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Original Article

Perioperative Hemodynamic Behavior and Incidence of Complications in Copd Patients: A Prospective Observational Study in Kashmiri Population

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ABSTRACT

Purpose: Study hemodynamic behavior and incidence of complications in COPD patients
Study design: Prospective Observational Study Place and duration of study: This prospective observational study took place between January 2017 to June 2018 over a period of 18 months. Patients above 40 years of age of either gender with COPD belonging to ASA Class II scheduled for elective surgeries under anaesthesia were selected for this study
Material and methods: Data was obtained during pre anesthetic assessment from the patient, patient's attendant, and physician's assessment and examination findings and from laboratory studies wherever applicable. Patients already on treatment or diagnosed but with poor compliance to treatment for co morbidity of interest were advised medical/pulmonary consultation wherever applicable for proper optimization of the condition. Whereas those who for the first time on pre anesthetic assessment were reported to have the co morbidity were consulted by physician/pulmonologist as was deemed appropriate for the diagnosis/grading/ counseling/ treatment/ optimization of the said condition. This organized/ relevant data was then collected from preanesthetic assessment forms. Pre-anaesthetic evaluation was done at this stage. Age, gender, weight, type of surgery, anesthesia time, and surgery time was noted down in all patients. A thorough history, clinical examination and preoperative spirometry was done with emphasis to following:
a. Duration of the illness
b. History of smoking
c. Recent hospitalization and exacerbation in last one year
d. Baseline O2 saturation and ABG on room air
e. Pre-op steroid usage
f. Pre-op antibiotics usage
g. Need for pre op nebulization
h. Previous anaesthetic exposure
i. Allergy to any medication
j. Grading of dyspnea

Keywords*: Chronic Obstructive Pulmonary Disease (COPD), Hemodynamic Changes, Perioperative Complications, General Anesthesia, Preoperative Assessment.*

INTRODUCTION

Kashmir is a moderate altitude area with severe winters that confine people to their homes for prolonged periods, with potentially higher exposure to indoor air pollution due to a much greater use of biomass fuel for heating and cooking. "Kangri", a firepot, is used for personal heating providing very close exposure to biomass fuel due to which various respiratory diseases are encountered in Kashmir.1

By far the most common pulmonary diseases encountered in clinical practice are obstructive disorders characterized by increased resistance to expiratory gas flow resulting in increase in lung volumes. Chronic obstructive pulmonary disease (COPD) is an all-inclusive term wherein the patients have variable features of both emphysema and conducive chronic bronchitis 2

The global initiative for Chronic Obstructive Pulmonary Disease guideline (GOLD) defines COPD as "A common preventable and treatable disease, characterized by persistent airflow limitation that is usually progressive, irreversible and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases."3 According to WHO estimates, 65 million people have moderate to severe chronic obstructive pulmonary disease (COPD) all over the world (WHO).4 There are wide variations in the prevalence of COPD in Indian subcontinent. The national burden of chronic bronchitis is estimated as 14.84 million. In a collaborative study with Burden of Lung Disease (BOLD) investigators using BOLD protocol, the prevalence of Stage 1 or higher COPD in participants > 40 years of age based in rural Kashmir was found to be 19.3%.5

Chronic Obstructive Pulmonary Disease (COPD) is one disease entity which shows strong association with several risk factors6. Cigarette smoking being the most prominent of the risk factors involved. Studies show that 80% of patients with COPD have significant exposure to tobacco smoking 7. Smoking manifests with accelerated decline in the volume of air exhaled in the first second (FEV1) during a forced expiratory maneuver and this follows a dose-response relationship to the intensity of cigarette smoking. Increased airway responsiveness to various exogenous stimuli, respiratory infections, occupational exposures to dust at work (e.g. coal mining, gold mining and cotton textile dust), ambient air pollution, as well as genetic factors like severe α 1antitrypsin (α1 AT) deficiency have also been implicated.8

Chronic Obstructive Pulmonary Disease (COPD) is characterized by 'air trapping' and a progressive increase in total lung capacity, due to high expiratory airway resistance combined with expiratory flow limitation, and low elastic recoil, together resulting in a process known as dynamic hyperinflation.9,10 . Non uniform ventilation and ventilation perfusion mismatch are characteristics of COPD 11. COPD also imposes significant extra-pulmonary effects which includes weight loss, nutritional abnormalities and skeletal muscle dysfunction.12 Cardiovascular dysfunction is usually related to acute and chronic blood gas derangements, dynamic hyperinflation and increased right ventricular afterload .13

A diagnosis of COPD is considered in smokers over the age of 35 years, presenting with exertional dyspnea, chronic cough, regular sputum production and frequent winter bronchitis or wheeze. Spirometry is used both at the time of diagnosis and also to reconsider the diagnosis if patients show an exceptionally good response to treatment with bronchodialors. Airflow obstruction defined by a ratio of forced expired volume in 1 s to forced vital capacity (FEV1/FVC) of <0.7 is used to diagnose COPD. If FEV1 is >80% of the predicted value, then a diagnosis of COPD should only be made in the presence of respiratory symptoms. Reversibility testing with bronchodilators or corticosteroids is not necessary for diagnosis, and clinical features should be used to differentiate COPD from asthma [nice global initiative]. 14,15

Table 1 Classification of severity of airflow limitation in COPD. Reproduced from NICE guideline 101.14

FEV1/FVC (post bronchodilator)	FEV1% predicted	NICE 2004	ATS/ERS 200416	GOLD 200815	NICE 201014
<0.7	>80%		Mild	Stage 1—mild	Stage 1—mild*
<0.7	50–79%	Mild	Moderate	Stage 2—moderate	Stage 2—moderate
<0.7	30–49%	Moderate	Severe	Stage 3—severe	Stage 3—severe
<0.7	<30%	Severe	Very severe	Stage 4—very severe†	Stage 4—very severe†

FEV1, forced expiratory volume in 1 s; FVC, forced vital capacity; NICE, National Institute for Health and Clinical Excellence; ATS, American Thoracic Society; ERS, European Respiratory Society; GOLD, Global initiative for chronic Obstructive Lung Disease. *Symptoms should be present to diagnose COPD in patients with mild airflow obstruction. †Or FEV1 <50% with respiratory failure.

The incidence of postoperative pulmonary complications in COPD patients [with FEV1 ≤ 1.2 L and FEV1/FVC < 75%] undergoing non-cardiothoracic surgery, as reported by Wong and colleagues is around 37% [excluding atelectasis] and a 2-year mortality rate of 47% is expected preoperatively.17

Perioperative bronchospasm in patients with reactive airway disease is relatively uncommon. The overall incidence of bronchospasm during general anaesthesia is approximately 0.2%.18 COPD patients are prone to intra-operative haemodynamic instability owing to decreased systemic venous return and raised PVR leading to right heart strain19,20.

Recurrent nocturnal hypoxaemic episodes during postoperative periods in COPD patients have been attributed to sleep disturbances and the pulmonary restrictive syndrome following thoracic and abdominal surgery and is characterized by substantial reductions in lung volumes (30% of FRC and total lung capacity, 40-60% of FEV1) with an elevated airway occlusion pressure and a shallow 'thoracic' breathing pattern21,22.

Preoperative evaluation aims at finding out the degree of impairment, identification of modifiable risk factors and their optimization which can improve the peri-operative outcome. Pre-operative optimization of these patients include cessation of smoking, improvement of pulmonary functions using bronchodilators and steroids, pre-operative chest physiotherapy and training of patient with lung expansion manuoevers.23 Observation of perioperative haemodynamic behavior of COPD patients under anesthesia.

Incidence of perioperative complications in COPD patients.
Length of hospital stay.

Inclusion Criteria
Patients above 40 years of age of either gender and belonging to ASA class II, scheduled for elective surgeries under anaesthesia were selected for this study.

Exclusion Criteria
Patients with diabetes, ischemic heart disease, hypothyroidism, thyrotoxicosis, valvular heart diseases, heart blocks, dysrrhythmias, cerebrovascular event, cardiac and neurological surgical procedures, pregnant women, lactating women, anticipated difficult intubation (Mallampati class III-IV) and patients with a recent exacerbation of COPD in last six weeks were excluded from the study.

Study Design
This prospective Observational study was conducted in the Department of Anesthesiology and Critical Care, Government Medical College, Srinagar and associated Hospital

Among 2575 profiles of the patients, who reported for pre anesthetic consultation on O.P.D/I.P.D basis, out of them 100 patients who represent the comorbidity of interest of our study for elective surgical procedures under the department of general surgery, ENT and Orthopedic were included in this observational study. Patients above 40 years of age and ASA classification II were among those included; while patients having comorbidities other than those of the interest for this study were excluded.

Table 1: Age wise distribution of study patients

Age (years)	Frequency	Percentage
40-49	18	18%
50-59	27	27%
60-69	43	43%
≥70	12	12%
Total	100	100%
Mean ± SD=51.3±7.63		

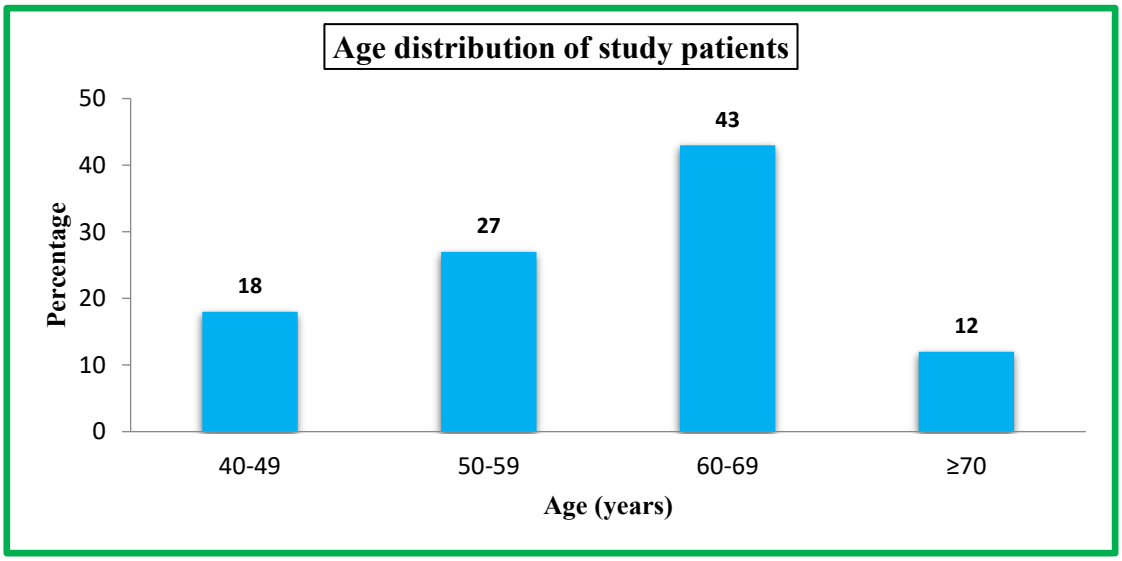


Table 2: Gender wise distribution of study patients		
Gender	Frequency	Percentage
Male	67	67%
Female	33	33%
Total	100	100%

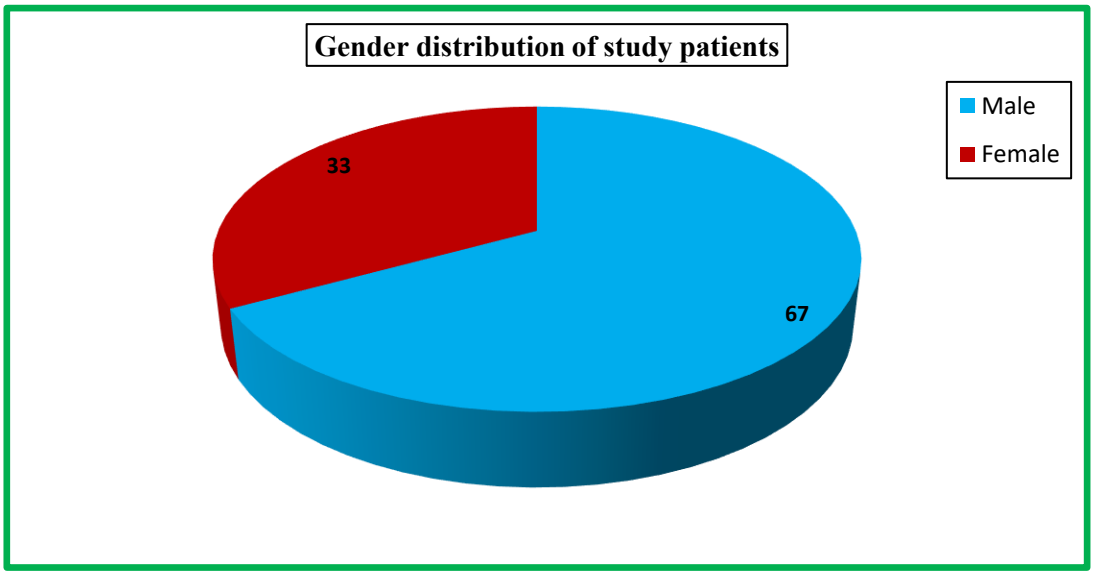


Table 3: Distribution of study patients according to weight		
Weight (kgs)	Frequency	Percentage
< 50	9	9%
50-59	27	27%
60-69	45	45%
70-79	11	11%
≥ 80	8	8%
Total	100	100%
Mean ± SD=63.7±9.58		

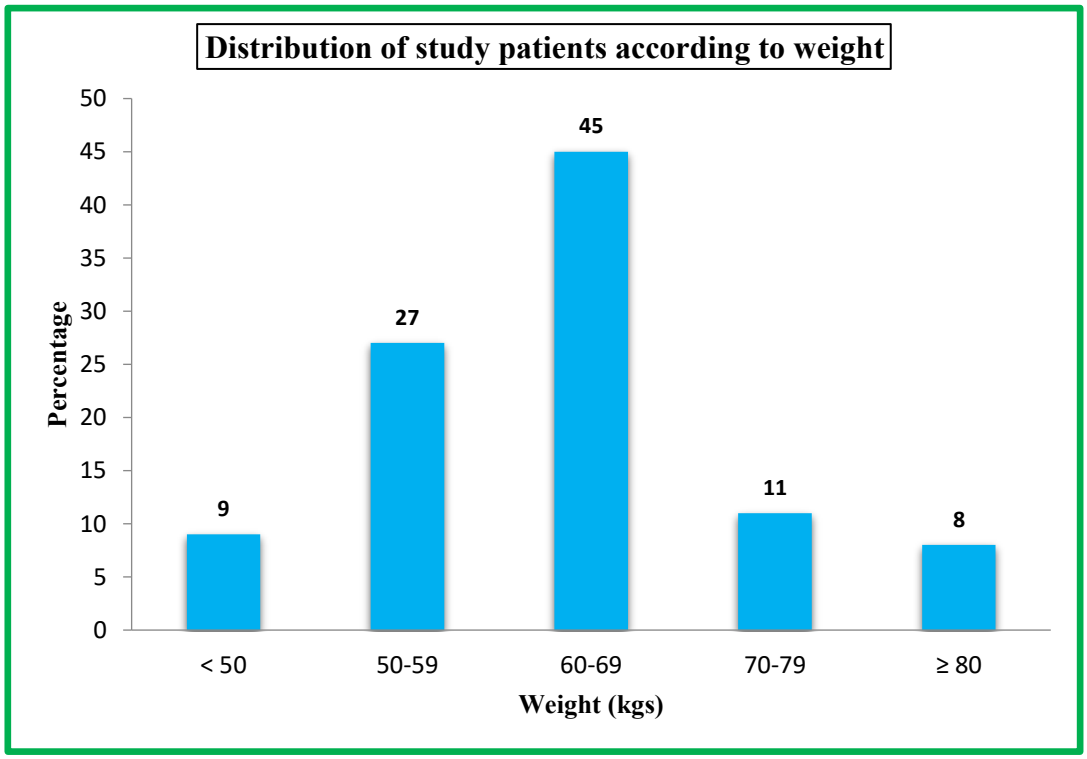


Table 4: Showing smoking status of study patients		
Smoking	Frequency	Percentage
Smoker	42	42%
Non-smoker	58	58%
Total	100	100%

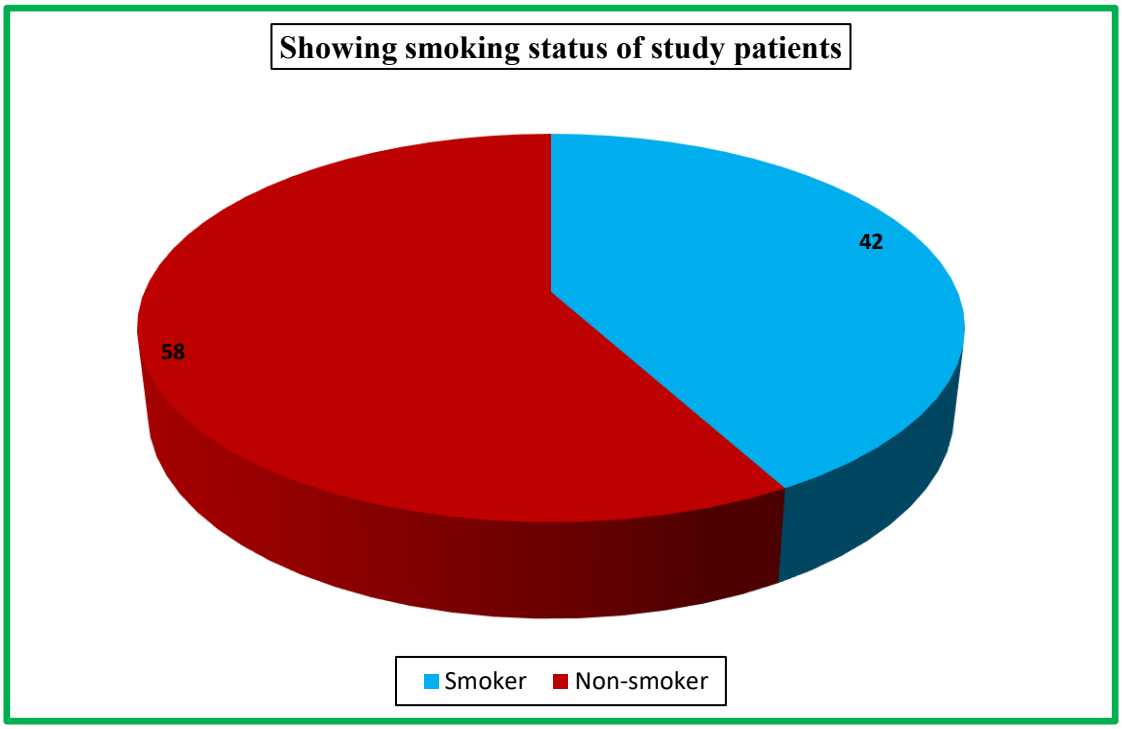


Table 6: Distribution of study patients as per duration of illness		
Duration of illness (years)	Frequency	Percentage
< 1 Year	20	20%
1-2 Years	34	34%
≥ 2Years	46	46%
Total	100	100%

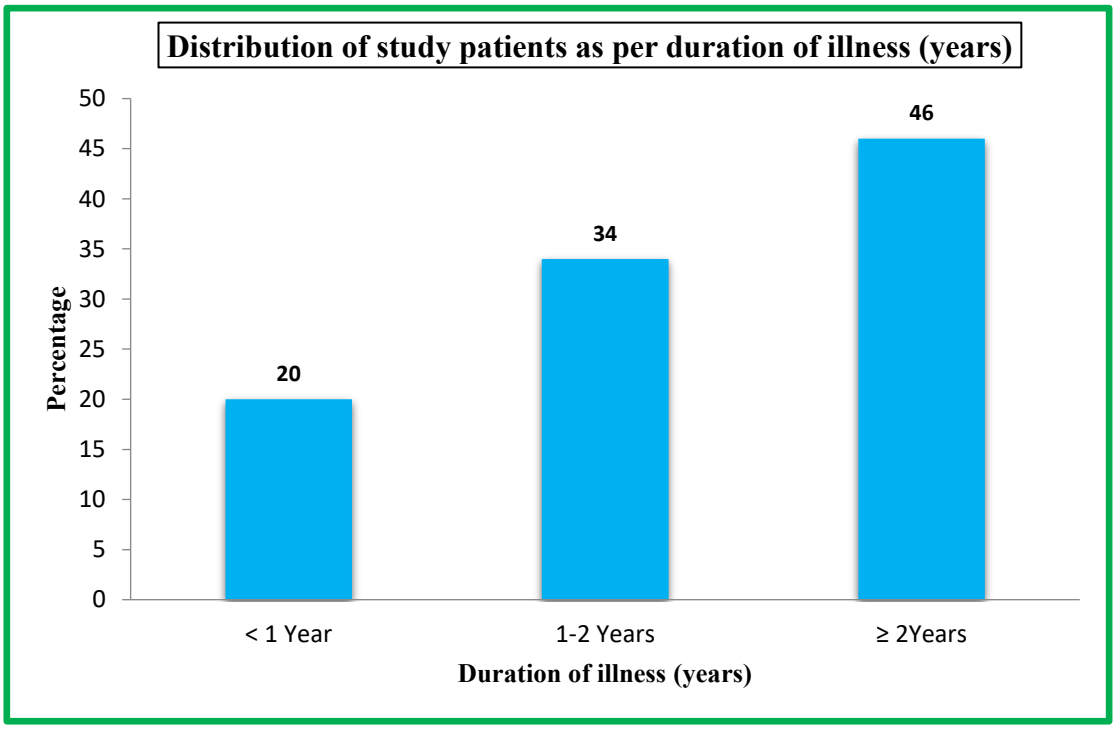


Table 5: Type of anesthesia		
Type of anesthesia	Frequency	Percentage
General Anesthesia	77	77%
Spinal Anesthesia	23	23%
Total	100	100%

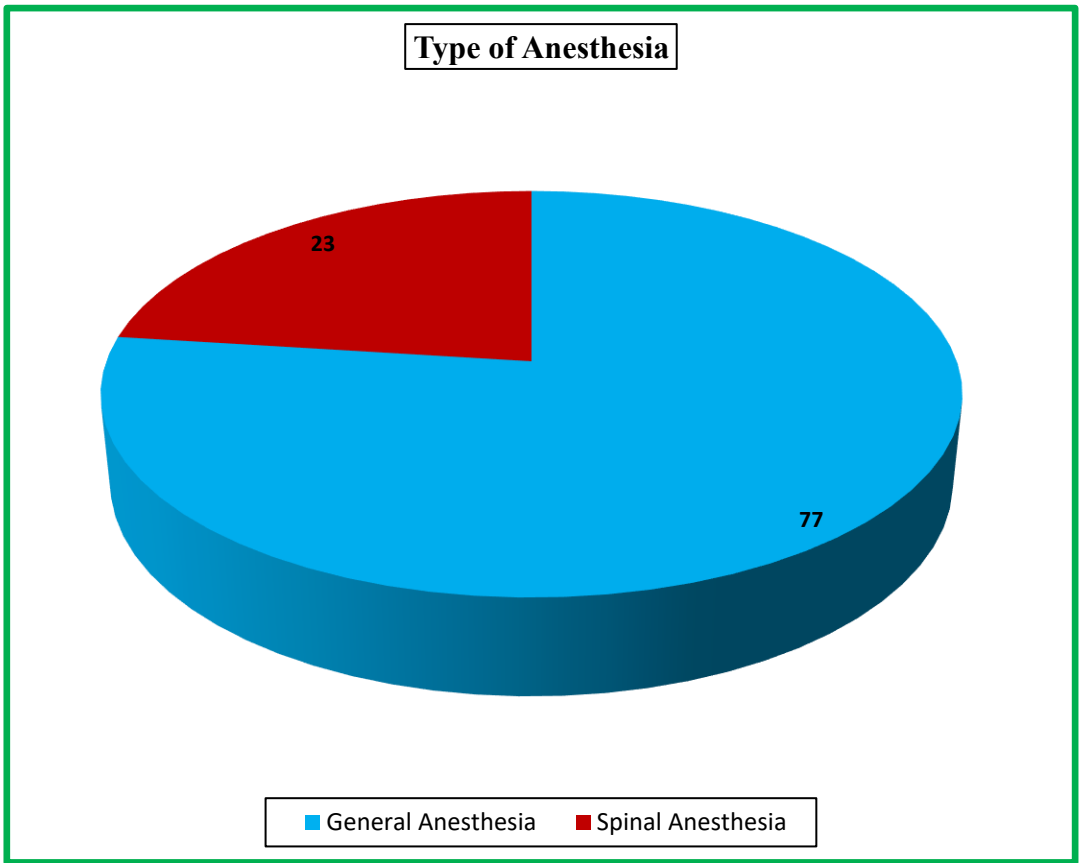


Table 4: Distribution of Study Patients as per Duration of Surgery				
Duration of Surgery	Type of Surgery	No. of Patients	Total	%age
Upto 1 hour	Laparoscopic Cholecystectomy Open Nephrolithotomy Non healing ulcer foot for debridement & graft	21 05 02	28	28%
Upto 2 hours	Open Cholecystectomy PCNL Laproscopic IPOM for Incisional Hernia Laminectomy TURBT TURP Orthoscopic Meniscectomy Arthoscopic ACL repair Total Hip replacement Open reduction & internal fixation (≠ shaft of femur) Squamous cell carcinoma (Excession & Grafting) FESS Tympanoplasty	06 05 07 04 03 04 05 04 03 03 02 05 08	59	59%
Upto 3 hours	Laryngectomy Hemithyroidectomy	02 06	8	8%
Upto 4 hours	Total Thyroidectomy with Neck Dissection Gastrectomy	03 02	05	5%

Total		100		100

Haemodynamic Behaviour during general Anesthesia

Table 5: Intra-operative heart rate (beats/min) of study patients as per duration of surgery at various intervals of time

Time Interval	Upto 1 hour surgeries	Upto 2 hours surgeries	Upto 3 hours surgeries	Upto 4 hours surgeries
Baseline	84.61±9.17	85.45±8.93	86.78±9.47	85.63±10.67
Before Induction	87.23±10.35	84.25±9.63	87.65±10.53	86.87±9.85
After Induction	96.49±8.53	98.28±8.63	99.28±8.63	97.35±8.28
1 Min After Intubation	99.35±9.12	101.74±8.72	102.39±9.87	100.26±8.63
15 Min	87.16±8.32	89.12±7.56	88.05±8.73	87.36±7.68
30 Min	85.38±7.84	86.54±7.89	84.27±8.72	86.55±8.85
45 Min	86.51±8.21	85.38±8.12	85.75±9.52	83.85±7.85
60 Min	92.65±7.63	83.37±7.82	86.62±7.34	84.58±8.31
75 Min		85.19±7.12	81.80±7.34	83.12±7.74
90 Min		86.23±8.35	83.81±8.9	85.76±7.84
105 Min		89.82±7.62	84.56±7.45	85.29±6.76
120 Min		94.24±6.78	83.59±8.35	86.68±7.38
135 Min			90.72±7.56	88.25±6.89
150 Min			93.73±6.85	85.39±7.09
165 Min			95.39±6.87	84.95±6.74
180 Min			95.82±7.31	87.64±6.73
195 Min				90.84±8.73
210 Min				93.92±7.75
225 Min				95.97±6.85
240 Min				98.10±7.63

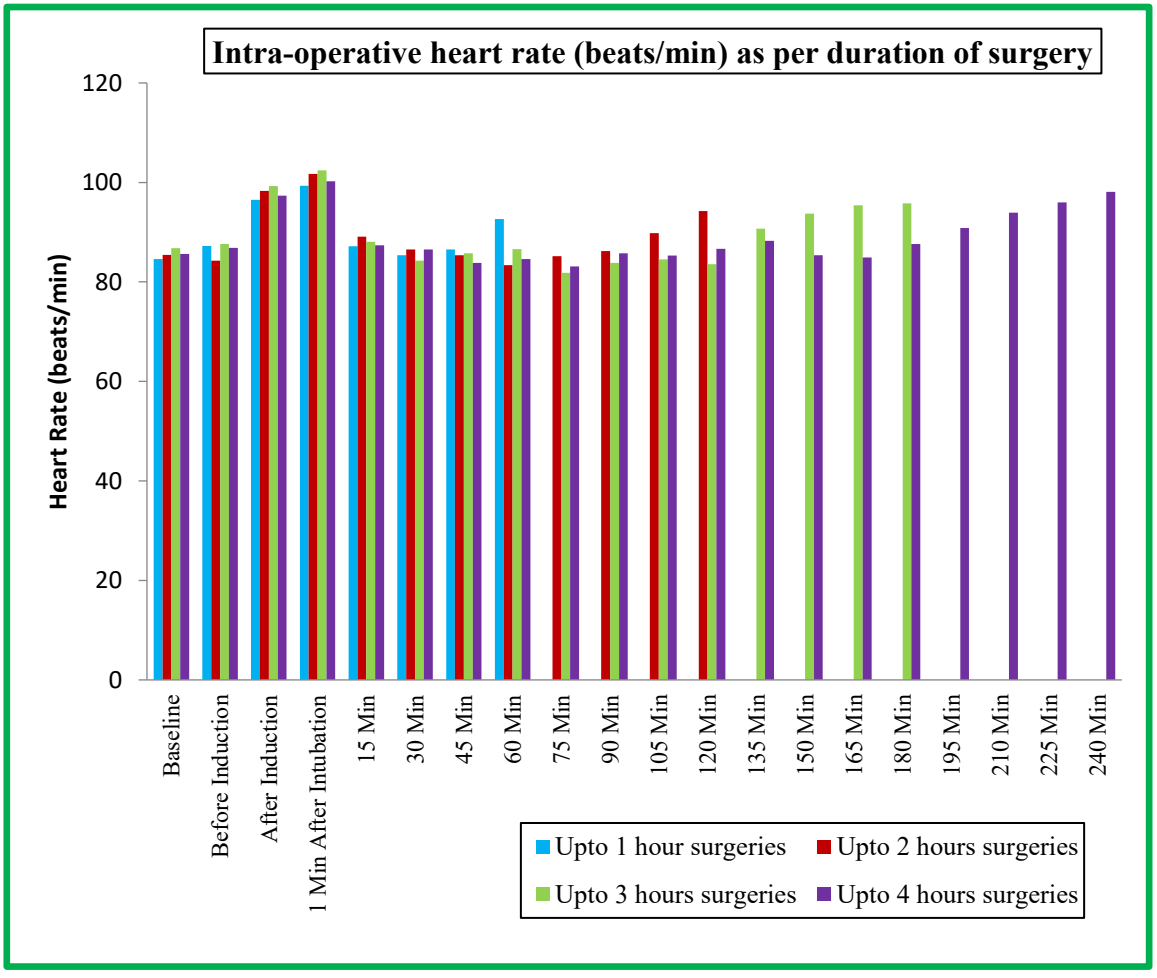


Table 6: Showing heart rate (beats/min) after extubation at various intervals of time				
Time Interval	Upto 1 hour surgeries	Upto 2 hours surgeries	Upto 3 hours surgeries	Upto 4 hours surgeries
After Extubation	97.06±6.98	99.02±7.09	101.91±6.16	101.05±8.61
15 Min After Ext.	85.81±5.83	88.1±7.53	89.98±5.76	87.69±4.34
30 Min After Ext.	83.64±5.38	85.37±8.55	84.04±8.85	85.36±5.34
45 Min After Ext.	86.05±9.2	84.22±7.54	85.73±7.58	87.1±7.6
60 Min After Ext.	84.81±7.22	85.72±6.52	86.99±8.04	85.59±7.78

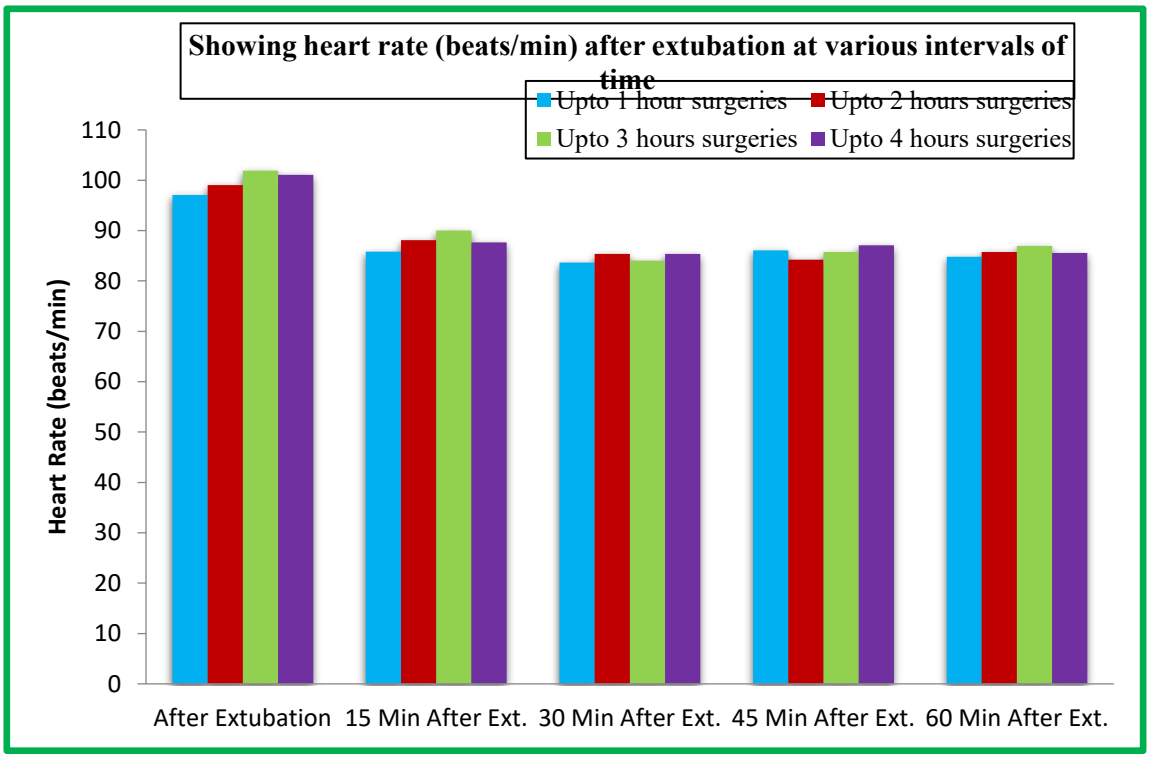


Table 7: Intra-operative SBP (mmHg) of study patients as per duration of surgery at various intervals of time				
Time Interval	Upto 1 hour surgeries	Upto 2 hours surgeries	Upto 3 hours surgeries	Upto 4 hours surgeries
Baseline	127.62±8.44	126.23±8.11	126.98±7.89	125.68±7.97
Before Induction	129.92±7.35	127.91±8.36	128.47±7.69	126.81±8.59
After Induction	106.81±5.96	107.72±6.55	104.7±7.58	108.81±6.6
1 Min After Intubation	137.92±9.25	135.58±6.37	133.71±7.36	130.89±5.7
15 Min	123.53±5.54	125.5±4.7	126.14±5.25	124.82±6.16
30 Min	122.74±6.55	124.67±5.02	127.13±5.92	123.63±6.39
45 Min	124.93±6.7	120.72±8.68	122.72±5.25	116.92±5.17
60 Min	128.97±6.15	122.38±7.14	119.82±6.16	124.7±5.27
75 Min		121.92±7.59	125.73±5.15	120.72±6.27
90 Min		124.69±6.65	123.73±6.75	123.68±7.85
105 Min		126.8±5.7	121.6±6.59	121.58±7.4
120 Min		130.59±6.7	126.14±4.36	117.81±7.38
135 Min			129.75±7.61	121.45±6.37
150 Min			132.81±6.88	123.59±6.75
165 Min			133.32±6.11	123.8±5.66
180 Min			132.68±5.87	124.94±7.61
195 Min				127.71±7.6
210 Min				128.73±6.4
225 Min				129.76±5.17
240 Min				131.6±6.37

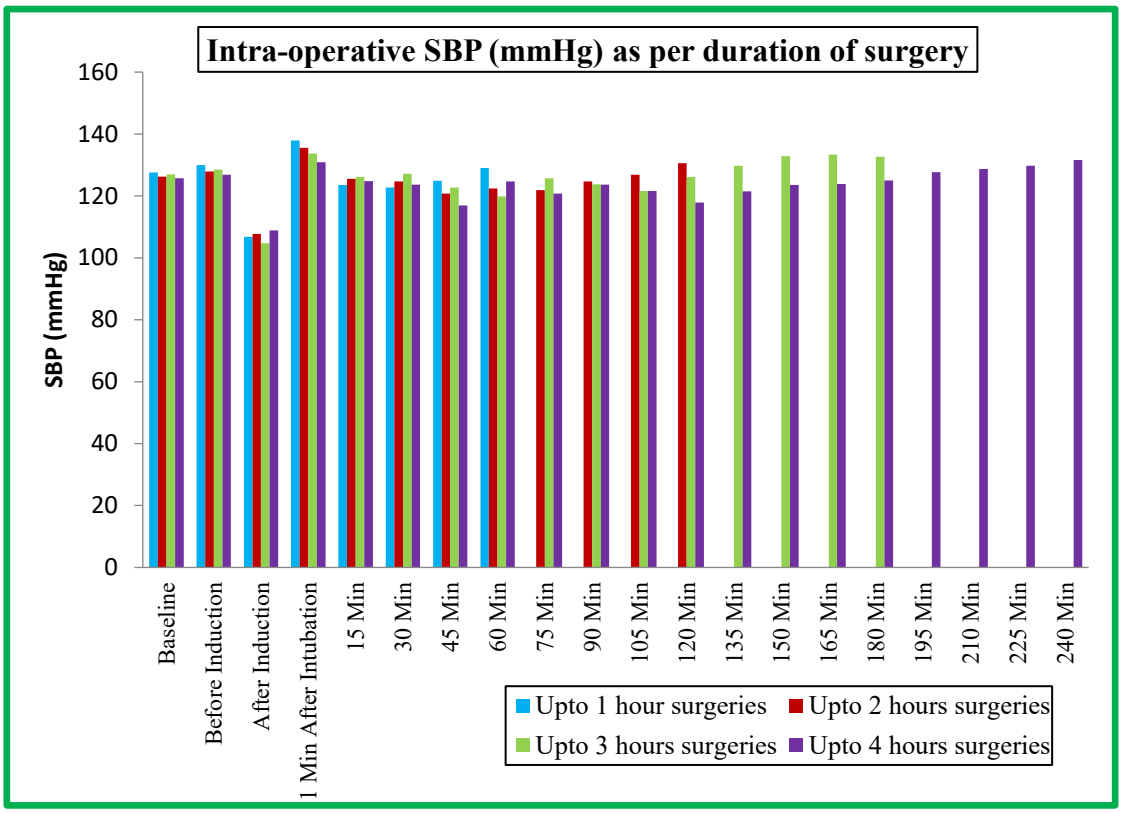


Table 8: Showing SBP (mmHg) after extubation at various intervals of time

Time Interval	Upto 1 hour surgeries	Upto 2 hours surgeries	Upto 3 hours surgeries	Upto 4 hours surgeries
After Extubation	136.38±5.14	137.89±5.91	137.06±6.91	135.11±5.93
15 Min After Ext.	126.01±5.97	127.46±6.99	129.31±5.19	126.91±6.94
30 Min After Ext.	125.07±5.95	127.23±6.91	123.82±4.78	124.49±5.97
45 Min After Ext.	125.9±4.5	126.49±4.9	124.08±5.32	125.26±6.01
60 Min After Ext.	125.02±6.48	124.01±6.53	124.93±6.3	123.98±6.4

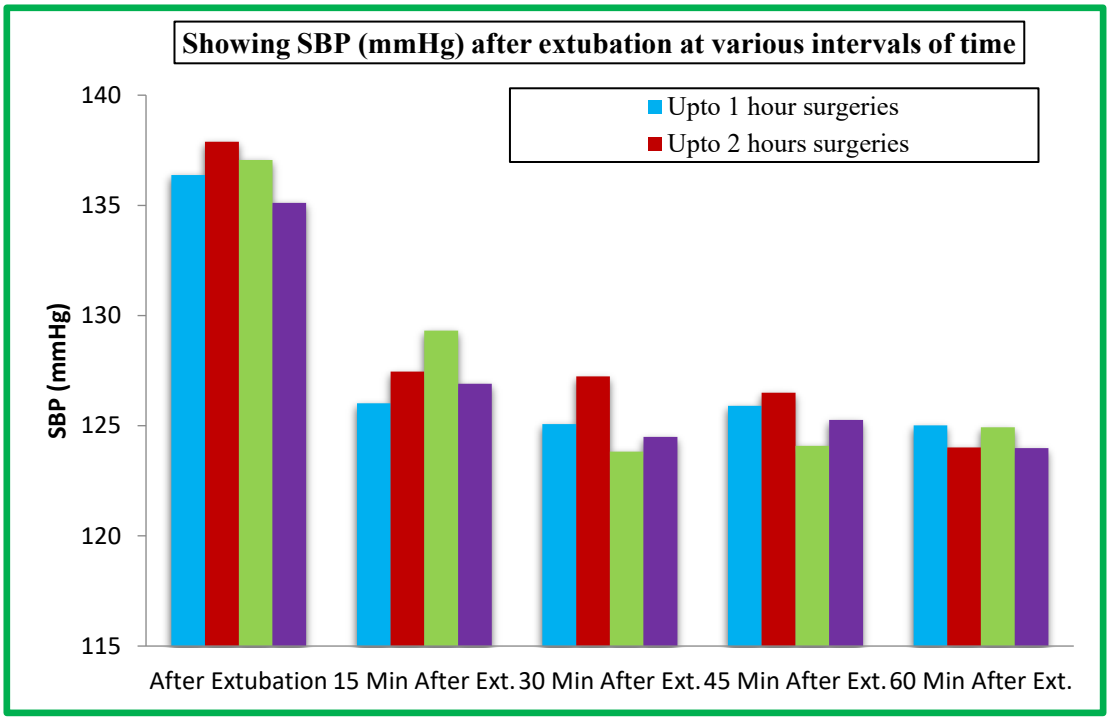


Table 9: Intra-operative DBP (mmHg) of study patients as per duration of surgery at various intervals of time				
Time Interval	Upto 1 hour surgeries	Upto 2 hours surgeries	Upto 3 hours surgeries	Upto 4 hours surgeries
Baseline	79.09±5.89	77.95±6.35	78.95±5.84	78.08±5.89
Before Induction	79.62±6.22	78.81±5.25	79.93±5.17	77.69±6.13
After Induction	67.95±4.37	68.7±5.18	66.93±6.15	67.5±7.64
1 Min After Intubation	87.96±3.01	86.5±6.18	87.7±5.04	84.59±7.6
15 Min	77.68±6.24	74.68±8.83	75.62±5.61	76.36±5.09
30 Min	76.37±5.36	75.52±6.89	76.86±6.49	75.71±6.37
45 Min	77.36±5.3	76.1±7.59	75.91±5.95	71.5±5.21
60 Min	78.81±5.3	75.36±6.09	77.37±5.09	74.57±7.23
75 Min		76.24±6.15	75.59±6.16	74.49±5.15
90 Min		76.62±5.91	74.71±5.9	73.91±6.39
105 Min		74.55±5.16	75.59±5.15	72.25±5.37
120 Min		80.15±5.7	74.7±4.14	71.61±6.49
135 Min			74.24±6.94	72.47±6.38
150 Min			75.41±5.66	73.91±5.66
165 Min			78.58±8.91	74.16±6.59
180 Min			81.48±6.31	74.59±6.72
195 Min				76.71±8.15
210 Min				78.79±7.71
225 Min				79.91±6.31
240 Min				80.6±8.71

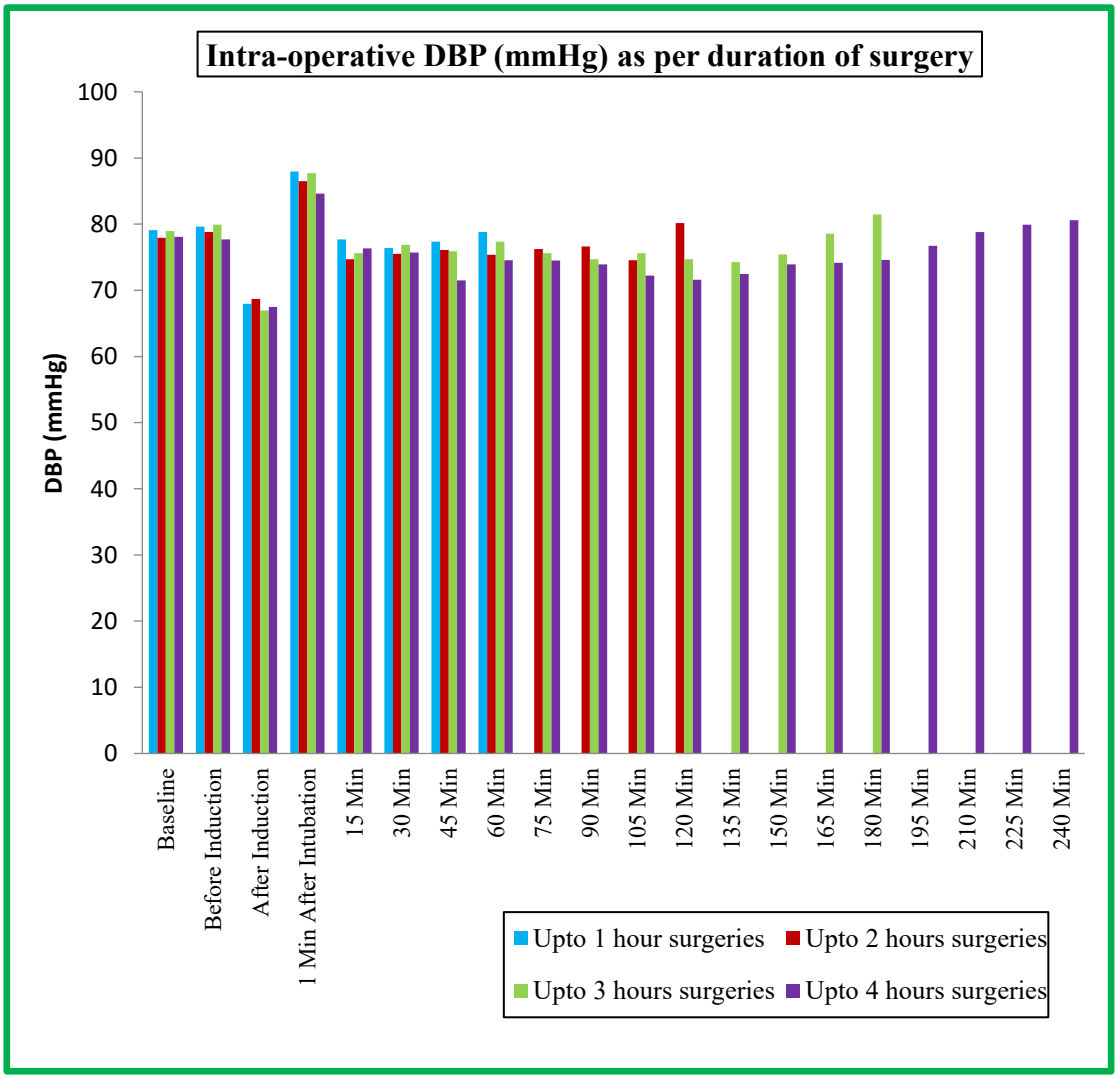


Table 10: Showing DBP (mmHg) after extubation at various intervals of time				
Time Interval	Upto 1 hour surgeries	Upto 2 hours surgeries	Upto 3 hours surgeries	Upto 4 hours surgeries
After Extubation	86.7±4.28	88.32±5.85	88.04±5.01	87.54±6.89
15 Min After Ext.	81.38±5.58	83±4.84	82.2±4.41	83.1±5.16
30 Min After Ext.	81.33±4.85	81.95±6.29	80.14±5.83	81.37±6.53
45 Min After Ext.	80.04±5.88	81.09±5.08	80.26±4.9	81.03±5.89
60 Min After Ext.	78.39±5.74	80.32±6.15	79.23±5.6	80.47±5.54

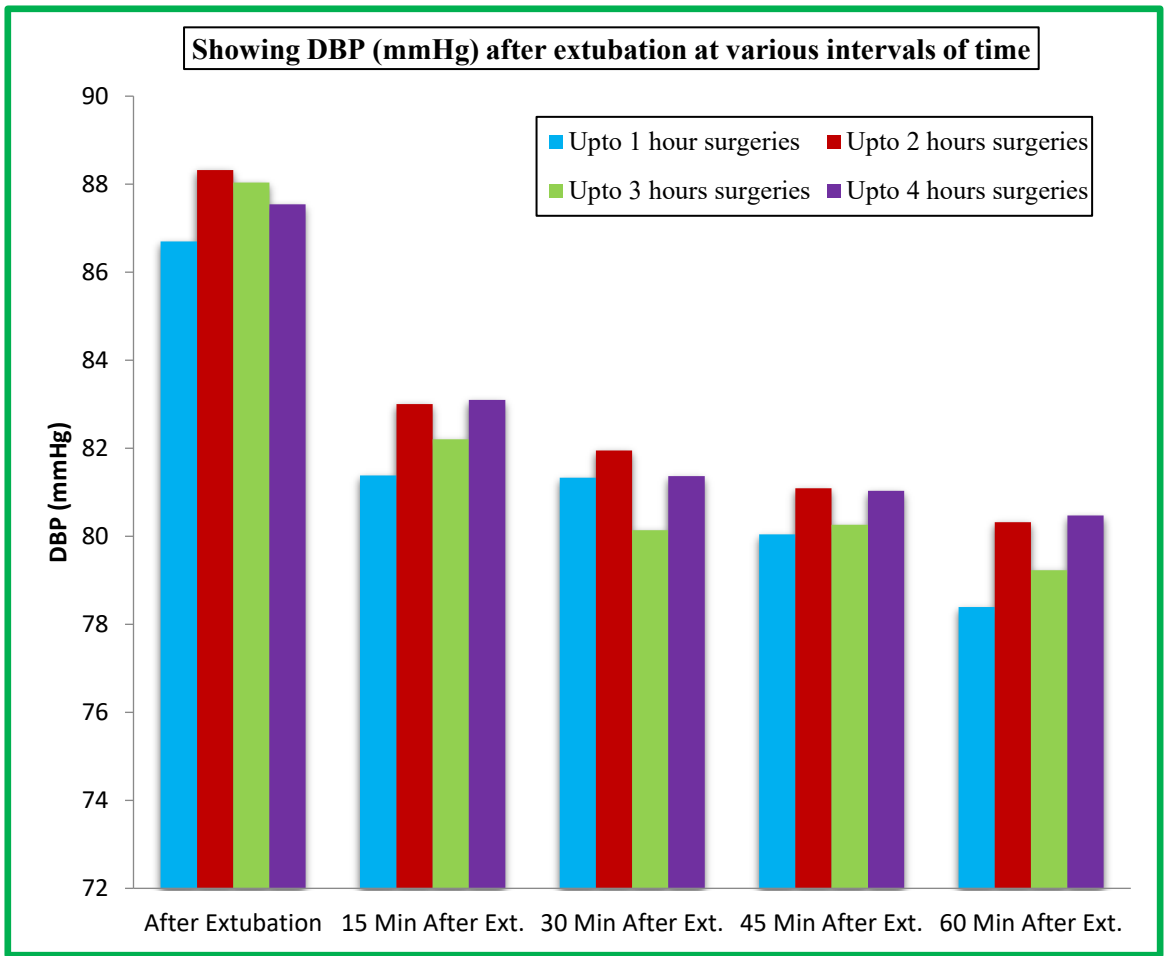


Table 11: Intra-operative MAP (mmHg) of study patients as per duration of surgery at various intervals of time				
Time Interval	Upto 1 hour surgeries	Upto 2 hours surgeries	Upto 3 hours surgeries	Upto 4 hours surgeries
Baseline	95.27±6.11	94.04±6.74	94.96±5.71	93.95±7.49
Before Induction	96.38±7.86	95.18±5.78	96.11±6.64	94.07±5.68
After Induction	80.91±6.76	81.7±6.56	79.52±6.92	81.27±6.45
1 Min After Intubation	104.61±7.92	102.86±6.84	103.04±5.15	100.02±7.47
15 Min	93.03±6.9	91.62±7.59	92.46±6.85	92.51±5.19
30 Min	91.83±7.56	91.9±6.91	93.62±7.69	91.68±6.73
45 Min	93.23±7.22	90.97±6.22	91.51±5.56	86.64±6.5
60 Min	95.54±6.12	91.03±7.12	91.52±6.74	91.28±5.69
75 Min		91.47±7.36	92.3±6.2	89.9±6.46
90 Min		92.64±5.92	91.05±5.89	90.5±6.37
105 Min		91.97±5.69	90.93±7.48	88.7±5.53
120 Min		96.96±6.59	91.85±6.49	87.01±6.15
135 Min			92.74±6.28	88.8±5.61
150 Min			94.54±5.61	90.47±5.09
165 Min			96.83±6.13	90.71±6.49

180 Min			98.55±4.91	91.37±6.16
195 Min				93.71±5.21
210 Min				95.44±5.37
225 Min				96.52±6.16
240 Min				97.6±5.24

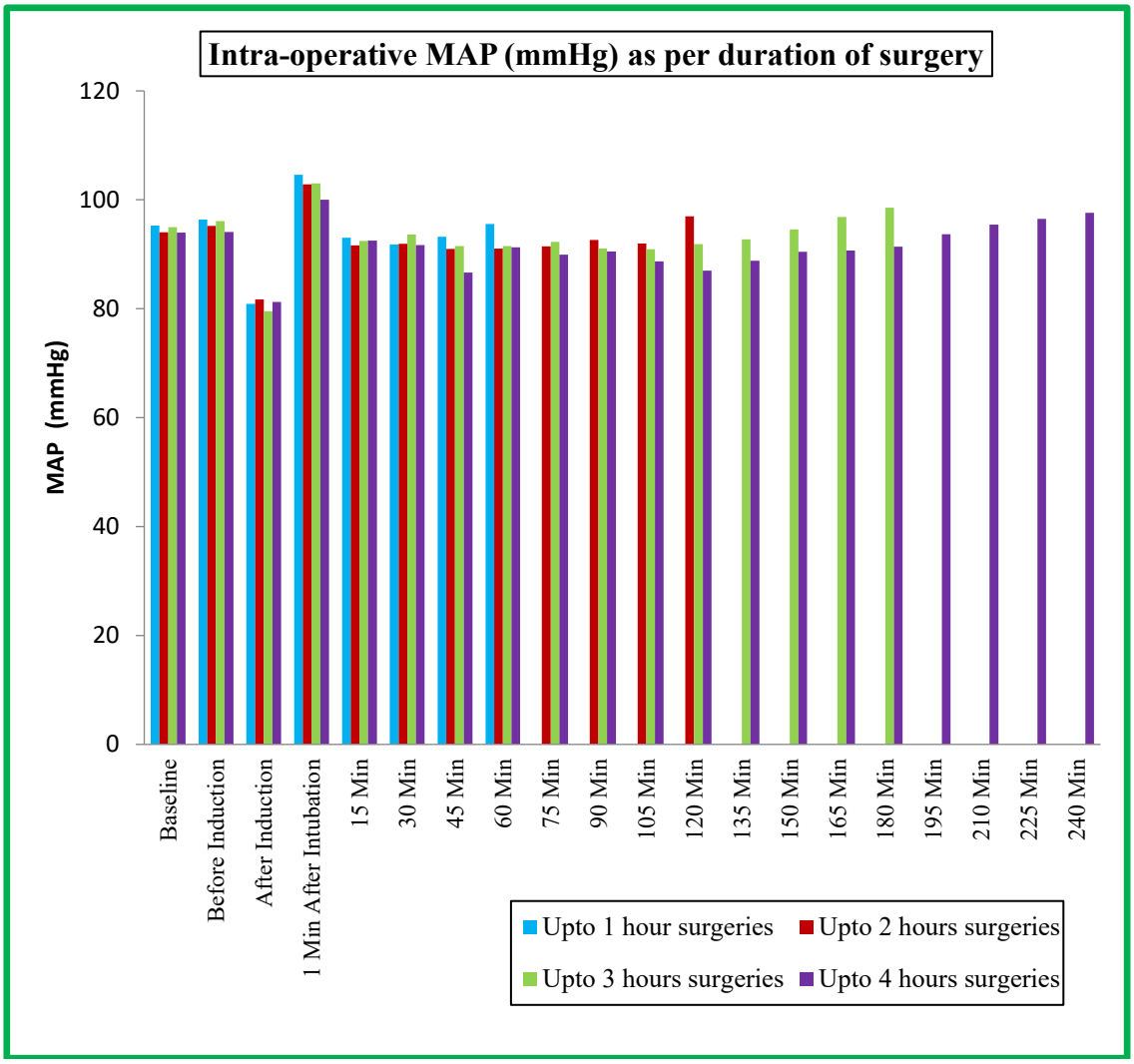


Table 12: Showing MAP (mmHg) after extubation at various intervals of time

Time Interval	Upto 1 hour surgeries	Upto 2 hours surgeries	Upto 3 hours surgeries	Upto 4 hours surgeries
After Extubation	103.26±5.28	104.84±4.25	104.38±5.72	103.4±4.74
15 Min After Ext.	96.26±6.54	97.82±5.24	97.9±4.85	97.7±5.99
30 Min After Ext.	95.91±4.87	97.04±4.76	94.7±5.59	95.74±4.53
45 Min After Ext.	95.33±5.93	96.22±6.54	94.87±5.46	95.77±7.14
60 Min After Ext.	93.93±7.6	94.88±5.46	94.46±6.44	94.97±5.38

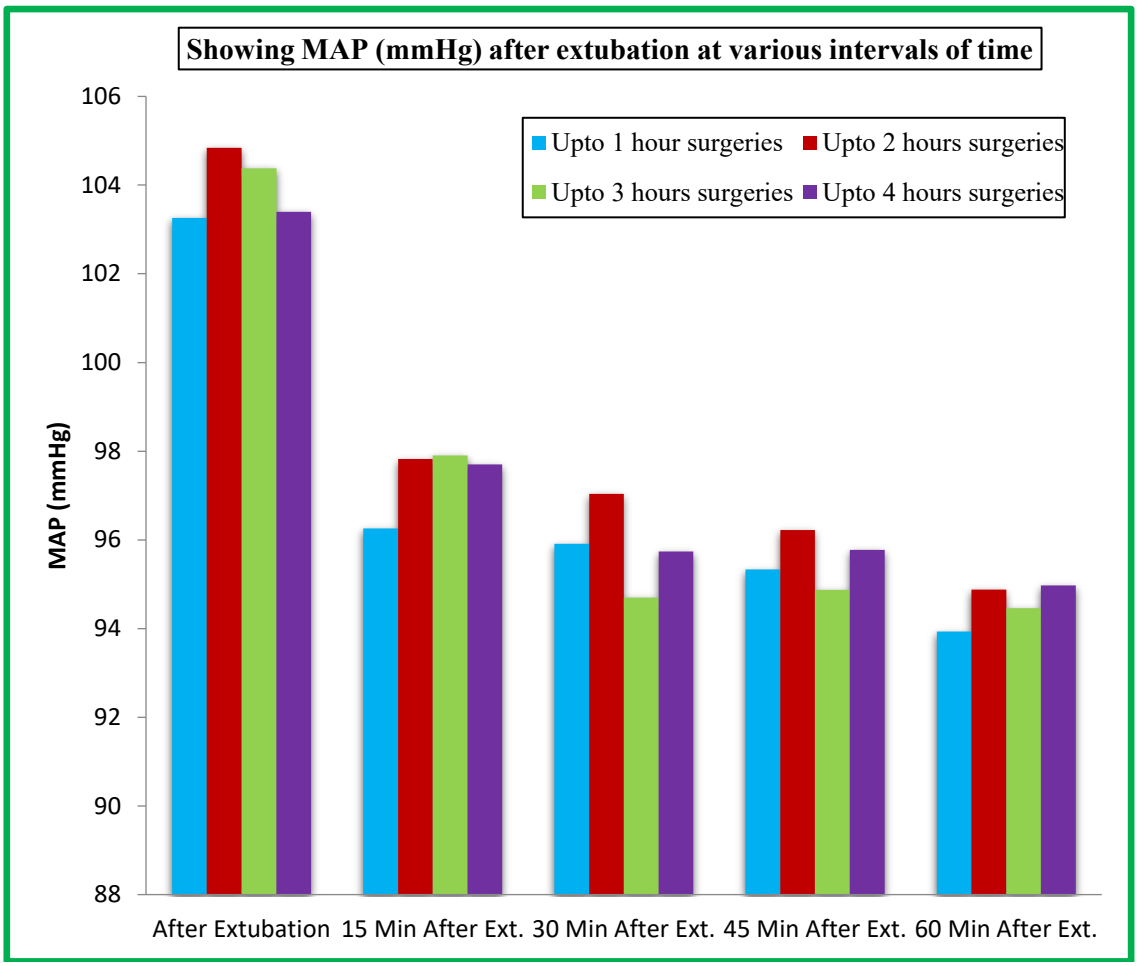


Table 13: Intra-operative oxygen saturation (%) of study patients as per duration of surgery at various intervals of time

Time Interval	Upto 1 hour surgeries	Upto 2 hours surgeries	Upto 3 hours surgeries	Upto 4 hours surgeries
Baseline	98.6±1.05	97.69±0.91	98.08±1.05	97.71±1.61
Before Induction	97.03±1.61	97.79±1.41	97.59±1.62	97.92±1.07
After Induction	98.08±0.96	98.07±0.96	97.69±0.94	98.59±0.95
1 Min After Intubation	97.12±1.05	97.59±1.04	98.68±0.99	98.5±0.99
15 Min	98.08±1.07	98.69±1.08	97.9±1.05	98.1±1.06
30 Min	98.09±0.96	97.7±0.95	98.58±1.05	97.71±0.92
45 Min	98.93±1.09	98.58±1.07	98.17±0.95	98.05±0.95
60 Min	98.09±1.05	98.58±1.06	97.7±0.92	97.71±1.61
75 Min		98.37±0.95	97.9±1.05	96.83±1.91
90 Min		98.06±1.06	98.1±0.96	97.72±0.95
105 Min		97.71±1.11	98.18±0.62	97.59±1.08
120 Min		98.7±0.94	99.03±0.62	97.7±1.62
135 Min			97.9±1.06	98.79±1.06
150 Min			98.09±0.95	98.11±0.96
165 Min			97.09±1.04	97.68±0.98
180 Min			98.7±0.61	98.48±1.11
195 Min				98.48±0.62
210 Min				98.11±0.96
225 Min				98.8±0.64
240 Min				96.19±0.65

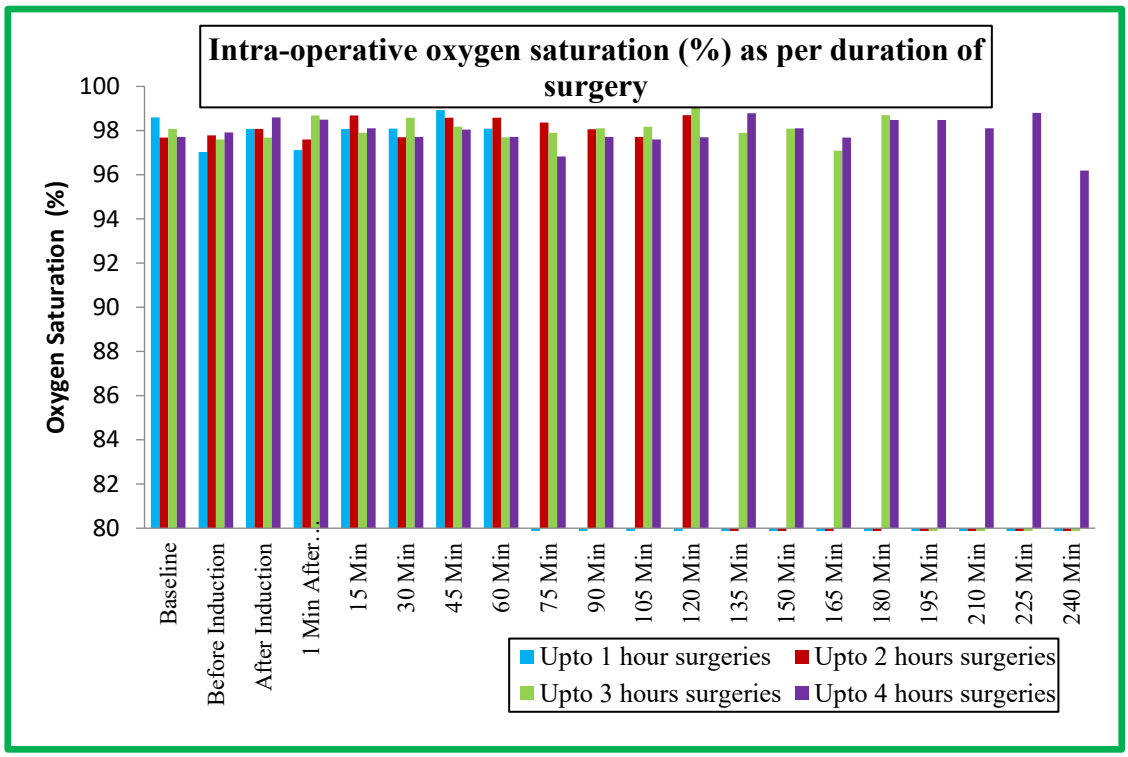
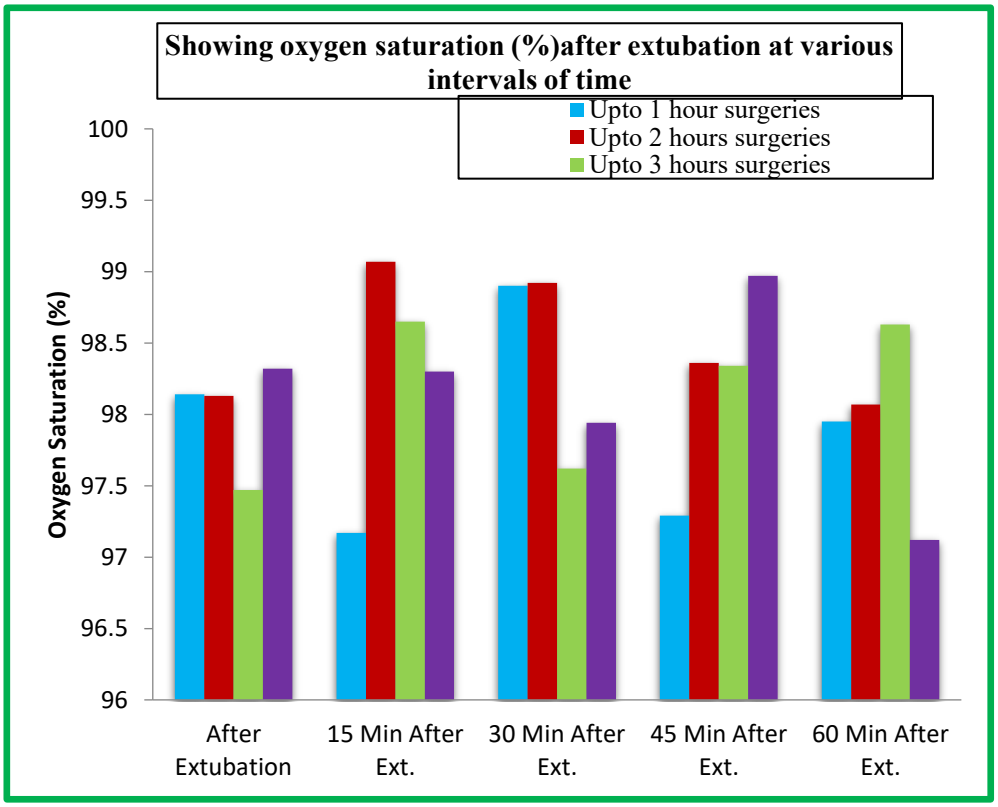


Table 14: Showing oxygen saturation (%) after extubation at various intervals of time				
Time Interval	Upto 1 hour surgeries	Upto 2 hours surgeries	Upto 3 hours surgeries	Upto 4 hours surgeries
After Extubation	98.14±1.38	98.13±0.9	97.47±1.28	98.32±1.23
15 Min After Ext.	97.17±0.7	99.07±0.8	98.65±0.81	98.3±0.62
30 Min After Ext.	98.9±0.74	98.92±0.76	97.62±0.75	97.94±0.9
45 Min After Ext.	97.29±0.86	98.36±0.86	98.34±0.87	98.97±0.89
60 Min After Ext.	97.95±0.75	98.07±0.78	98.63±0.74	97.12±0.78



Haemodynamic Behaviour during spinal Anesthesia

Table 15: Peri-operative complications as per duration of surgery								
Complications	Upto 1 hour surgeries		Upto 2 hour surgeries		Upto 3 hours surgeries		Upto 4 hours surgeries	
	No.	%age	No.	% age	No.	% age	No.	% age
Acute Exacerbation of COPD	0	0.0%	1	1.0%	1	1.0%	02	2.0%
Bronchospasm	0	0.0	0	0	1	1.0%	01	1.0%
Pneumonia	0	0.0	0	0.0	0	0.0	1	1.0%
Hypoxia	0	0.0	0	0.0%	0	0.0%	0	0.0%
Need for post operative Mechanical ventilation	0	0.0	0	0.0	0	0.0%	01	1.0%
Atelectasis	0	0.0	0	0.0	0	0.0%	0	0.0%
Ventricular arrhythmia	0	0.0	0	0.0%	0	0.0	0	0.0%
CHF	0	0.0	0	0.0	0	0.0	01	1.0%

Table showing postoperative complications as per duration of surgery.

The present study was prospective observational study conducted in the Postgraduate Department of Anaesthesiology and Critical Care, Government Medical College, Srinagar and Associated Hospitals, over a period of 18 months on optimized COPD patients under anaesthesia.

Aims of the study were to observe perioperative hemodynamic behaviour of COPD patients under anaesthesia, to observe incidence of perioperative complications in COPD patients, and length of hospital stay. A total of 100 patients with optimised COPD were observed and among them the number of patients that were operated under general anaesthesia and spinal anaesthesia were 77 and 23 respectively. Among these patients, 46 had ≥ 2 year history of COPD, 34 had ≥ 1 but < 2 year history of illness, 20 had less than one year history of COPD. Among 100 patients, 42 had history of smoking in which 39 were male smokers and rest were the female smokers. The history of recent hospitalization and exacerbation was noted down in 38 patients. Preoperative steroid and antibiotic usage was noted down in 68 and 24 patients respectively. 32 patients were in need of preoperative nebulisation. 23 had previous anaesthetic exposure. Grade of dyspnea was noted down, most of the patients had mMRC dyspnea scale score of 0.

Among all the patients 18% were in the age group of 40-49, 27%were in the age group of 50-59, 43% belonged to age group of 60-69 and 12% belonged to ≥ 70. The patients were classified according to the duration of surgery and hemodynamics were monitored under general anaesthesia.

Among 77% patients under general anesthesia,26% belonged to surgeries upto one hour of duration, 38% patients belonged to surgeries upto two hours of duration,08% patients belonged to surgeries upto three hours of duration and 05% patients belonged to surgeries upto four hours of duration. Hemodynamic parameters like heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure and oxygen saturation was observed in all patients before induction, after induction, after intubation, during maintenance of anaesthesia till I hour after extubation.

In our study, in patients with surgeries of one hour duration, the mean Heart Rate before induction was 87.61±9.17, after induction there was increase in mean heart rate to 96.49±8.53 and one minute after intubation it was further increased to 99.35±9.12 due to normal laryngoscopy and tracheal intubation response that did not show any statistically significant deviation from the mean heart rate before induction. The mean heart rate during intraoperative period at 15 minutes interval didn't show any statistically significant changes from the mean heart before induction of general anesthesia. After extubation, mean heart rate was increased to 97.06±6.98 due to extubation response and at 15 minutes after extubation mean heart rate was 85.81±5.83 that shows no statistically significant deviation from the mean heart rate before induction. The mean MAP before induction was 96.38±7.86, after induction there was decrease in MAP to 80.91±6.76 because of effect of anaesthetic inducing agent and one minute after intubation it was increased to 104.61±7.92 due to normal laryngoscopy and tracheal intubation response that shows statistically insignificant deviation from the mean MAP before induction. The Mean MAP during intraoperative period at 15 minutes interval didn't show any statistically significant changes from the mean MAP before induction. After extubation, mean MAP was increased to 103.26±5.28 due to extubation response and at 15 minutes after extubation mean MAP was 96.26±6.54 that shows statistically insignificant variation from the mean MAP before induction. The mean oxygen saturation before induction was 97.03±1.61 and after induction, after intubation, during intraoperative period at 15 minute interval and after extubation didn't show any statistically significant deviation from the mean oxygen saturation before induction.

In patients with surgeries of two hours duration, the mean Heart Rate before induction was 84.25±9.63, after induction there was increase in mean heart rate to 98.28±8.63 and one minute after intubation it was further increased to 101.74±8.72 due to normal laryngoscopy and tracheal intubation response that did not show any statistically significant deviation from the mean heart before induction. The mean heart rate during intraoperative period at 15 minutes interval didn't show any statistically significant deviation from the mean heart rate before induction of general anesthesia. After extubation, mean heart rate was increased to 99.02±7.09 due to extubation response and at 15 minutes after extubation mean heart rate was 88.10±7.53 that shows no statistically significant deviation from the mean heart rate before induction. The mean MAP before induction was 95.18±5.78, after induction there was decrease in MAP to 81.70±6.56 because of effect of anaesthetic inducing agent and one minute after intubation it was increased to 102.86±6.84 due to normal laryngoscopy and tracheal intubation response that show statistically insignificant deviation from the mean MAP before induction. The Mean MAP during intraoperative period at 15 minutes interval didn't show any statistically significant changes from the mean MAP before induction. After extubation, mean MAP was increased to 104.84±4.25 due to extubation response and at 15 minutes after extubation the mean MAP was 97.82±5.24 that shows statistically insignificant variation from the mean MAP before induction. The mean oxygen saturation before induction was 97.79±1.41 and after induction, after intubation during intraoperative period at 15 minute interval and after extubation didn't show any statistically significant deviation from the mean oxygen saturation before induction.

In patients with surgeries of three hours duration, the mean Heart Rate before induction was 87.65±10.53, after induction there was increase in mean heart rate to 99.28±8.63 and one minute after intubation it was further increased to 102.39±9.87 due to normal laryngoscopy and tracheal intubation response that did not showany statistically significant deviation from the mean heart before induction. The mean heart rate during intraoperative period at 15 minutes interval didn't show any statistically significant changes from the mean heart rate before induction of general anesthesia. After extubation, mean heart rate was increased to 101.91±6.16 due to extubation response and at 15 minutes after extubation mean heart rate was 89.98±5.76 that shows no statistically significant deviation from the mean heart rate before induction. The mean MAP before induction was 96.11±6.64, after induction there was decrease in MAP to 79.52±6.92 because of effect of anaesthetic inducing agent and one minute after intubation it was increased to 103.04±5.15 due to normal laryngoscopy and tracheal intubation response that shows statistically insignificant deviation from the mean MAP before induction. The Mean MAP during intraoperative period at 15 minutes interval didn't show any statistically significant changes from the mean MAP before induction. After extubation, mean MAP was increased to 104.38±5.72 due to extubation response and at 15 minutes after extubation mean MAP was 97.90±4.85 that shows statistically insignificant variation from the mean MAP before induction. The mean oxygen saturation before induction was 97.59±1.62 and after induction, after intubation, during intraoperative period at 15 minute interval and after extubation didn't show any statistically significant deviation from the mean oxygen saturation before induction.

In patients with surgeries of four hour duration, the mean heart rate before induction was 86.87±9.85, after induction there was increase in mean heart rate to 97.35±8.28 and one minute after intubation it was further increased to 100.26±8.63 due to normal laryngoscopy and tracheal intubation response that did not show any statistically significant deviation from the mean heart before induction. The mean heart rate during intraoperative period at 15 minutes interval didn't show any statistically significant changes from the mean heart before induction of general anesthesia. After extubation, mean heart rate was increased to 101.05±8.61 due to extubation response and at 15 minutes after extubation mean heart rate was 87.69±4.34 that shows no statistically significant deviation from the mean heart rate before induction. The mean MAP before induction was 94.07±5.68, after induction there was decrease in MAP to 81.27±6.45 because of effect of anaesthetic inducing agent and one minute after intubation it was increased to 100.02±7.47 due to normal laryngoscopy and tracheal intubation response that shows statistically insignificant deviation from the mean MAP before induction. The Mean MAP during intraoperative period at 15 minutes interval didn't show any statistically significant changes from the mean MAP before induction. After extubation, mean MAP was increased to 103.40±4.74 due to extubation response and at 15 minutes after extubation mean MAP was 97.70±5.99 that shows statistically insignificant variation from the mean MAP before induction. The mean oxygen saturation before induction was 97.92±1.07 and after induction, after intubation, during intraoperative period at 15 minute interval and after extubation didn't show any statistically significant deviation from the mean oxygen saturation before induction. In the postoperative period, the mean heart rate, mean MAP, diastolic B.P, systolic B.P and mean oxygen saturation till 1 hour after extubation shows no statistically significant variation.

In our study Incidence of perioperative complications was 9%. 0% in surgeries of one hour duration, 1% in surgeries of two hour duration, 2% in 3 hour duration and 6% in 4 hour duration. Among these complications 8% were respiratory complications and 1% was cardiac complication. Our study included only optimized mild COPD patients belonging to ASA class

From systematic review and meta-analysis, it has been found that the global prevalence of chronic obstructive pulmonary disease (COPD) has increased over the last few decades due to increasing sedentary life styles, smoking, and prolonged life expectancy.52 The global prevalence of physiologically defined COPD in adults aged >40 years is approximately 9–10%. Recently, the Indian study on the epidemiology of asthma, respiratory symptoms and chronic bronchitis in adults has shown that the overall prevalence of chronic bronchitis in adults >35 years is 3.49%.7

COPD is a common comorbidity found in the perioperative setting, and may be even the reason for surgical interventions itself (e.g. volume reduction surgery or lung transplant), thus an anesthesiologist may face this on a daily basis. Pulmonary complications after surgery are leading cause of postoperative morbidity and mortality. Advances in anaesthesia and surgical technique have made operative intervention possible in patients with serious underlying cardiopulmonary disease, who previously would have been denied surgery. Postoperative pulmonary complications contribute significantly to overall perioperative morbidity and mortality.53 COPD is a well-known independent risk factor for development of postoperative complications after thoracic or non-thoracic surgery.54,55,56

The present study was prospective observational study conducted in the Postgraduate Department of Anaesthesiology and Critical Care, Government Medical College, Srinagar and Associated Hospitals, over a period of 18 months on optimized COPD patients under anaesthesia.

A total of 100 patients with optimised COPD were observed and among them the number of patients that were operated under general anaesthesia and spinal anaesthesia were 77 and 23 respectively. Among these patients, 46 had ≥ 2 year history of COPD , 34 had ≥ 1 but less than 2 year history of illness, 20 had less than 1 year history of disease of interest,

Haemodynamic parameters like heart rate ,systolic blood pressure, diastolic blood pressure, mean arterial pressure, oxygen saturation were observed in all patients under general anaesthesia preoperatively (baseline), before induction, after induction, immediately after intubation, during maintenance of anaesthesia and after extubation at different intervals of time till one hour. During spinal anaesthesia, it was observed before subarachnoid block and every 15 minutes during the procedure till the end of surgery. In our study, we observed hemodynamic stability during anaesthesia and no statistically significant deviation of hemodynamic behaviour from baseline hemodynamics during intraoperative and postoperative periods.

CONCLUSION

- This study concluded that peri-operative hemodynamic behavior in optimized COPD patients belonging to ASA class II was stable.
- Patients who underwent general anaestheisa had significantly more complications than the patients who underwent spinal anesthesia. Regional anesthesia is preferable in patients with COPD due to less complication rates observed.
- Respiratory complications were more than the cardiovascular complications in COPD patients belonging to ASA class II.
- Preoperative optimization of COPD patients with cessation of smoking, incentive spirometry and treatment with steroids leads to decrease in perioperative complication in COPD patients.
- Length of hospital stay is not prolonged when COPD patients are optimized before surgery.

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