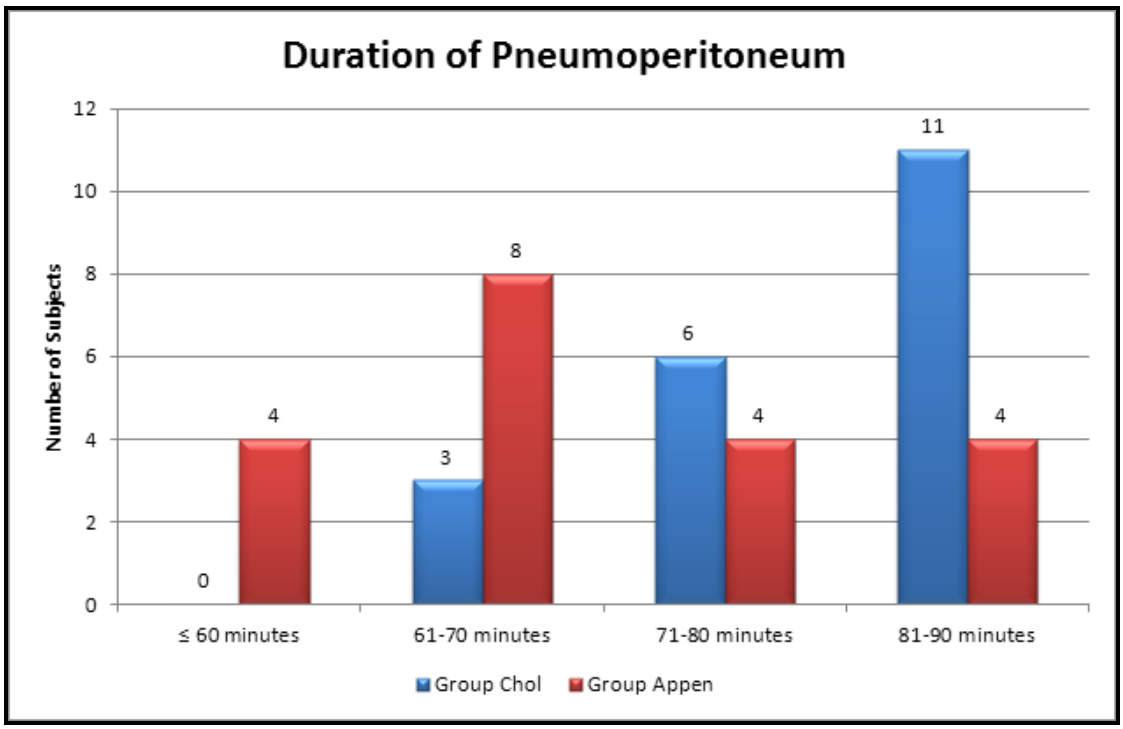
The mean 24 hours Post-Operative PEFR measurement was meaningfully less in group CHOLE compared to

group APPEND by 1.10 litres/sec. This significant difference of 16% decrease in mean 24 hours Post-Operative PEFR measurement in group CHOLE compared to group APPEND is true and has not occurred by chance. In this study we can safely conclude that the mean 24 hours Post-Operative Peak Expiratory Flow Rate measurement is significantly more impaired in patients undergoing Elective Laparoscopic Cholecystectomy compared to patients undergoing Elective Laparoscopic Appendicectomy.

DURATION OF PNEUMOPERITONEUM

Duration of Pneumoperitoneum	Group CHOLE	%	Group APPEND	%
≤ 60 minutes	0	0.00	4	20.00
61-70 minutes	3	15.00	8	40.00
71-80 minutes	6	30.00	4	20.00
81-90 minutes	11	55.00	4	20.00
Total	20	100	20	100

Duration of Pneumoperitoneum	Group CHOLE	Group APPEND
N	20	20
Mean	80.60	71.15
SD	7.73	10.54
P Value Unpaired t Test		0.0027*

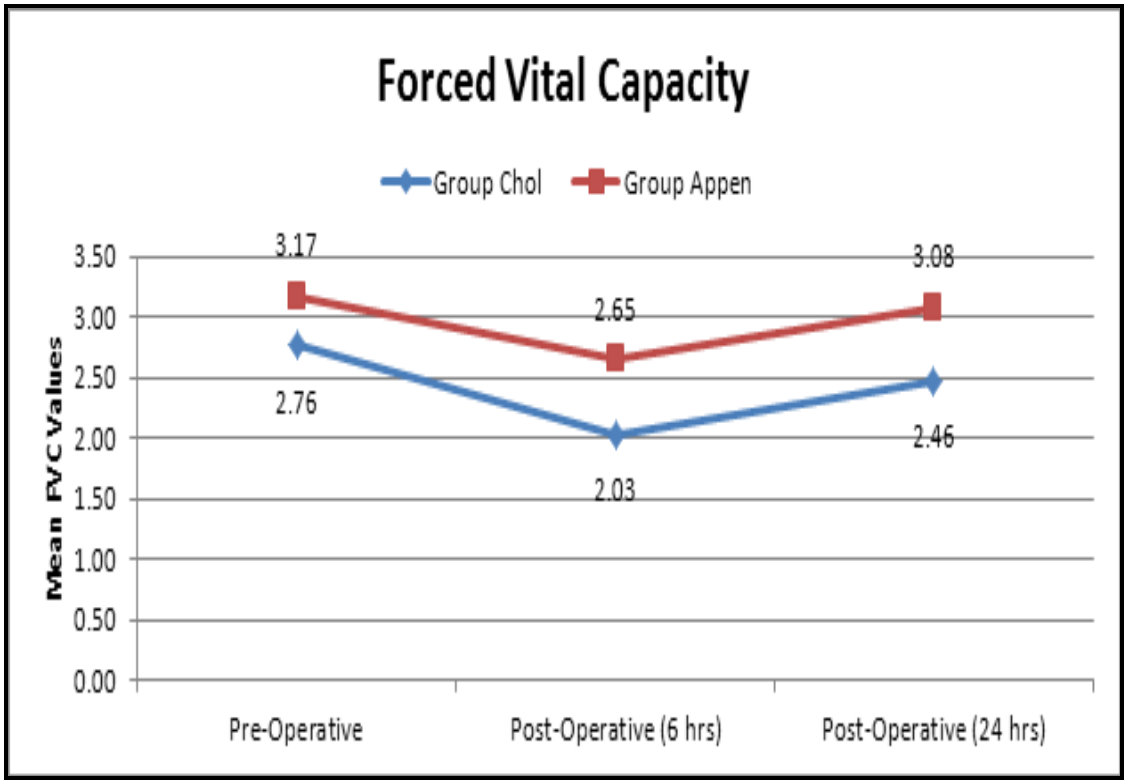


In patients belonging to group cholecystectomy, the mean duration of pneumoperitoneum is 80.60 minutes. In group appendicectomy, the mean duration of pneumoperitoneum is 71.15 minutes. The increase in the mean duration of pneumoperitoneum time in group cholecystectomy compared to the group appendicectomy is statistically significant as the p value is 0.27 as per unpaired t- test indicating a true difference among study groups. The mean duration of pneumoperitoneum time was marginally more in group CHOLE compared to group APPEND by 9.45 minutes. This difference of 1.13 times increase in mean duration of pneumoperitoneum time in group CHOLE compared to group APPEND is not statistically significant.

FVC PRE-OP VS POST-OP

Mean FVC	Pre-Operative	Post-Operative (6 hrs)	Post-Operative (24 hrs)
Group CHOLE	2.76	2.03	2.46
Group APPEND	3.17	2.65	3.08

FVC % of Change	Group CHOLE	Group APPEND	P value Unpaired t Test
Preoperative Vs Postoperative – 6 hours	26.47 % Decrease	16.54 % Decrease	0.0006*
Postoperative – 6 hours Vs Postoperative – 24 hours	17.52 % Increase	14.23 % Increase	0.0134*
Preoperative Vs Postoperative – 24 hours	10.86 % Decrease	2.81% Decrease	0.0298*



In patients belonging to group CHOLE, the mean Forced Vital Capacity preoperatively (2.76 litres) decreased by 26.47 % at 6 hours postoperatively (2.03 litres). Similarly the mean Forced Vital Capacity at 6 hours postoperatively increased by 17.52 % at 24 hours postoperatively (2.46 litres). The mean Forced Vital Capacity at 6 hours postoperatively preoperatively when compared to preoperative levels showed a decrease of 10.86 %.

In patients belonging to group APPEND, the mean FVC decreased by 16.54 % from a mean pre-op value of (3.17) litres to (2.65) litres at 6 hours postoperatively. Similarly the mean FVC at 6 hours postoperatively increased by 14.23% at 24 hours

postoperatively (2.46 litres). The mean Forced Vital Capacity at 6 hours postoperatively preoperatively when compared to preoperative levels showed a decrease of 2.81 %.

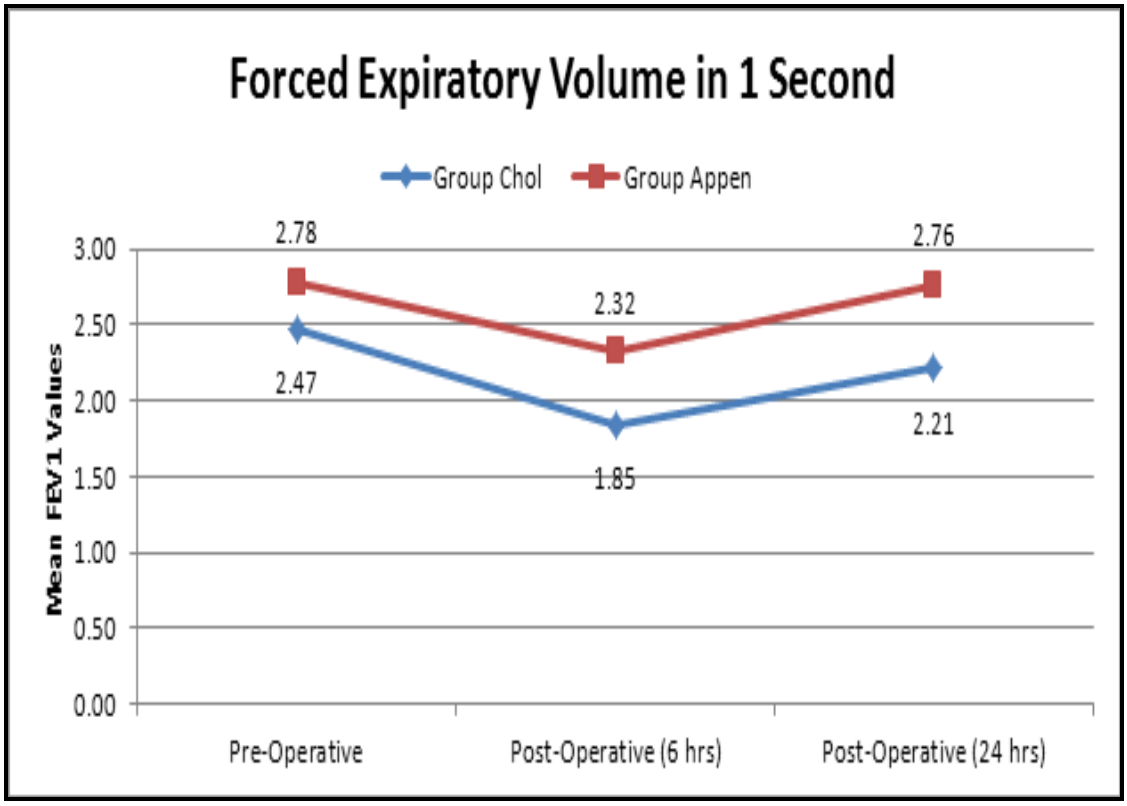
The FVC Preoperative Vs Postoperative at (6 hours) difference was statistically significant with a p value of 0.0006 as per unpaired t test.

The FVC Preoperative Vs Postoperative at (24 hours) difference was statistically significant with a p value of 0.0298 as per unpaired t test.

FEV1 PRE-OP VS POST-OP

Mean FEV1	Pre-Operative	Post-Operative (6 hrs)	Post-Operative (24 hrs)
Group CHOLE	2.47	1.85	2.21
Group APPEND	2.78	2.32	2.76

FEV1 % of Change	Group CHOLE	Group APPEND	P value Unpaired t Test
Preoperative Vs Postoperative – 6 hours	25.30 % Decrease	16.58 % Decrease	0.0033*
Postoperative – 6 hours Vs Postoperative – 24 hours	16.58 % Increase	15.96 % Increase	0.0243*
Preoperative Vs Postoperative – 24 hours	10.46 % Decrease	0.74% Decrease	0.0054*



In patients belonging to group CHOLE, the mean FEV1 preoperatively (2.47 litres) decreased by 25.30 % at 6 hours postoperatively (1.85 litres). Similarly the mean FEV1 at 6 hours postoperatively increased by 16.58 % at 24 hours postoperatively (2.21 litres). The mean FEV1 at 6 hours postoperatively when compared to preoperative levels showed a decrease of 10.46 %.

In patients belonging to group APPEND, the mean FEV1 preoperatively (2.78 litres) decreased by 16.58 % at 6 hours postoperatively to(2.32 litres). Similarly the mean FEV1 at 6 hours postoperatively increased by 15.96% at 24 hours postoperatively to (2.76 litres). The mean Forced Expiratory Volume in 1 Second at 6

hours postoperatively preoperatively when compared to preoperative levels showed a decrease of 0.74 %.

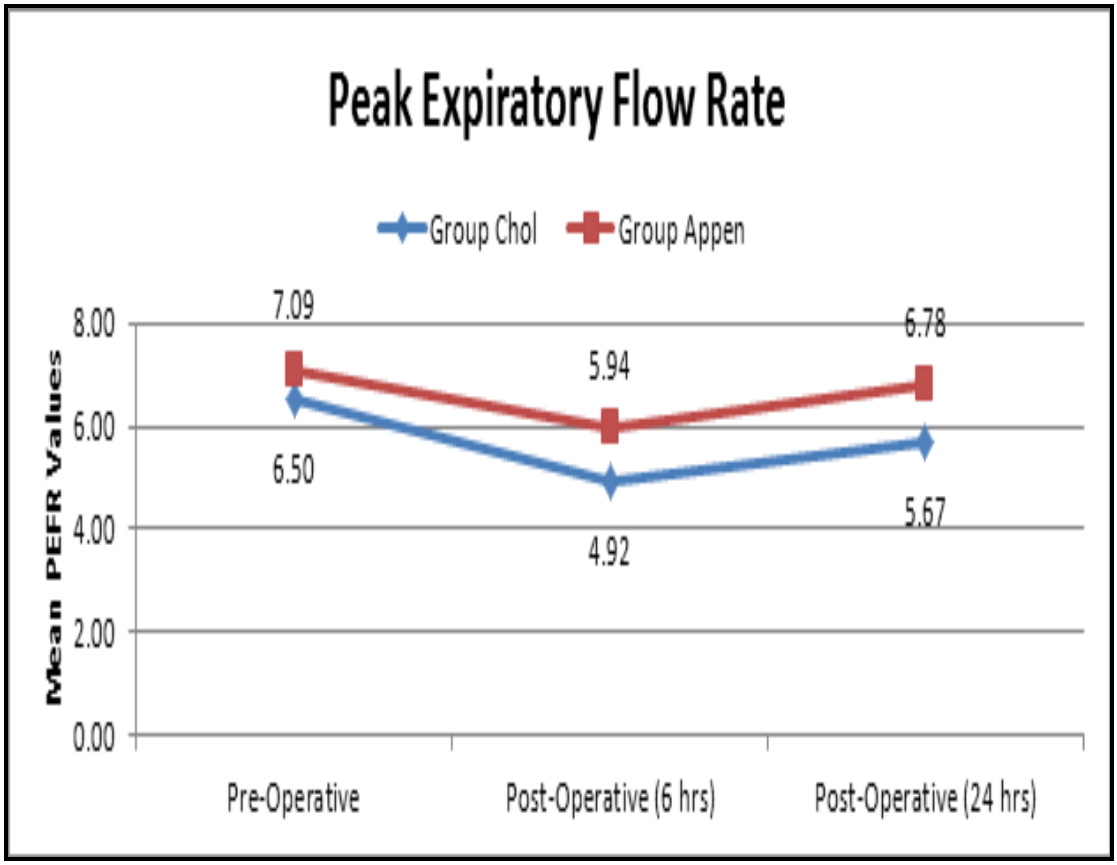
The FEV1 Preoperative Vs Postoperative at 6 hours difference was statistically significant with a p value of 0.0033 as per unpaired t test.

The FEV1 Preoperative Vs Postoperative – 24 hours difference was statistically significant with a p value of 0.0054 as per unpaired t test.

PEFR PREOP VS POSTOP

PEFR	Pre-Operative	Post-Operative (6 hrs)	Post-Operative (24 hrs)
Group CHOLE	6.50	4.92	5.67
Group APPEND	7.09	5.94	6.78

PEFR % of Change	Group CHOLE	Group APPEND	P value Unpaired t Test
Preoperative Vs Postoperative – 6 hours	24.36 % Decrease	16.17 % Decrease	0.0007*
Postoperative – 6 hours Vs Postoperative – 24 hours	13.25 % Increase	12.27 % Increase	0.0402*
Preoperative Vs Postoperative – 24 hours	12.82 % Decrease	4.45% Decrease	0.0112*



In patients belonging to group CHOLE, the mean PEFR preoperatively (6.59 litres/sec) decreased by 24.36 % at 6 hours postoperatively (4.92 litres/sec). Similarly the mean PEFR at 6 hours postoperatively increased by 13.25 % at 24 hours postoperatively (5.67 litres/sec). The mean Peak Expiratory Flow Rate at 6 hours postoperatively when compared to preoperative levels showed a decrease of 12.82 %.

In patients belonging to group APPEND, the mean PEFR preoperatively (7.09 litres) decreased by 16.17 % at 6 hours postoperatively (5.94 litres/sec). Similarly the mean PEFR at 6

hours postoperatively increased by 12.27% at 24 hours postoperatively (6.78 litres/sec). The mean Peak Expiratory Flow Rate at 6 hours postoperatively when compared to preoperative levels showed a decrease of 4.45 %.

The PEFR Preoperative Vs Postoperative at 6 hours difference was statistically significant with a p value of 0.0007as per unpaired t test.

The PEFR Preoperative Vs Postoperative – 24 hours difference was statistically significant with a p value of 0.0112 as per unpaired t test.

DISCUSSION

This study of measuring post op pulmonary dysfunction following laparoscopic cholecystectomy and laparoscopic appendicectomy has been conducted at Rajiv Gandhi Government General Hospital attached to Madras Medical College Chennai-3 during March 2015- June 2015.The two group of patients who were compared for post-op pulmonary dysfunction were GROUP-CHOLE and GROUP-APPEND having 20 patients each.

All our cases were done under General Anaesthesia with inj. glycopyrrolate as premedication. Inj. fentanyl at a dose of 2 micro gm/kg body wt was used for obtunding intubation response and intra-op analgesia. Additional intra-operative analgesia at a dose of 25 micro gm was used if surgery duration exceeded one hour. Adequate plane of anaesthesia maintained with sevoflurane as volatile agent titrated as per patients need. Adequate muscle relaxation attained by using Inj.atracurium in standard prescribed dosage. ETCO2 monitoring was done for all patients to ensure adequate ventilation and CO2 elimination. All the cases are done under standard laparoscopic instruments with three ports, one for camera and two for instrumentation. Intra peritoneal insufflations

of gases were done using CO2 maintaining the pressures between 12-14 mm of Hg. Duration of pneumoperitoneum recorded. At the end of procedure abdomen compressed to release the residual gas from peritoneum. Inj. tramadol i.m was given for post op analgesia at a dose of 1 mg/kg body wt for all patients.

COMPARISON OF PATIENT PFROFILE

Patient profiles in both the study groups were comparable in terms of age, sex, height, body weight. The mean BMI of lap-cholecystectomy group was 23 and of lap-appendicectomy was 21 and the difference between these values was not statistically different. Hence difference in spirometry values if any cannot be attributed to patient's physical profile.

COMPARISON OF PAIN SCORE

In both the study groups the post-operative spirometry was performed after achieving a VAS score of 30 or less by giving adequate analgesia. Hence any reduction in PFT values found during post-operative period can't be attributed to pain.

COMPARISON OF FVC

Post operatively both group of patients had a significant fall in FVC values measured 6 hrs after surgery. In group CHOLE the reduction was significantly more, from mean pre-op FVC 2.76 L to

post-op FVC 2.03 with a reduction of 26.47 % .Whereas in group APPEN pre-op FVC 3.17 to post-op FVC 2.65 with a reduction of 16.54%.The second post-op FVC done after 24 hrs revealed improvement in capacities in both the groups. In group CHOLE FVC recovered to 2.46 L which is still 10.86 % less than the pre-op values. In group APPEND FVC recovered to 3.08 L which is just 2.8% less compared to pre-op values which falls within the normal range.

Hence FVC measurements in lap-cholecystectomy group was found to be significantly low both during day of surgery and first post-operative day, this is similar to the findings published by Joris et al, Tiefenthaler et al.

The decrease of FVC in lap-appendicectomy is marginal and showed significant improvements in first post-operative day. This observation in our study is in accordance with findings reported by Joris et al in his study.

COMPARISON OF FEV1

In group CHOLE pre-op value of 2.47 L was reduced to 1.85 L at 6 hrs following surgery with a reduction of 25.3% which later improved significantly to 2.21 L at 24 hrs following surgery which

is again a reduction of 10.46 % compared with the pre-op value and is statistically significant. In group APPEND the mean pre-op FEV1 of 2.78 L was followed by initial post-op FEV1at 6 hrs of 2.32 L indicating 16.5% reduction. Second post-op FEV1 measured at 24 hrs was 2.76 with a negligible difference of 0.74% indicating the near complete recovery in group APPEND.

The FEV1 values in cholecystectomy group were significantly reduced both on day of surgery and first post-operative day, this is similar to the findings reported by Joris et al.

The FEV1 values in lap-appendicectomy group were reduced during the day of surgery in our study to an extent of 16% in our study. Whereas FEV1 values remain unchanged in reports published by Joris et al.

COMPARISON OF PEFR

PEFR values in group CHOLE was mean of 6.5 L/min in pre-op which decreased to 4.92 L/min with a reduction of 24.36% at 6hrs.It later recovered well at 5.67 L/min measured at 24 hrs post-op which was still 12.82% less compared with pre-op values and was statistically significant. In group APPEND with a mean pre-op

PEFR of 7.09 L/min was measured 5.94 L/min at 6 hrs post-op with a reduction of 16.17% which was statistically significant.

Second post-op PEFR done 24 hrs later improved significantly to 6.78 L/min with a minimal reduction of 4.45% compared to pre-op values.

The PEFR values were significantly reduced in lap-cholecystectomy group during day of surgery and first post-operative day. This is similar to the findings reported by Joris et al.

The PEFR values in lap-appendicectomy group were reduced during the day of surgery and recovered very well to pre-operative levels. This observation is similar to the findings reported by Joris et al.

SUMMARY

In this prospective study, we have compared patients undergoing elective cholecystectomy and appendicectomy under laparoscopic technique with 20 patients in each group to determine if lap-cholecystectomy resulted in more post-operative lung dysfunction compared with lap-appendicectomy. Pulmonary function testing was done pre-operatively and twice following surgery 6 hrs after procedure on day of surgery and 24 hrs on the first POD.

In both the groups there was significant reduction in FVC, FEV1, PEFR values on the day of surgery. Whereas the PFT values measured 24 hrs following procedure found that the lung volumes in appendicectomy group have returned to pre-operative levels but cholecystectomy group still had statistically significant reduced post-op values. All the post-operative measurements are done after adequate analgesia to attain a VAS score of less than 40 in a scale of (10-100).

This study suggests that anatomical location of surgery is an important determinant of lung dysfunction in lap-cholecystectomy rather than pain and anaesthetic factors which can be optimised.

CONCLUSION

The significant and persistent reduction in lung volumes and capacities found in laparoscopic cholecystectomy during the post-operative period was related to the site of surgery rather than anesthetic, analgesic or patient related factors.

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INSTITUTIONAL ETHICS COMMITTEE
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CERTIFICATE OF APPROVAL

To
Dr.Sathishkumar.A.P.
Post Graduate in MD (Anaesthesiology)
Madras Medical College
Chennai 600 003

Dear Dr.Sathishkumar.A.P.

The Institutional Ethics Committee has considered your request and approved your study titled " **A PROSPECTIVE STUDY COMPARING POST-OPERATIVE SPIROMETRY AFTER LAPAROSCOPIC CHOLECYSTECTOMY AND LAPAROSCOPIC APPENDICECTOMY SURGERIES"** NO.28032015.

The following members of Ethics Committee were present in the meeting hold on 03.03.2015 conducted at Madras Medical College, Chennai 3

1. Prof.C.Rajendran, MD	:Chairperson
2. Prof.R.Vimala,MD.,Dean,MMC,Ch-3	: Deputy Chairperson
3. Prof.B.Kalaiselvi,MD.,Vice Principal,MMC,Ch-3	: Member Secretary
4. Prof.R.Nandini,MD.,Inst.of Pharmacology,MMC	: Member
5. Prof.K.Ramadevi, Director ,Inst.of Bio-Chem.MMC	: Member
6. Prof.Saraswathy,MD.,Director,Pathology, MMC	: Member
7. Prof.S.G.Sivachidambaram,MD.,Director I/c Inst.of Internal Medicine,MMC	: Member
8. Thiru S.Rameshkumar, B.Com., MBA.	: Lay Person
9. Thiru S.Govindasamy, BA., BL.,	: Lawyer
10.Tmt.Arnold Saulina, MA., MSW.,	: Social Scientist

We approve the proposal to be conducted in its presented form.

The Institutional Ethics Committee expects to be informed about the progress of the study and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

Member Secretary – Ethics Committee

MEMBER SECRETARY
INSTITUTIONAL ETHICS COMMITTEE
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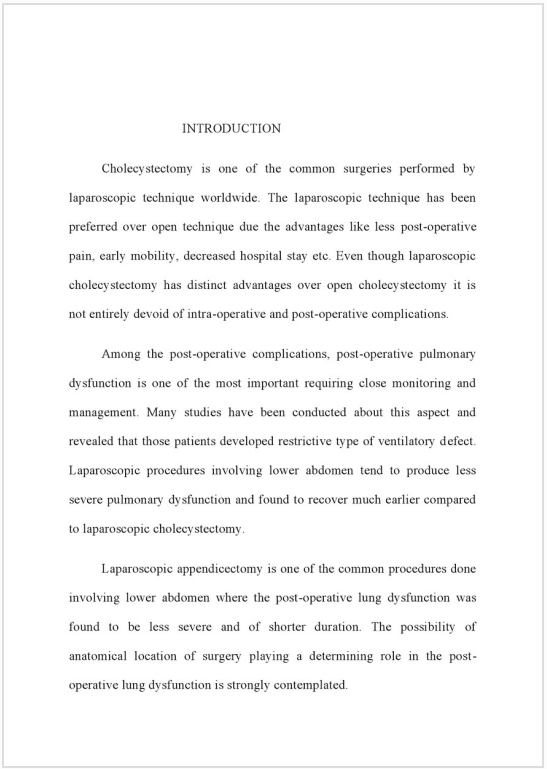

INTRODUCTION

Cholecystectomy is one of the common surgeries performed by laparoscopic technique worldwide. The laparoscopic technique has been preferred over open technique due the advantages like less post-operative pain, early mobility, decreased hospital stay etc. Even though laparoscopic cholecystectomy has distinct advantages over open cholecystectomy it is not entirely devoid of intra-operative and post-operative complications.

Among the post-operative complications, post-operative pulmonary dysfunction is one of the most important requiring close monitoring and management. Many studies have been conducted about this aspect and revealed that those patients developed restrictive type of ventilatory defect. Laparoscopic procedures involving lower abdomen tend to produce less severe pulmonary dysfunction and found to recover much earlier compared to laparoscopic cholecystectomy.

Laparoscopic appendicectomy is one of the common procedures done involving lower abdomen where the post-operative lung dysfunction was found to be less severe and of shorter duration. The possibility of anatomical location of surgery playing a determining role in the post-operative lung dysfunction is strongly contemplated.

INFORMATION TO PARTICIPANTS

Investigator: Dr. A.P.SATHISHKUMAR

Name of the Participant:

Title: A prospective study comparing postoperative spirometry (lung function testing) after laparoscopic cholecystectomy and laparoscopic appendicectomy surgeries.

You are invited to take part in this research study. We have got approval from the IEC. You are asked to participate because you satisfy the eligibility criteria. We want to determine if lower abdominal laparoscopy results in less postoperative pulmonary dysfunction than upper abdominal laparoscopy.

What is the Purpose of the Research

To confirm that the site of surgery is an independent risk factor for postoperative pulmonary dysfunction and thereby make it routine to optimize the patients undergoing upper abdominal laparoscopic procedures to do respiratory exercises and incentive spirometry preoperatively and to continue in the immediate postoperative period after adequate pain relief.

The Study Design:

Patients in the study will be divided into two groups.

Group (CHOLE) - Patients undergoing laparoscopic cholecystectomy

Group (APPEND) - Patients undergoing laparoscopic appendicectomy.

Patients will be evaluated clinically and investigated with CXR, ECG, SPO2.

All the patients will undergo lung function testing by preoperative spirometry.

All patients will be given general anaesthesia for undergoing laparoscopic surgery.

Postoperatively all the patients will undergo two spirometry tests after adequate pain relief.

First postoperative spirometry will be done 6 hours after surgery.

Second postoperative spirometry will be done 24 hours after surgery.

Benefits

Helps to assess the preoperative lung function and quantify the extent of postoperative pulmonary function following the laparoscopic surgical procedures. For patients with significant pulmonary dysfunction respiratory exercises and incentive spirometry may be started at the earliest to reduce postoperative morbidity.

Discomforts and risks

Discomfort while performing postoperative spirometry will be reduced by giving adequate pain relief. As such there are no risks involved in performing spirometry. In fact patients with significant reduction in postoperative lung function will be taught respiratory exercises and incentive spirometry to improve their lung function which is not a part of study. Patients who don't want to be part of study may withdraw as per their own wish.

Time :
Date :
Place :

Signature / Thumb Impression of Patient
Patient Name:

Signature of the Investigator : _____

\Name of the Investigator : _____

PATIENT CONSENT FORM

Study title :

"A prospective study comparing postoperative spirometry after laparoscopic cholecystectomy and laparoscopic appendicectomy surgeries."

Study centre:

INSTITUTE OF ANAESTHESIOLOGY AND CRITICAL CARE,
RAGIV GANDHI GOVT. GENERAL HOSPITAL,
MADRAS MEDICAL COLLEGE,
CHENNAI -3

Participant's Name :

Age:
Sex:

I confirm that I have understood the purpose of procedure for the above study. I have the opportunity to ask the question and all my questions and doubts have been answered to my satisfaction. I have been explained about the pitfall in the procedure. I have been explained about the safety, advantage and disadvantage of the technique. I understand that my participation in the study is voluntary and that I am free to withdraw at anytime without giving any reason.

I understand that investigator, regulatory authorities and the ethics committee will not need my permission to look at my health records both in respect to current study and any further research that may be conducted in relation to it, even if I withdraw from the study. I understand that my identity will not be revealed in any information released to third parties or published, unless as required under the law. I agree not to restrict the use of any data or results that arise from the study.

Time:
Date:
Place; Signature /thumb impression of the patient

(Name of the patient)

Name and signature of the investigator.

<u>ஆராய்ச்சி ஒப்புதல் படிவம்</u>

ஆராயச்சியின் தலைப்பு

லேப்பரோஸ்கோப்பி மூலம் செய்யப்படும் பித்தப்பை நீக்கல் அறுவை சிகிச்சை மற்றும் குடல்வால் நீக்கல் அறுவை சிகிச்சைக்கு பிறகு ஏற்படும் நுரையீரல் செயல்திறன் குறைபாட்டினை ஒப்பிட்டு பார்த்தல்.

ஆய்வு நிலையம் : மயக்கவியல் துறை, சென்னை மருத்துவக் கல்லூரி சென்னை – 3.

பங்கு பெறுவரின் பெயர் :

பங்குபெறுபவரின் எண் :

பங்குபெறுபவர் இதனை (✓) குறிக்கவும்

மேலே குறிப்பிட்டுள்ள மருத்துவ ஆய்வின் விவரங்கள் எனக்கு விளக்கப்பட்டது. என்னுடைய சந்தேகங்களை கேட்கவும், அதற்கான தகுந்த விளக்கங்களை பெறவும் வாய்ப்பளிக்கப்பட்டது. ☐

நான் இவ்வாய்வில் தன்னிச்சையாகதான் பங்கேற்கிறேன். எந்த காரணத்தினாலோ எந்த கட்டத்திலும் எந்த சட்ட சிக்கலுக்கும் உட்படாமல் நான் இவ்வாய்வில் இருந்து விலகி கொள்ளலாம் என்றும் அறிந்து கொண்டேன். ☐

இந்த ஆய்வு சம்பந்தமாகவோ, இதை சார்ந்த மேலும் ஆய்வு மேற்கொள்ளும் போதும் இந்த ஆய்வில் பங்குபெறும் மருத்துவர் என்னுடைய மருத்துவ அறிக்கைகளை பார்ப்பதற்கு என் அனுமதி தேவையில்லை என அறிந்து கொள்கிறேன். நான் ஆய்வில் இருந்து விலகிக் கொண்டாலும் இது பொருந்தும் என அறிகிறேன். ☐

இந்த ஆய்வின் மூலம் கிடைக்கும் தகவல்களையும், பரிசோதனை முடிவுகளையும் மற்றும் சிகிச்சை தொடர்பான தகவல்களையும் மருத்துவர் மேற்கொள்ளும் ஆய்வில் பயன்படுத்திக்கொள்ளவும் அதை பிரசுரிக்கவும் என் முழு மனதுடன் சம்மதிக்கின்றேன். ☐

இந்த ஆய்வில் பங்கு கொள்ள ஒப்புக்கொள்கிறேன். எனக்கு கொடுக்கப்பட்ட அறிவுரைகளின்படி நடந்து கொள்வதுடன் ‘இந்த ஆய்வை மேற்கொள்ளும் மருத்துவ அணிக்கு உண்மையுடன் இருப்பேன் என்று உறுதியளிகிறேன். ☐

ஸ்பைரோமைட்ரி எனப்படும் நுரையீரல் செயல்திறன் பரிசோதனை அறுவை சிகிச்சைக்கு முன்பு ஒருமுறையும் அறுவை சிகிச்சைக்கு பின்பு இரண்டுமுறையும் எனக்கு செய்யப்படும் என்பதை அறிந்துகொண்டேன். இதனால் எனக்கு உடல் உபாதை எதுவும் ஏற்படாது என்பதையும் தெளிவாக புரிந்துகொண்டேன். ☐

பங்கேற்பவரின் கையொப்பம் ..... இடம்..... தேதி.....

கட்டைவிரல் ரேகை

பங்கேற்பவரின் பெயர் மற்றும் விலாசம் .....

ஆய்வாளரின் கையொப்பம் ..... இடம்..... தேதி.....

ஆய்வாளரின் பெயர் .....

ஆராய்ச்சி தகவல் தாள்

ஆராய்ச்சி தலைப்பு

லேப்பரோஸ்கோப்பி மூலம் செய்யப்படும் பித்தப்பை நீக்கல் அறுவை சிகிச்சை மற்றும் குடல்வால் நீக்கல் அறுவை சிகிச்சைக்கு பிறகு ஏற்படும் நுரையீரல் செயல்திறன் குறைபாட்டினை ஒப்பிட்டு பார்த்தல்.

ஆராய்ச்சியாளர் பெயர் : மருத்துவர்.ஏ.பி.சதீஷ் குமார்

பங்கேற்பாளர் பெயர் :

ஆராய்ச்சியின் நோக்கம்

லேப்பரோஸ்கோப்பியின் மூலம் செய்யப்படும் பித்தப்பை நீக்கல் மற்றும் குடல்வால் நீக்கல் அறுவை சிகிச்சைக்குப் பிறகு நுரையீரல் செயல்திறனில் ஏற்படும் குறைபாட்டினை நுரையீரல் செயல்திறன் பரிசோதனை (ஸ்பைரோமெட்ரி) மூலம் கண்டறிதல்.

1) அறுவை சிகிச்சைக்கு முன்னர் ஒரு நுரையீரல் செயல்திறன் பரிசோதனை

2) அறுவை சிகிச்சைக்குப்பின் 6 மணி நேரம் கழித்து மற்றும் 24 மணி நேரம் கழித்து இரண்டுமுறை நுரையீரல் செயல்திறன் பரிசோதனை செய்யப்படும்.

ஆய்வு முறை

ஆய்வில் பங்குபெறும் நோயாளிகள் இரண்டு குழுக்களாகப் பிரிக்கப்படுவர்.

குழு-1 லேப்பரோஸ்கோப்பியின் மூலம் பித்தப்பை நீக்கல்

குழு-2 லேப்பரோஸ்கோப்பியின் மூலம் குடல்வால் நீக்கல்

அறுவை சிகிச்சைக்கு முன்னும் பின்னும் நுரையீரல் செயல்திறன் பரிசோதனை (ஸ்பைரோமெட்ரி) செய்யப்படும்.

நன்மைகள்

வயிற்றின் மேல்பகுதியில் அறுவை சிகிச்சை செய்யப்படும் நோயாளிகளுக்கு மூச்சுப்பயிற்சி மற்றும் இதர நுரையீரல் பயிற்சிகளை செய்வித்து தயார்படுத்துவதற்கான நடைமுறையை ஏற்படுத்தலாம்.

பக்கவிளைவுகள்

பக்கவிளைவுகள் ஏதுமில்லை. அறுவை சிகிச்சைக்குப் பின் நுரையீரல் செயல்திறன் பரிசோதனை செய்யும்போது தேவையான அளவு வலிநிவாரணம் அளித்த பிறகே பரிசோதனை நடத்தப்படுவதால் வலி குறித்த கவலை தேவையில்லை.

இந்த முறையான ஆய்வு ஏற்கனவே பல இடங்களில் நடத்தப்பட்டுள்ளது. மேலும் இதன் பாதுகாப்பு உறுதிசெய்யப்பட்டுள்ளது. நீங்கள் இந்த ஆய்வில் பங்குகொள்ள விரும்பவில்லை என்றால் எப்போதும் உபயோகிக்கப்படும் மருந்தே கொடுக்கப்படும். உங்கள் பாதுகாப்பே எங்களின் முக்கிய நோக்கம்.

இந்த ஆய்வு சம்பந்தமான எல்லா புள்ளி விவரங்கள் மற்றும் நோயாளிகளின் விவரங்கள் ரகசியமாக வைக்கப்படும். இந்த ஆய்வு சம்பந்தப்பட்ட எல்லா பரிசோதனைகள், மருந்துகள் மற்றும் மருத்துவ சேவைகள் அனைத்தும் நோயாளிகளுக்கு இலவசமாக வழங்கப்படும்.

ஆய்வாளரின் பெயர் **பங்குபெறுபவரின் பெயர்**

ஆய்வாளரின் கையொப்பம் **பங்குபெறுபவரின் கையொப்பம்**

PROFORMA

Height	
Weight	
BMI	

NAME:

AGE:

SEX:

Smoking status

DIAGNOSIS:

SURGICAL PROCEDURE DONE:

PRE OP ASSESSMENT:

HISTORY

Any Co-morbid illness IHD, Bronchial Asthma ,COPD, Pulmonary tuberculosis etc.

EXAMINATION

CVS	RS	CNS	ABD	RR	BHT	CXR	ECG	SPO2

AIRWAY ASSESSMENT

Thyro-mental distance

Inter-incisor distance

Neck movements

Loose teeth / Dentures

Modified Mallampatti Score

SPIROMETRY PARAMETERS

PARAMETERS	PRE-OP	POST-OP (6 HRS)	VAS (6HRS)	POST-OP (24 HRS)	VAS (24 HRS)
FVC					
FEV1					
PEFR					

S.NO	Patient ID	Name	Age	sex	Height	Weight	BMI	CVS	RS	ECG	CXR	RR	SPO2	Pre op FVC	Pre op FEV1	Pre op PEFR	Post op FVC[6HRS]	Post op FEV1[6hrs]	Post op PEFR[6hrs]	Post op FVC [24 hrs]	Post op FEV1[24hrs]	Post op PEFR [24hrs]	Duration of pneumoperitoneum
1	C1	ROSIE	20	FEMALE	150	44	19.6	N	N	N	N	12	99	2.19	2.05	5.88	1.55	1.43	4.67	1.97	1.8	5.23	76 min
2	C2	PRAVEENA	33	FEMALE	150	52	23.11	N	N	N	N	14	99	1.95	1.77	3.89	1.23	1.05	2.96	1.51	1.37	3.15	90 min
3	C3	SIVAKAMI	27	FEMALE	152	45	19.48	N	N	N	N	13	99	2.65	2.35	5.82	1.92	1.63	4.56	2.27	2.09	5.17	70 min
4	C4	NITHYA	28	FEMALE	165	65	24	N	N	N	N	14	99	2.71	2.35	6.1	2.05	1.9	5.17	2.45	2.11	5.75	75 min
5	C5	RAVISHANKAR	25	MALE	152	47	20.3	N	N	N	N	12	99	2.39	2.17	6.05	1.87	1.65	5.23	2.1	1.95	5.7	85 min
6	C6	VINOTH	18	MALE	167	65	23.3	N	N	N	N	15	99	3.05	2.85	7.25	2.43	2.27	6.32	2.85	2.67	6.93	65 min
7	C7	GANGADEVI	35	FEMALE	148	57	26	N	N	N	N	14	99	1.96	1.88	5.73	1.32	1.17	4.51	1.75	1.52	5.1	73 min
8	C8	SHANTHA	32	FEMALE	152	63	27.3	N	N	N	N	13	99	2.21	2.21	6.67	1.75	1.62	4.86	2.01	1.96	5.12	82 min
9	C9	JEYAKARAN	40	MALE	165	60	22	N	N	N	N	14	99	2.57	2.24	7.73	1.88	1.65	5.35	2.32	2.05	6.56	85 min
10	C10	SARASWATHI	45	FEMALE	155	70	29	N	N	N	N	15	99	2.28	2.06	6.35	0.88	0.81	2.38	1.96	1.72	4.13	70 min
11	C11	PUSHPA	50	FEMALE	140	58	29.59	N	N	N	N	15	99	2.46	2.27	6.72	1.79	1.63	3.8	2.39	1.96	4.6	85 min
12	C12	MALINI	28	FEMALE	156	65	26.7	N	N	N	N	12	99	2.72	2.39	5.93	2.01	1.75	3.58	2.61	2.3	5.29	80 min
13	C13	AMUDHA	31	FEMALE	145	55	26.2	N	N	N	N	14	99	2.48	2.2	5.45	1.93	1.78	4.12	2.23	2	4.97	75 min
14	C14	RAVISHANKAR	39	MALE	165	58	21.3	N	N	N	N	15	99	2.89	2.47	6.8	2.13	1.96	6.05	2.53	2.21	6.27	90 min
15	C15	FEROZA	28	FEMALE	165	64	23.5	N	N	N	N	13	99	2.44	2.27	5.29	1.67	1.52	3.85	2.13	1.95	5.05	83 min
16	C16	ARUMUGAM	35	MALE	164	60	22.3	N	N	N	N	13	99	3.6	3.11	7.67	1.91	1.86	5.12	2.76	2.65	6.32	85 min
17	C17	ABDUL RAHMAN	22	MALE	170	54	18.68	N	N	N	N	14	99	3.81	3.35	7.92	3.15	3.03	6.25	3.56	3.37	6.83	90 min
18	C18	DHANALAKSHMI	41	FEMALE	163	60	22.64	N	N	N	N	15	99	3.56	3.07	6.55	2.91	2.65	5.57	3.12	2.8	6.15	88 min
19	C19	PRIYA	25	FEMALE	165	55	20.22	N	N	N	N	12	98	3.53	3.15	6.85	2.96	2.68	5.88	3.15	2.79	6.18	90 min
20	C20	GOPINATH	29	MALE	170	60	20.76	N	N	N	N	14	99	3.82	3.24	9.42	3.3	2.9	8.15	3.6	3.01	8.9	75 min
21	A1	KAMESWARAN	20	MALE	152	42	18.18	N	N	N	N	13	99	3.39	3.1	6.7	3.01	2.9	6.15	3.3	3.06	6.56	65 min
22	A2	PRAMILA	19	FEMALE	154	43	18.1	N	N	N	N	15	99	2.28	2.18	5.97	1.51	1.28	2.43	2.31	2.17	4.8	70 min
23	A3	GAYATHRI	20	FEMALE	152	40	17.31	N	N	N	N	16	99	3.08	2.74	5.92	2.76	2.58	5.13	3.1	2.72	5.85	80 min
24	A4	BARATHI	36	FEMALE	152	65	28.13	N	N	N	N	12	99	2.91	2.52	5.92	2.44	2.09	5.76	2.85	2.58	5.81	75 min
25	A5	GIRIJA	29	FEMALE	150	55	24.44	N	N	N	N	13	99	2.76	2.49	6.93	2.42	2.17	5.92	2.61	2.51	6.72	70 min
26	A6	TAMILKUDIARASAN	27	MALE	167	82	29.4	N	N	N	N	17	99	4.17	3.72	8.53	2.73	2.42	7.87	4.01	3.59	8.1	85 min
27	A7	MALLIGA	54	FEMALE	153	50	21.36	N	N	N	N	13	99	2.75	1.9	6.23	2.25	1.67	5.75	2.61	1.94	6.05	80 min
28	A8	RANI	52	FEMALE	150	50	22.22	N	N	N	N	14	99	2.63	2.34	4.58	2.05	1.95	4.1	2.56	2.32	4.37	90 min
29	A9	VINOTHA	18	FEMALE	152	46	19.91	N	N	N	N	15	99	2.62	2.52	5.4	2.37	2.15	5.08	2.5	2.45	5.45	60 min
30	A10	MOHANRAJ	32	MALE	172	67	22.71	N	N	N	N	12	99	4.56	4.01	8.25	4.01	3.85	7.55	4.45	4.15	8.12	65 min
31	A11	LEELAVATHI	42	FEMALE	156	45	18.51	N	N	N	N	13	99	2.61	2.58	7.02	1.86	1.86	4.23	2.58	2.51	6.53	55 min
32	A12	DEVENDIRAN	30	MALE	168	54	19.1	N	N	N	N	12	99	3.33	2.96	8.75	3.28	2.91	8.64	3.35	2.91	8.72	65 min
33	A13	UMAPATHI	18	MALE	152	47	20.3	N	N	N	N	15	99	3.02	2.67	7.32	2.81	2.35	7.01	3.01	2.71	6.65	85 min
34	A14	KUPPUSAMY	35	MALE	172	57	19.3	N	N	N	N	14	99	3.85	3.17	8.1	2.98	2.58	6.53	3.35	2.98	7.11	78 min
35	A15	SABARI	18	MALE	167	65	23.3	N	N	N	N	14	99	3.39	3.08	8.13	2.53	2.55	5.35	3.43	3.14	8.2	85 min
36	A16	GEETHA	32	FEMALE	154	43	18.1	N	N	N	N	13	99	2.49	2.32	5.71	2.01	1.6	4.35	2.45	2.27	5.07	65 min
37	A17	PRAJITH	33	MALE	172	65	22	N	N	N	N	14	99	3.46	3.05	8.27	2.98	2.49	6.14	3.37	2.96	8.1	70 min
38	A18	PREM	20	MALE	170	52	18	N	N	N	N	13	99	3.81	3.16	8.7	3.22	2.63	8.1	3.76	3.2	8.81	60 min
39	A19	SAADIQ	18	MALE	176	67	21.6	N	N	N	N	14	99	3.38	3.11	8.9	3.1	2.96	7.21	3.26	3.05	8.16	55 min
40	A20	SUDHA	39	FEMALE	164	65	24.2	N	N	N	N	12	99	2.95	2.39	6.1	2.63	2.05	5.8	2.8	2.36	6.12	65 min

S.NO	PATIENT ID	NAME	AGE	SEX	VAS[6 HRS]	VAS[24 HRS]
1	C1	ROSIE	20	FEMALE	30	20
2	C2	PRAVEENA	33	FEMALE	30	20
3	C3	SIVAKAMI	27	FEMALE	30	10
4	C4	NITHYA	28	FEMALE	20	20
5	C5	RAVISHANKAR	25	MALE	30	20
6	C6	VINOTH	18	MALE	30	20
7	C7	GANGADEVI	35	FEMALE	30	20
8	C8	SHANTHA	32	FEMALE	30	20
9	C9	JEYAKARAN	40	MALE	20	10
10	C10	SARASWATHY	45	FEMALE	30	20
11	C11	PUSHPA	50	FEMALE	30	20
12	C12	MALINI	28	FEMALE	30	10
13	C13	AMUDHA	31	FEMALE	30	10
14	C14	RAVI	39	MALE	30	20
15	C15	FEROZA	28	FEMALE	30	20
16	C16	ARUMUGAM	35	MALE	20	20
17	C17	ABDURRAHMAN	22	MALE	20	20
18	C18	DHANALAKSHMI	41	FEMALE	20	20
19	C19	PRIYA	25	FEMALE	30	20
20	C20	GOPINATH	29	MALE	20	20
21	A1	KAMESWARAN	20	MALE	20	20
22	A2	PRAMILA	19	FEMALE	20	10
23	A3	GAYATHRI	20	FEMALE	20	20
24	A4	BHARATHI	36	FEMALE	30	20
25	A5	GIRIJA	29	FEMALE	20	20
26	A6	TAMILKUDIYARASAN	27	MALE	20	20
27	A7	MALLIGA	54	FEMALE	30	20
28	A8	RANI	52	FEMALE	20	10
29	A9	VINOTHA	18	FEMALE	20	20
30	A10	MOHANRAJ	32	MALE	30	20
31	A11	LEELAVATHI	42	FEMALE	30	20
32	A12	DEVENDRAN	30	MALE	30	20
33	A13	UMAPATHY	17	MALE	30	10
34	A14	KUPPUSAMY	35	MALE	30	20
35	A15	SABARI	18	MALE	20	20
36	A16	GEETHA	32	FEMALE	30	20
37	A17	PRAJITH	33	MALE	20	20
38	A18	PREMKUMAR	20	MALE	30	20
39	A19	SAADIQ	18	MALE	20	10
40	A20	SUDHA	39	FEMALE	20	20