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RESEARCH ARTICLE
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''TO STUDY THE ANTIEMETIC PROPERTIES OF PROPOFOL IN ABDOMINAL SURGERIES''

Dr. Rashmi Gupta[1]*, Dr. Sneha Gupta[2], Dr Pramod Pandey[3], Dr. Nishitha Divakar[4]

[1]*Senior Resident, Department Of Anaesthesiology, Sms Medical College, Jaipur
[2]Md, Dnb Anaesthesiology, Ex. Senior Resident Gmc Shahdol Mp
[3]Department Of Anaesthesiology King George's Medical University, Lucknow, Uttar Pradesh, India 226003
[4]Md Anaesthesiology, Senior Resident Nscb Medical College Jabalpur Mp

***Corresponding Author: Dr. Nishitha Divakar**
*Md Anaesthesiology, Senior Resident Nscb Medical College Jabalpur Mp

Abstract

Background: Postoperative Nausea and Vomiting (PONV) is a dreadful and uncomfortable experience that significantly detracts patient's quality of life after surgery. Symptoms affecting patients undergoing abdominal surgery under general anaesthesia. It is also associated with complications such as gastric aspiration, bleeding, dehydration, wound dehiscence and delayed hospital discharge. Use of volatile anesthetic agents, prolonged duration of surgery, pain/anxiety, women, nonsmokers, obesity, use of opioids are certain factors which are proven to increase the incidence of PONV. The present study compared the antiemetic effect of ondansetron versus propofol for prevention of postoperative nausea and vomiting in patients undergoing open abdominal surgery under general anaesthesia.

Objectives: *''To study the antiemetic properties of propofol in abdominal surgeries''*

Methods: This study was conducted in the Department of Anaesthesiology & Critical Care, Dr. S. N. Medical College, and Jodhpur after obtaining institutional ethical committee approval and written informed consent from study subjects. Patients meeting the inclusion criteria were included in the study between august 2021 to January 2022. This was a prospective Double Blind Randomized Comparative Trial. The patients were divided into two groups of 35 each and were allocated to the groups by computer generated random number table method as follows:

1. Group P: Patients receiving Propofol
2. Group O: Patients receiving Ondansetron

In the post-operative period, incidence of nausea and vomiting was diagnosed by the use of PONV score and VNRS scale and sedation by Ramsay sedation score for postop till stay in PACU, along with Aldrete score for discharging patients from PACU. Time for extubation and time for need of first rescue antiemetic after extubation was noted. The incidence of PONV and mean total frequency of rescue antiemetic used in 24 hour postoperatively among the two groups was compared.

Results & Discussion -

Results were analysed statistically and were discussed as under. Demographics and Haemodynamic changes were minimal between both groups and statistically not significant. At time 0hr, 2hr, 4hr, 6hr, 12hr and 24 hr postoperatively we compared nausea and vomiting score in patients of P and O group. It is statistically not significant (P>0.05) in terms of requirement of mean dose of rescue antiemetic 24 hrs postop. Incidence of PONV is statistically significant at 5-6hr for group P and at 6-7 hour for group O postoperatively**.** So sub hypnotic dose of propofol 30 mg is comparable to ondansetron for reducing the incidence of nausea and vomiting in abdominal surgeries for first 6 hours, when they administered as a bolus 15-20 minutes before skin closure in adults undergoing abdominal surgeries under sevoflurane anaesthesia. Time for extubation in group O was 14.31±1.15 mints and in group P was 14.6±2.00 minutes. Time to stay in PACU after recovery room discharge was 83.91±9.22 minutes in group O and 81.45±7.29 in group P. Both results are comparable in both groups and statistically not significant. Time for first rescue antiemetic dose in group O was 7.18±0.76 hrs. and in group P, it was 5.55±0.52 hours. So we can infer that patients with propofol as antiemetic for postop PONV prophylaxis requires rescue antiemetic earlier than patients with ondansetron as prophylaxis. Mean Sedation score in first two hours postop was 1.31±0.47 in group O and 1.49±0.51 in group P, Mean Aldrete score for discharge from PACU for first two hours postop was 9.54±0.51 in group O and 9.4±0.5 in group P. Both results are comparable in both groups and statistically not significant. Difference in the overall incidence of side effects observed of both groups was statistically insignificant (P> 0.05).

Conclusion: From this study it can be concluded that sub hypnotic dose of propofol is comparable to ondansetron as conventional therapy for preventing PONV in patients undergoing general anaesthesia for abdominal surgery in terms of incidence and severity of nausea and vomiting and requirement of rescue antiemetic.

Keywords- postoperative nausea and vomiting, antiemetic,

INTRODUCTION

Postoperative Nausea and Vomiting (PONV) is a dreadful and uncomfortable experience that significantly detracts patient's quality of life after surgery. Despite the increasing fear of pain after surgery, patients still consider PONV to be a significant concern or complication of anaesthesia. When questioned about issues of concern, 22% of 800 patients in a study gave PONV the highest level of concern compared with 34% for postoperative pain and 24% for waking up during surgery.[1] The associated morbidity with PONV includes decreased patient satisfaction, delayed hospital discharge, and unexpected hospital readmission. It can also contribute to wound dehiscence, bleeding, pulmonary aspiration, oesophageal rupture, and fluid and electrolyte disturbances.[2]

PONV can cause severe discomfort amongst patients and is probably related to several factors, which include age, sex, operation type, and anaesthesia-related factors.[5,6,7] Other factors, including obesity, a history of motion sickness and/or a history of previous postoperative emesis, and also preoperative volume loading may have an important role in PONV.[8,9,10]

The direct effect of vagal afferents and stimulation of receptors due to the release of 5HT from the enterochromaffin cells, due to surgical manipulation of intestine stimulates vomiting centre which results in emesis. Post-operative nausea and vomiting incidence over 24 hours was 42% for abdominal surgery compared with other surgical procedures (36%). [11]

Many different drugs are available for treatment of PONV like phenothiazine (chlorpromazine, promethazine, dixyrazine), butyrophenones (domperidone, droperidol), antihistaminic (hydroxyzine, cyclizine), anticholinergic (scopolamine, hyoscine), benzamides (metoclopramide), and serotonin antagonists (ondansetron, graniesetron).[12]

Propofol has been universally accepted as an anaesthetic since its approval by the Food and Drug Administration and introduction into clinical practice in 1989.[14] With respect to anaesthetic agents, nitrous oxide (N_2O) and volatile anaesthetics increase the occurrence of PONV, but Propofol is known to have an antiemetic effect.[15]

Although propofol was initially accepted as an induction and maintenance hypnotic agent, its clinical use has remarkably expanded over the past 30 years. In this study, we focused on unique antiemetic properties of propofol. The mechanisms of antiemetic effects are not completely elucidated. Many investigators had conducted a variety of studies to identify the mechanism.

This study was planned to compare intravenous ondansetron and propofol for prevention of PONV in patients undergoing open abdominal surgery under general anaesthesia.

MATERIALS AND METHODS

STUDY DESIGN: Interventional Randomised Comparative Trial

STUDY SITE: The present study was conducted in the department of anaesthesiology and critical care DR. S.N. MEDICAL COLLEGE AND ATTACHED GROUP OF HOSPITALS, JODHPUR, after obtaining institutional ethics committee approval and written informed consent from study subjects.

STUDY PERIOD: August 2021 to January 2022

SAMPLE SIZE:

Sample size was calculated at alpha error 0.05 and study power 80% using the formula for hypothesis testing for two population mean -
Sample size was calculated to be a minimum of 32 subjects in each group, which was round to 35 subjects in each group.

STUDY POPULATION:

INCLUSION CRITERIA:

Patients of age 18 years to 60 years of either sex, belonging to ASA Physical Status category 1 & 2 undergoing elective open abdominal surgery under general anaesthesia were included.

EXCLUSION CRITERIA: Following patients were excluded from study:

1. Who refuse to give written informed consent,
2. Haemodynamically unstable (patient in shock or on vasopressor support),
3. Patient with BMI less than 18.5 & with more than or equal to 30.0
4. Positive history of drug allergy/allergy to study drugs,
5. On steroid therapy or opioids therapy, or medications causing nausea/vomiting,
6. Pregnant and lactating patient,
7. With a history of motion sickness.

RANDOMISATION TECHNIQUE

The patient's randomization was done by computer-generated random number table, and group allocation was done by sealed opaque envelope method, which was opened just before induction of anesthesia. All patients were randomly allocated into two equal groups of 35 each.

1. Group O received IV ondansetron 4mg 20 minutes before closure
2. Group P received IV propofol 30 mg 20 minutes before closure.

Blinding: The bolus of drugs of different volumes and colors was prepared by an anesthesiologist, who was different from the one administering the drug (drug syringe was wrapped around by

micropore adhesive) and assessing the patient parameters. To avoid bias, the patient, observers, and attending anesthesiologists were blinded to the study group, not aware of the preparation of drug and group allocation. If patient reported any unanticipated side effects, then, code of blinding was decoded, on an immediate action and drug causing unanticipated event was reported and managed as per standard treatment protocol.

INVESTIGATION REQUIRED:-

Blood investigations: Haemoglobin (Hb) %, bleeding time, clotting time, prothrombin time, INR, serum urea, serum creatinine, blood sugar, blood grouping and cross matching. Electrocardiography (ECG) and Chest X-ray posterior anterior view depending on the age and associated comorbities. Test to rule out Human immuno deficiency virus, hepatitis B surface antigen, or hepatitis C virus antigen infection and RT-PCR for COVID-19.

PREANAESTHETIC ASSESSMENT

Patients posted for the elective surgery did undergo a thorough preoperative evaluation which included proper history, general condition of the patient, and examination of CVS, Respiratory system, CNS, vertebral columns, and airway assessment. Haemoglobin, packed cell volume, platelet count, bleeding time, clotting time, renal function test, liver function test, electrocardiogram (ECG), and chest X-ray PA view were done preoperatively. Patients who fulfilled the inclusion criteria were included in the study. They were explained about the planned surgery, the anesthetic procedure, and the study in detail and proper informed written consent from the patient was obtained. The nil by mouth instruction was given one day prior to surgery as per institutional guidelines.

After taking the patient in the operation theatre, the patient was monitored using pulse oximetry (SPo2), non-invasive B.P. (NIBP), and continuous ECG. A peripheral intravenous (IV) line was secured with an 18 G cannula on the forearm, and a 0.5ml/kg/hr crystalloid solution was started.

Premedication was given with inj. fentanyl 2μg.kg^{-1}, inj. lignocaine 1-1.5 mg.kg$^{-1,}$ and inj. Midazolam 0.03mg/kg IV. Preoxygenation [3-minute tidal volume breathing using an oxygen flow of 5 l/min] with 100% oxygen was done via a close breathing circuit of anaesthesia workstation. Then anaesthesia was induced with inj. thiopentone sodium [3- 5mg/kg] and muscle relaxant injection atracurium 0.5mg/kg, and maintained on sevoflurane with 40% oxygen. Patient's ECG, NIBP, and SPo2 were continuously monitored intraoperatively. Supplemental analgesia was provided with injection fentanyl (1 μg/kg) IV bolus if H.R. or mean blood pressure (MBP) exceeded 30% of the preoperative values even after an adequate depth of anesthesia. Continuous monitoring of HR, NIBP, and SpO2 were done every 15 min till the end of surgery. All the patients were given Inj. Paracetamol 15mg/kg at 30 min before end of surgery and repeated every 6 hourly for the first 24 hours postoperatively. Twenty minutes before the end of skin closure, patients were administered either 4 mg ondansetron (Group O) or 30 mg propofol (Group P).

After completion of the surgery, neuromuscular blockade was reversed with injection neostigmine 0.05mg/kg and injection glycopyrrolate 0.01mg/kg. After demonstrating recovery from the muscle relaxant, patients were extubated and shifted to the recovery room. The total duration of surgery was noted **(only the patients having surgery duration less than or equal to 2 hours were included**) and time to extubation after reversal was noted.

Postoperative Assessment: - After shifting the patient to the recovery room, patients were observed by data collectors and questioned on outcome variables, such as nausea, vomiting, rescue antiemetic request, as well as the severity of nausea/vomiting on a numerical rating scale by another data collector who was blinded to group allocation. PONV score, VNRS, Ramsay sedation score, aldrete score and haemodynamic parameters were noted.

Rescue antiemetic (Metoclopramide 10mg) - was given if PONV score equal or greater than 4. Total frequency of rescue antiemetic used in first 24 hr postoperative period was noted. Any adverse effects like dizziness, headache, hypotension, allergic reaction, etc., were emphasized.
Haemodynamic variables including pulse rate, SBP, MAP, DBP, SPO2 were recorded every 15 mins intraoperatively and every 30 min for the first hour in the recovery room and then at 2hr, 4hr, 6hr, 12hr, 18hr and 24hr.
The patients were continuously monitored in the recovery room in the first hr by one of anaesthetic. After that, time duration of patient stay in the PACU was noted.

STATISTICAL ANALYSIS

All statistical analyses were performed using the SPSS software package (SPSS Inc. Chicago, IL, USA). T-test for independent samples was used to compare two groups for data with normal distribution, and Mann–Whitney U test was used for comparing data with non-normal distribution. Yates continuity correction test (Chi-square test), Fisher's exact test, and Fisher Freeman Haltom test) were used for comparison of qualitative data. All data was summarized as mean ± S.D. for continuous variables & numbers, and percentages for categorical variables. A $p<0.05$ was considered as statistically significant. For multiple comparisons among means, ANOVA with Fischer's protected least significant difference test. In addition, the differences between these trends were analyzed by paired t-tests.

- A total of 76 subjects were taken for the study, out of these 6 were excluded. Out of 6 patients excluded, 2 patient's attenders did not give consent and 4 patients did not meet inclusion criteria- having presence of hemodynamically instability or prolongation of surgery to more than 120 min. Rest 70 subjects were divided into two groups P and O of 35 subjects each.

These 70 patients were analyzed and the following results were obtained.

OBSERVATIONS AND RESULTS

DEMOGRAPHIC DISTRIBUTION

TABLE 1: AGE WISE DISTRIBUTION OF PATIENTS

Age (yrs)	Group O		Group P	
	N	%	N	%
20-30	15	42.86	14	56.00
31-40	9	25.71	6	24.00
41-50	7	20.00	10	40.00
51-60	4	11.43	5	20.00
Median	35		39	
Range	20-69		20-69	
Mean±SD	36.0±11.1		37.4±12.3	
t & p value	0.519, 0.608			

Unpaired t test

-The table-1 compares the ages of both groups. The mean ages of the two groups were statistically non significant (P>0.05).

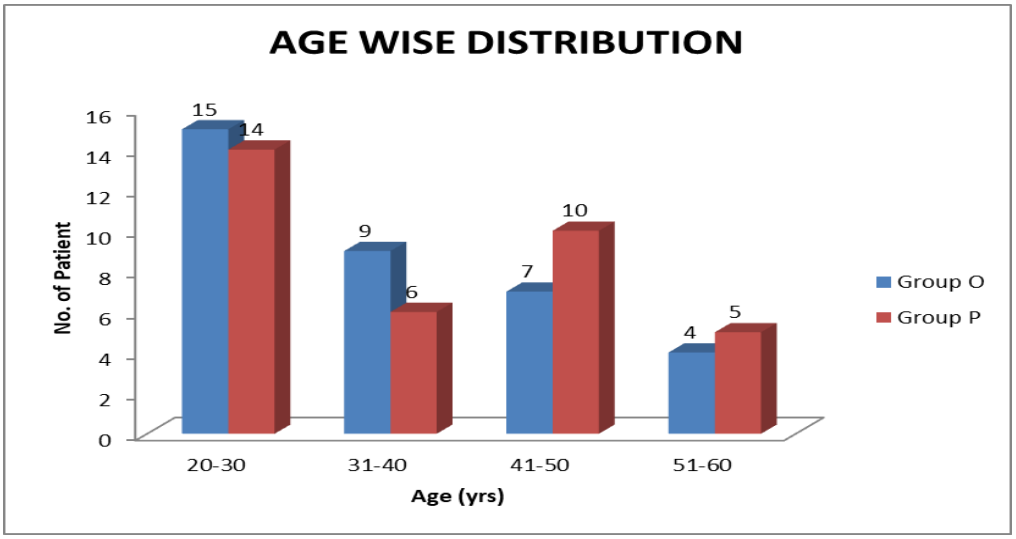


TABLE 2: GENDER WISE DISTRIBUTION OF PATIENT

Gender	Group O		Group P	
	N	%	N	%
Male	23	65.71	22	62.86
Female	12	34.29	13	37.14
Total	35	100.00	35	100.00

Chi square 0.062, P value 0.803 (NS)
Among all enrolled patients 45 were males and 25 were females. The difference between both sexes was found statistically non-significant (P > 0.05).

TABLE 3: BMI WISE DISTRIBUTION

BMI (kg/m2)	Group O		Group P	
	N	%		N
18.5-24.9	31	88.57	18.5-24.9	31
25-29.9	4	11.43	25-29.9	4
Median	22.04		22.76	
Range	18.95-27.82		18.56-28.19	
Mean+SD	22.47+2.03		22.62+2.72	
t & p value	0.226, 790 (NS)			

Unpaired t test
-table-3 compares the BMI of both groups. The mean BMI of the two groups were statistically non significant (P>0.05).

TABLE 4: ASA PS WISE DISTRIBUTION OF PATIENT

ASA	Group O		Group P	
	N	%	N	%
I	29	82.86	30	85.71
II	6	17.14	5	14.29
Total	35	100.00	35	100.00

Chi square 0.107, P value 0.742 (NS)
-Among all enrolled patients, the ASA PS classification was found statistically non-significant (>0.05)

TABLE 5: Comparison of Intraoperative HR between the group O and P from preop through after extubation:

Time	Intraoperative Heart Rate (bpm)		t value	p value
	Group O (Mean±SD)	Group P (Mean±SD)		
Preop	83.54±10.66	83.4±10.41	0.056	0.954
Pre induction	85.49±10.27	83.4±9.29	0.89	0.376
Post induction	87.31±9.99	87.97±9.32	0.284	0.776
Post intubation	86±9.54	85.03±9.19	0.433	0.665
At skin incision	83.03±10.89	80.71±8.81	0.977	0.331
15min	80.91±10.6	78.11±10.83	1.093	0.278
30min	79.03±9.67	78.14±7.5	0.428	0.669
45min	79.03±9.22	78.46±10.92	0.236	0.813
60min	78.06±8.82	79.6±11.07	0.644	0.521
75min	79.31±9.53	80.34±10.87	0.421	0.675
90min	79.77±9.84	81.46±10.89	0.679	0.499
105min	80±8.96	80.91±9.57	0.412	0.681
120min	80.63±8.63	80.31±10.08	0.1401	0.889
After giving drug (GO/GP)	82.83±11.34	80.37±11.28	0.908	0.366
At skin closure	85.23±12.21	82.11±12.1	1.072	0.287
After extubation	86.11±11.58	84.94±9.91	0.454	0.6507

Unpaired t test

The table-5 above and graph below compares the intraop HR between group P and O from preop through after extubation. The differences of mean intraop heart rate between both groups were found statistically non significant (P>0.05) at all time intervals.

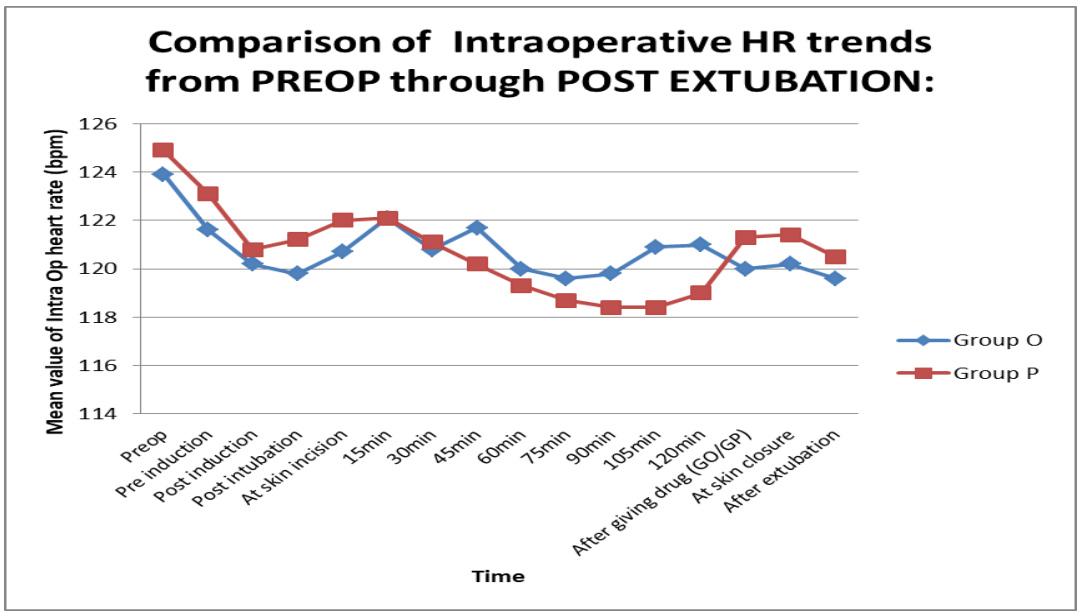


TABLE 6: Comparison of Intraoperative SBP between group O and P from preop through after extubation:

Time	Intraoperative SBP(mmHg)		t value	p value
	Group O (Mean±SD)	Group P (Mean±SD)		
Preop	123.91±7.59	124.94±10.3	0.475	0.363
Pre induction	121.66±8.2	123.14±12.11	0.601	0.549
Post induction	120.23±7.94	120.86±11.0	0.274	0.784
Post intubation	119.83±7.87	121.26±9.76	0.674	0.502
At skin incision	120.74±6.14	122±10.69	0.603	0.548

15min	122.11±6.26	122.14±10.12	0.041	0.988
30min	120.89±7.31	121.14±10.12	0.121	0.903
45min	121.74±8.35	120.23±11.73	0.622	0.535
60min	120.00±7.81	119.37±12.21	0.256	0.798
75min	119.63±5.17	118.74±10.43	0.45	0.654
90min	119.8±6.88	118.43±10.45	0.648	0.518
105min	120.91±6.05	118.46±9.86	1.256	0.213
120min	121.09±5.99	119.09±9.99	1.016	0.313
After giving drug (GO/GP)	120.03±5.57	121.37±9.49	0.722	0.472
At skin closure	120.29±6.5	121.46±9.76	0.59	0.556
After extubation	119.66±10.23	120.57±8.74	0.401	0.689

Unpaired t test

-The differences of mean intraop SBP between both groups were found statistically non significant (P>0.05) at all time intervals.

TABLE 7: Comparison of Intraoperative DBP between group P and O from preop through after extubation

Time	Intraoperative DBP(mmHg)		t value	p value
	Group O (Mean±SD)	Group P (Mean±SD)		
Preop	78.06±7.84	78.17±8.13	0.059	0.952
Pre induction	77.14±7.39	76.83±7.99	0.170	0.864
Post induction	75.57±6.82	77.00±9.25	0.735	0.464
Post intubation	77.97±6.67	77.09±9.69	0.445	0.657
At skin incision	78.69±5.93	77.29±10.71	0.676	0.501
15min	77.37±4.94	76.14±8.63	0.771	0.467
30min	76.49±5.14	77.23±8.00	0.462	0.645
45min	75.63±5.47	76.66±9.13	0.571	0.569
60min	75.46±5.72	75.91±7.93	0.276	0.782
75min	74.94±4.43	73.51±7.56	0.964	0.338
90min	74.77±5.42	77.17±7.88	1.485	0.142
105min	75.26±4.56	76.74±7.5	1.001	0.320
120min	77.83±5.03	78.11±8.48	0.171	0.864
After giving drug (GO/GP)	81.4±6.1	80.66±13.87	0.290	0.772
At skin closure	80.43±8.17	81.17±7.75	0.390	0.697
After extubation	76.89±6.09	77.54±8.29	0.378	0.706

Unpaired t test

-The differences of mean intraop DBP between both groups were found statistically non significant (P>0.05) at all time intervals.

TABLE 8: Comparison of Intraoperative MBP between group P and O from preoperative through after extubation-

Time	Intraoperative MBP(mmHg)		t value	p value
	Group O (Mean±SD)	Group P (Mean±SD)		
Preop	93.34±6.74	93.76±8.06	0.177	0.86
Pre induction	90.65±5.83	92.27±8.08	1.042	0.300
Post induction	90.46±5.61	91.62±7.6	0.695	0.488
Post intubation	91.98±5.1	91.81±7.88	0.144	0.885
At skin incision	92.7±4.45	92.19±8.08	0.273	0.785
15min	92.29±3.87	91.48±7.31	0.553	0.582
30min	90.62±4.08	91.87±6.98	0.925	0.358
45min	91.00±5.31	91.18±8.22	0.103	0.917
60min	90.3±5.28	90.4±7.6	0.036	0.971
75min	89.95±3.72	88.59±6.65	1.012	0.315

90min	89.97±4.76	90.92±7.27	0.6408	0.523
105min	90.48±3.59	90.65±6.34	0.163	0.870
120min	90.91±3.91	91.77±6.88	0.642	0.522
After giving drug (GO/GP)	94.28±4.3	94.23±10.23	0.030	0.975
At skin closure	93.71±6.24	94.6±5.7	0.602	0.549
After extubation	90.48±5.52	91.89±5.32	1.054	0.295

Unpaired t test

-The differences of mean intraop DBP between both groups were found statistically non significant (P>0.05) at all time intervals.

TABLE 9: Comparison of Intraoperative Spo2% between group P and O from preop through post extubation

Time	Intraoperative SpO2%		t value	p value
	Group O (Mean±SD)	Group P (Mean±SD)		
Preop	99.03±0.66	98.83±0.75	1.184	0.24
Pre induction	99.2±0.72	99±0.77	1.125	0.264
Post induction	99.34±0.73	99.26±0.66	0.518	0.606
Post intubation	99.31±0.63	99.29±0.67	0.184	0.854
At skin incision	99.09±0.78	99.14±0.81	0.3005	0.764
15min	99.17±1.01	99±0.73	0.812	0.419
30min	99.54±0.51	99.37±0.73	1.141	0.257
45min	99.4±0.55	99.49±0.61	0.614	0.54
60min	99.31±0.63	99.6±0.60	1.935	0.057
75min	99.63±0.49	99.71±0.57	0.672	0.503
90min	99.6±0.55	99.77±0.55	1.304	0.196
105min	99.23±0.73	99.51±0.74	1.622	0.109
120min	99.22±0.77	99.54±0.7	1.786	0.078
After giving drug (GO/GP)	99.43±0.61	99.51±0.66	0.565	0.573
At skin closure	99.25±0.70	99.49±0.61	1.453	0.150
After extubation	99.54±0.51	99.69±0.53	1.154	0.252

Unpaired t test

-The differences of mean intraop SPO2 between both groups were found statistically non significant (P>0.05) at all-time intervals.

TABLE 10: Comparison of Postoperative HR between group O and P from zero through 24 hr postoperatively

Time	Postoperative Heart Rate (bpm)		t value	p value
	Group O (Mean±SD)	Group P (Mean±SD)		
0 hr	81.94±11.71	79.74±12.79	0.750	0.455
30 min	82.46±10.63	81±11.89	0.540	0.590
60 min	82.23±10.21	79.46±11.2	1.082	0.2831
02 hrs	81.77±8.73	78.63±11.28	1.304	0.1967
04 hrs	84.23±8.74	82.26±10.67	0.845	0.4008
06 hrs	79.31±9.53	78.26±10.01	0.452	0.652
12 hrs	79.77±9.84	78.89±8.36	0.405	0.686
18 hrs	80±8.96	78±7.72	1.000	0.320
24 hrs	80.63±8.63	78.51±5.79	1.203	0.233

Unpaired t test

The table-10 above and graph below compares the postop HR between group P and O from zero through 24 hr. The differences of mean postop HR between both groups were found statistically non significant (P>0.05) at all time intervals.

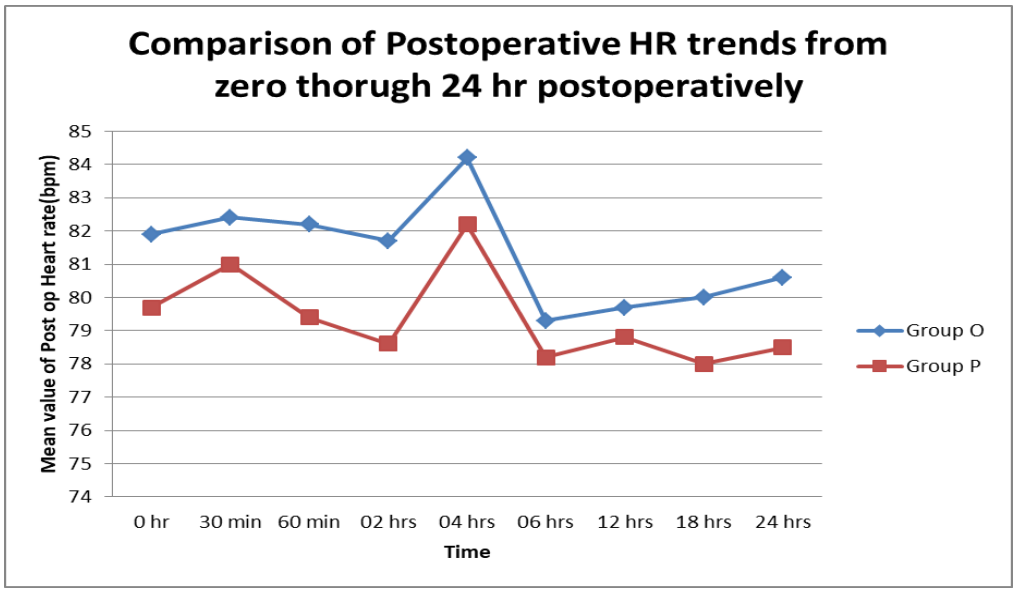


TABLE 11: Comparison of postoperative SBP between group O and P from zero through 24 hr postoperatively

Time	Postoperative SBP (mmHg)		t value	p value
	Group O (Mean±SD)	Group P (Mean±SD)		
0 hr	121.03±9.28	122.34±7.83	0.64	0.523
30 min	123.43±5.5	121.8±8.2	0.976	0.332
60 min	126.46±7.58	124.14±7.83	1.256	0.213
02 hrs	125.11±7.9	121.74±8.73	1.694	0.094
04 hrs	119.4±5.15	119.97±7.2	0.382	0.703
06 hrs	118.94±6.66	119.11±9.03	0.09	0.928
12 hrs	120.09±5.6	121.14±5.19	0.819	0.415
18 hrs	120.63±4.74	119.91±4.59	0.6403	0.524
24 hrs	120.37±3.21	118.8±3.56	1.939	0.056

Unpaired t test

-The differences of mean postop SBP between both groups were found statistically non significant (P>0.05) at all-time intervals.

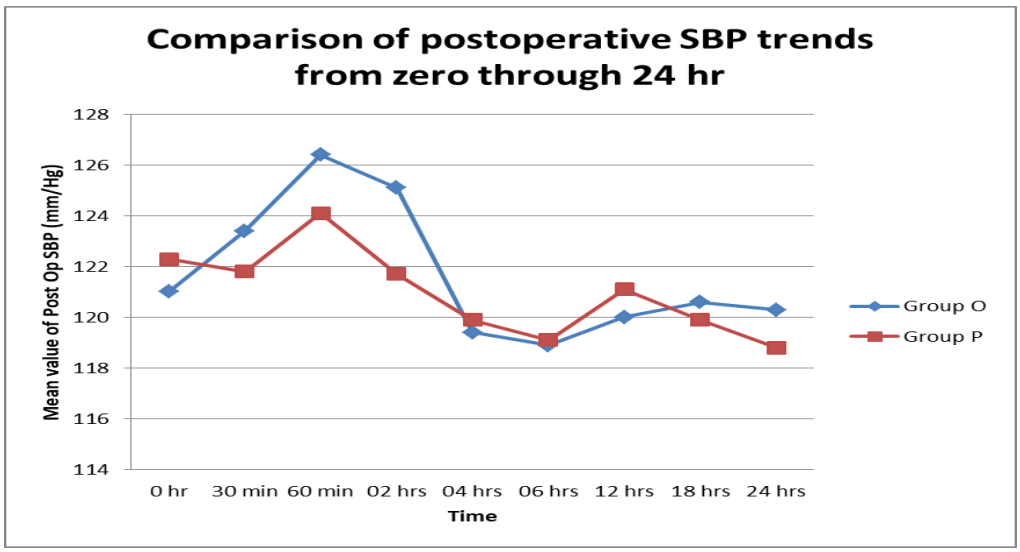


TABLE 12: Comparison of Postoperative DBP between group O and P from zero through 24 hr postoperatively

Time	Postoperative DBP(mmHg)		t value	p value
	Group O (Mean±SD)	Group P (Mean±SD)		
0 hr	80.09±6.83	80±7.65	0.049	0.96
30 min	78.97±5.94	78.83±7.59	0.087	0.9304
60 min	77.71±4.82	78.71±7.52	0.661	0.5103
02 hrs	75.6±5.19	75.86±7.59	0.165	0.869
04 hrs	78.09±7.7	77.49±7.92	0.321	0.748
06 hrs	76.54±7.8	76.71±7.52	0.093	0.925
12 hrs	76.17±5.92	76.14±7.33	0.0179	0.985
18 hrs	78.2±4.22	78.37±6.35	0.133	0.894
24 hrs	79.86±4.47	79.31±5.85	0.436	0.664

Unpaired t test

- The differences of mean postop DBP between both groups were found statistically non significant (P>0.05) at all time intervals.

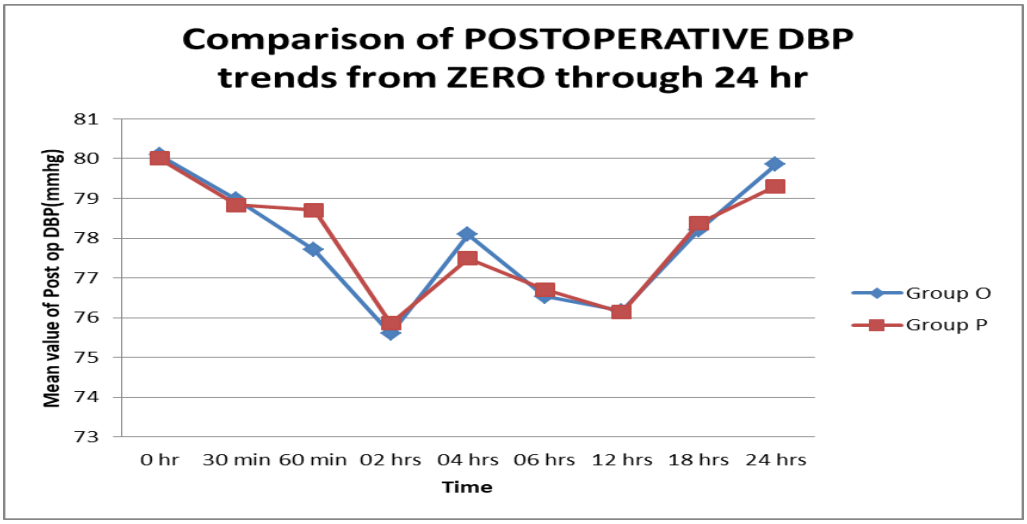


TABLE 13: Comparison of POSTOPERATIVE MBP between group O and P from ZERO through 24 hr

Time	Postoperative MBP(mmHg)		t value	p value
	Group O (Mean±SD)	Group P (Mean±SD)		
0 hr	93.73±5.55	94.11±5.63	0.254	0.799
30 min	93.79±5.02	93.15±5.05	0.545	0.587
60 min	93.96±3.83	93.86±5.13	0.105	0.916
02 hrs	92.1±3.86	91.15±4.47	0.881	0.381
04 hrs	91.86±5.97	91.65±5.08	0.129	0.897
06 hrs	90.68±5.86	90.85±6.29	0.118	0.906
12 hrs	90.81±4.79	91.14±5.69	0.250	0.803
18 hrs	92.34±4.04	92.1±4.95	0.132	0.895
24 hrs	93.36±3.89	92.48±4.19	1.003	0.319

Unpaired t test

-The differences of mean postop MBP between both groups were found statistically non significant (P>0.05) at all time intervals.

TABLE 14: Comparison of postoperative SPO2 between group P and O from zero through 24 hr

Time	Postoperative SpO2%		t value	p value
	Group O (Mean±SD)	Group P (Mean±SD)		
0 hr	99.49±0.51	99.2±0.72	1.92	0.059
30 min	99.6±0.55	99.31±0.76	1.801	0.076
60 min	99.57±0.5	99.49±0.7	0.5877	0.558
02 hrs	99.37±0.54	99.43±0.7	0.381	0.704
04 hrs	99.45±0.50	99.63±0.6	1.295	0.199
06 hrs	99.4±0.49	99.57±0.56	1.358	0.179
12 hrs	99.54±0.51	99.71±0.46	1.486	0.141
18 hrs	99.65±0.48	99.77±0.49	0.983	0.328
24 hrs	99.8±0.40	99.89±0.32	0.977	0.331

Unpaired t test

-The differences of mean postop SPO2 between both groups were found statistically non significant (P>0.05) at all time intervals.

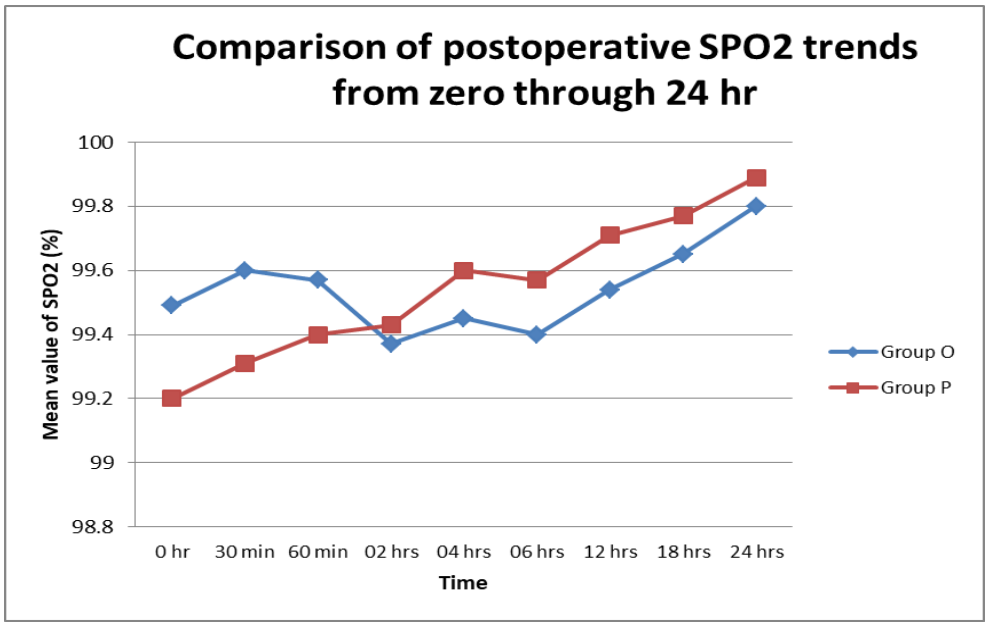


TABLE 15: Comparison in Time to extubation after reversal (min) between groups O AND P

Time to extubation after reversal (min)	Group O		Group P	
	N	%	N	%
12-14	20	57.14	16	45.71
15-17	15	42.86	17	48.57
≥18	0	0.00	2	5.71
Median	14		15	
Range	12-16		12-18	
Mean±SD	14.31±1.15		14.6±2.00	
t & p value	0.730, 0.467			

Unpaired t test

Among all enrolled patients, the, 20 patients in Group O and 16 patients in group P were found in category 12- 14 mint. In 15-17minute category, group O had 15 patients and group P had 17 patients. In > or equal to 18minutes category, group O had zero patients and group P had 2 patients. Among all enrolled patients, the mean extubation time was found 14.31±1.15 in group O and 14.6±2.00 in group P. The difference between the mean time to extubation of both groups was found as statistically non- significant (P >0.05)

TABLE 16: Comparison in Time Interval between extubation and first dose antiemetic (hr) between group O and P

Time interval between extubation and first dose antiemetic (hrs)	Group O		Group P	
	N	%	N	%
≤5	0	0.00	13	37.14
5.1-6	5	14.29	22	62.86
6.1-7	16	45.71	0	0.00
>7	14	40.00	0	0.00
Median	7		5.5	
Range	6-9		5-6	
Mean±SD	7.18±0.76		5.55±0.52	
IQR (Q1-Q3)	1 (5-6)		1.25(6.75-8)	
t & p value	10.35, <0.0001			

Unpaired t test

Among all enrolled patients, in group O, none of the patients required rescue antiemetic in less than 5 hr category, 5 patients demanded rescue antiemetic in 5.1-6 hr category, 16 patients demanded antiemetic in 6.1 to 7 hr category and 14 patients demanded in >7 hr category. In group P, 13 patients demanded in </= 5 hr category, 22 patients demanded in 5.1 -6 hr category, no patients demanded antiemetic in 6.1-7 hr and >7hr category. Among all enrolled patients, 45.71% belonged to 6.1-7 hr category in group O while 62.86% patients belonged to 5.1 – 6 hr category in group P. Among all enrolled patients the mean time was found as 7.18±0.76 hour in group O while 5.55±0.52 hour in group P. The difference between the mean time interval between extubation and first dose antiemetic of both groups was found as **statistically significant (P<0.0001).**

TABLE 17: Comparison in Time to stay in PACU after extubation (min) between group O and P

Time to stay PACU after extubation (min)	Group O		Group P	
	N	%	N	%
60-75	7	20.00	7	20.00
76-90	20	57.14	25	71.43
≥91	8	22.86	3	8.57
Median	85		82	
Range	60-98		62-96	
Mean±SD	83.91±9.22		81.45±7.29	
t & p value	1.236, 0.220			

Unpaired t test

-Among all enrolled patients, in Group O, 7 patients stayed in PACU in 60-75 minutes category, 20 patients stayed in PACU in 76-90 minutes category, 8 patients stayed in >/= 91 minutes category. While in group P, 7 patients stayed in PACU in 60-75 minutes category, 25 patients stayed in PACU in 76-90 minutes category, 3 patients stayed in >/= 91 minutes category. Among all enrolled patients, in 76-90 minutes category, 57.14% belonged in group O while 71.43% belonged in group P. Among all enrolled patients, the mean time to stay in PACU was found as 83.91±9.22 minutes in group O while 81.45±7.29 minutes in group P. The difference between mean **Time to stay in PACU after extubation (min)** of both groups was found as statistically Non - significant (P value>0.05).

TABLE 18: Comparison for total frequency of rescue antiemetic used in 24 hr between group O and P

Total frequency of rescue antiemetic used in 24hrs Postop	Group O		Group P	
	N	%	N	%
One	17	48.57	16	45.71
Two	16	45.71	15	42.86
Three	2	5.71	4	11.43
Total	35	100.00	35	100.00
Mean±SD	1.57±0.60		1.65±0.68	

-Among all enrolled patients, in Group O , 17 patients required one time rescue antiemetic , 16 patients required two times rescue antiemetic , 2 patients required 3 times rescue antiemetic. While in group P, 16 patient's required one time rescue antiemetic, 15 patients required two times rescue antiemetic, 4 patients required 3 times rescue antiemetic. Among all enrolled patients, mean of total frequency of rescue antiemetic required in 24 hours postop was 1.57±0.60 in group O and 1.65±0.68 in group P, so**, mean of total frequency of rescue antiemetic used in 24 hr** was found as statistically Non - significant (P Value (>0.05).

TABLE 19: Comparison of complications between group O and P

Complications	Group O		Group P		P value
	N	%	N	%	
Hypotension	2	5.71	2	5.71	1.000
Bradycardia	0	0.00	0	0.00	-
Allergy	0	0.00	0	0.00	-

The table-19 compares the complications between both groups. The difference in number of complications between both groups was found to be statistically non-significant (P>0.05).

TABLE 20: Comparison of PONV score between group O and P

Time	PONV Score				z score	p value
	Group O		Group P			
	M	Mean±Sd	M	Mean±Sd		
0hr	0	0.49±0.51	1	0.6±0.5	-0.946	0.343
30min	1	1.37±0.49	1	1.34±0.48	0.246	0.805
60min	2	1.63±0.49	2	1.63±0.49	0.000	1.000
2hrs	2	2.43±0.5	2	2.46±0.51	-0.236	0.812
4hrs	3	2.91±0.45	5	4.54±0.51	**-14.20**	**<0.0001**
6hrs	4	4.06±0.24	3	3.29±0.71	**6.098**	**<0.0001**
12hrs	3	2.54±0.51	3	2.57±0.5	-0.236	0.812
18hrs	2	1.66±0.48	2	1.77±0.65	-0.838	0.401
24hrs	2	1.68±0.75	1	1.49±0.51	1.298	0.194

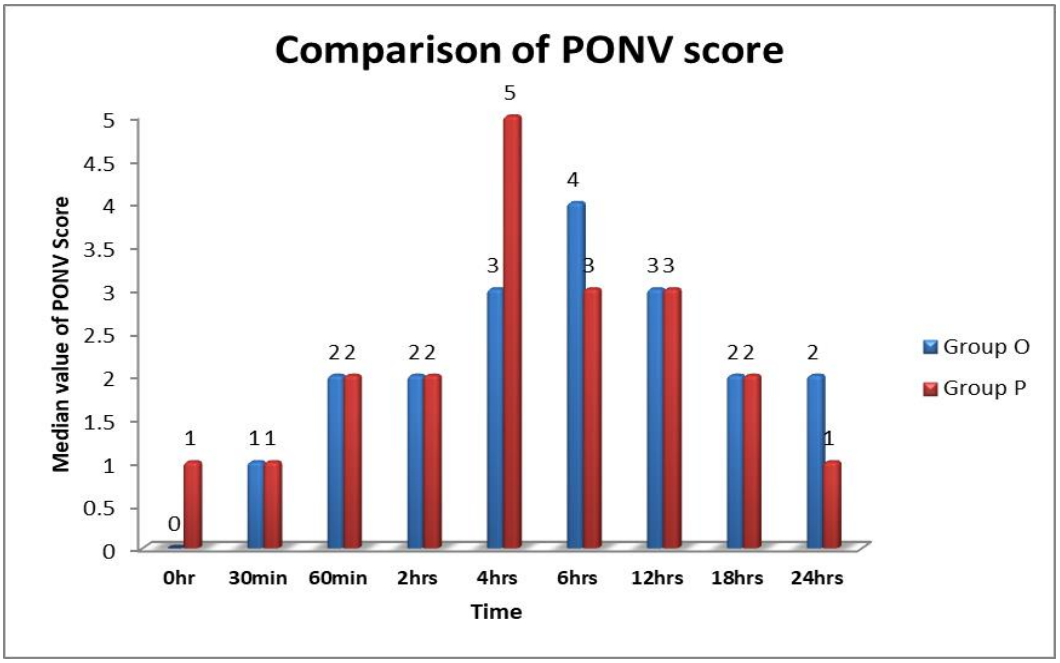
Z test

Time	Group O	Group P	P value
0-6hr	2.147± 1.23	2.309±1.41	0.6119
12-24hr	2.22±0.626	1.94±0.71	0.111
overall	2.16±1.07	2.18±1.23	0.94

The table 20 above and graph 20 below shows comparison **in PONV score between group O and P.**

The difference in mean PONV score of both groups was found as statistically non significant (p>0.05) at most of time intervals except at 4 hr and 6 hr.

The PONV at 4 hr in group O was 3 and in group P was 5, mean value 2.91±0.45in group O and 4.54±0.51 in group P, p value (**<0.0001) found** statistically **significant**
The PONV at 6 hr in group O was 4 and in group P was 3, mean value 4.06±0.24 in group O and 3.29±0.71 in group P, p value (**<0.0001) found** statistically **significant**
Overall, mean PONV score was found as 2.16±1.07 in group O and 2.18±1.23 in group P.
The difference of overall mean PONV score between both groups was found as statistically non-significant (p>0.05).



DISCUSSION

The importance of motivating this research is focused on the high level of reported incidence of postoperative nausea and vomiting. PONV is a common problem after abdominal surgery and can lead to complications such as wound dehiscence, prolonged recovery stay, prolonged hospital stay, and thus it increases cost.

Published articles show a great discrepancy in the incidence of PONV ranging from 30% to 70% Together with the increased hospital costs and the fear towards this condition felt by patients, this makes it a topic of special interest for anaesthetists. The impact of this research study is based on the fact propofol which is the recently most commonly developed anaesthesia inducer by the pharmaceutical industry and perhaps the most commonly used for general anaesthesia in the world by anaesthetists, had been found to have antiemetic properties.

The results obtained in this randomised, prospective, double blind, comparative clinical trial regarding the prophylactic PONV effect of ondansetron and propofol by measuring the mean of total frequency of rescue antiemetic used in 24 hours postoperatively in abdominal surgeries suggest the following:

AGE, SEX, ASA AND BMI -WISE DISTRIBUTION

There was even distribution of age in both groups. A random allocation of patients was done in both groups. The mean age in Group D was 36.0±11.1 year while in Group P, mean age is 37.4±12.3 year. Similar age range have also been reported by **Naghibi K et al (2015) [50] & L.A. Rosillo-Meneses et al (2016) [52] & Hailu Yimer et al (2016)[53] in** their study.
In our study, out of 35 patients in each group, 12 female patients were in group O, 13 female patients were in group P. The p value was >0.05 i.e. statistically insignificant. Our results were

similar as studies conducted by **Naghibi K et al (2015) [50] & L.A. Rosillo-Meneses et al (2016) [52] &** Hailu **Yimer et al (2016)[53]**

ASA grading- In our study, only patients with ASA physical status I and II were taken and no significant difference (p >0.05) was observed between both groups. Our results were in line with the studies done by **Naghibi K et al (2015) [50] &** various other studies.

In our study there was even distribution of BMI in both groups. The mean BMI in Group O is 22.47±2.03 (Kg/m2) and in Group P is 22.62±2.72 (Kg/m2). Mean BMI of both groups was between 22-24 kg/m^2. The variation in the distribution of the patients according to BMI was statistically insignificant P value >0.05, which coincides with the study conducted by **Naghibi K et al (2015) [50] & L.A. Rosillo-Meneses et al (2016) [52]** & **Hailu Yimer et al (2016)[53]**

Hence the demographic profile of both groups of our study was comparable (P>0.05). This provided us the uniform platform to evenly compare the results obtained.

HEAMODYNAMIC CHANGES

There was no significant difference in the haemodynamic parameters i.e. HR, SBP, DBP, MBP & SpO_2 during (from preop through after extubation) & Postop (from zero through 24 hr) in both groups. HR, SBP, DBP, MBP & SpO_2 remained stable without any fluctuation.

Similar results of HR, SBP, DBP , MBP & SpO_2 trends have also been reported by **Naghibi K et al (2015) [50] & L.A. Rosillo-Meneses et al (2016) [52]** & **Hailu Yimer et al (2016)[53]** in their studies.

RESCUE ANTIEMETIC

Time interval between extubation and first dose rescue antiemetic & **mean of total frequency of rescue antiemetic (metoclopramide 10 mg) required in 24 hours postop** was recorded in group O & P.

48.57% patients required one time MCP in 24 hr , 45.71% patients required 2 time MCP in 24 hr, 5.71% required MCP 3 times in 24 hr ,in group O, while 45.71% patients required one time MCP in 24 hr , 42.86% patients required 2 time MCP in 24 hr, 11.43% required MCP 3 times in 24 hr, in group P. **Mean value of Total frequency of rescue antiemetic in 24 hr is comparable in both groups O and P, 1.57+/-0.60 & 1.65+/-0.68 respectively and not significant statistically (p value > 0.05).** Our results were in line with the studies done by Naghibi **K et al (2015) [50]**

In our study we observed that, time interval between **extubation and first dose rescue antiemetic was statistically significant between Group O and group P (p value <0.0001).**

In group O , 14.29 % patients required MCP between 5.1 to 6 hr category , 45.71 % patients required MCP in 6.1 to 7 hr category and 40 % patients required MCP in >7 hr category . **7.18±0.76 hr is mean time between extubation and first dose of antiemetic requirement in group O**.

While in group P, 37.14 % patients required MCP <5 hr category, 62.86 % patients required MCP in 5.1 to 6 hr category**. 5.55±0.52 hr is mean time between extubation and first dose of antiemetic requirement in group P.**

The difference in mean time interval between extubation and first dose rescue antiemetic between group O and group P was found as statistically significant (p<0.0001)

Incidence & Severity of Nausea & Vomiting (PONV SCORE & VNRS SCALE[55])

PONV was defined as at least one episode of either nausea or vomiting or both during the first 24 h postoperatively. We recorded incidence of nausea and vomiting at 0 hr, 30 mint, 1 hr, 2 hr, 4 hr, 6hr, 12hr, 18hr, and 24hr postoperatively.

In our study we observed that at time 4hr & 6 hr significant results P< 0.05 obtained when PONV & VNRS scoring was done. Mean values are as follows:-

VNRS

At 4 hr, Grp O showed 4.60±0.65 and Grp P showed 6.37±0.49

At 6 hr, Grp O showed 6.14±0.77 and Grp P showed 5.42±0.72

PONV

At 4 hr, Grp O showed 2.91±0.45 and Grp P showed 4.54±0.51
At 6 hr, Grp O showed 4.06±0.24 and Grp P showed 3.29±0.71.
P value at 4 hr and 6 hr was statistically significant (<0.0001) in group P and O which showed patients in propofol group had early demand of rescue antiemetic than ondansetron group's patients in 0-6 hr postop period which is in concordance with by Naghibi K et al (2015) [(50)] & L.A. Rosillo-Meneses et al (2016) [(52)] & Hailu Yimer et al (2016)[53] in their studies.

Our results showed that there were no significant differences among requirement of rescue antiemetic in both groups at 12 to 24 hr postoperatively. Regarding the number of patients that need rescue anti-emetics, our result was also comparable with other studies. These results are similar to those reported by previous studies [**56, 57**] although, of note, the assessment tool used and definition of severity of nausea differs between studies.

The protection exercised by ondansetron to prevent postoperative nausea and vomiting showed no statistically significant difference with respect to propofol, in line with the study published by **Kalidag et al. (57)** .They found an identical decrease in nausea and vomiting between propofol and ondansetron (71.4%). **Splinter et al. (58)** found a similar efficacy even though their sample was from among the paediatric population.

PACU STAY

Mean time to stay in PACU after discharge from recovery room was found to be 83.91 ±9.22 minutes in group O and 81.45±7.29 in group P , which is in line with results obtained by **Naghibi K et al (2015) [(50)]** which were 75±6 minutes in group 30 mg propofol and 95±15 minutes in group MCP .

TIME FOR EXTUBATION AFTER REVERSAL

The mean time for extubation after reversal (minutes) was found as 14.31+/-1.15 in group O and 14.6+/-2.00 in group P. Our results are not significant statistically.

COMPLICATIONS

The difference in the incidence of complications in group O & P were statistically insignificant. The adverse events reported were those that would be expected in patients having surgery performed under general anaesthesia.
Gann TG and colleagues [56] reported that the plasma concentration of propofol to have antiemetic property was much lower when compared to the concentration associated with sedation (343 ng/ml and 1 to 3 mcg/ml, respectively). Our finding was in line with this study in which there were no significant documented complications such as hypotension, apnoea and a decrease in oxygen saturation in the propofol group. We are using small dose of propofol (30 mg), this dose has been used in **Naghibi K et al (2015) [(50)] & L.A. Rosillo-Meneses et al (2016) [(52)] &** Hailu **Yimer et al (2016)[53] in** their studies with the effect of reducing PONV without any complications. The overall side effect profile was similar in both groups of our present study.

CONCLUSION

From this study it can be concluded that subhypnotic dose of Propofol at end of surgery is comparable to standard antiemetic ondansetron (5HT3 Antagonist) as conventional therapy for preventing PONV in patients undergoing general anaesthesia for abdominal Surgery in terms of nausea, vomiting and requirement of rescue antiemetic. Use of propofol as an induction agent in abdominal surgery protects the patient from nausea and vomiting in the early post-operative period (0-6hours), but after 6 hours, the incidence of nausea and vomiting reaches the same value of any technique which does not use propofol.

BIBLIOGRAPHY

1. Kampo, S., Afful, A.P., Mohammed, S. et al. Sub-hypnotic dose of propofol as antiemetic prophylaxis attenuates intrathecal morphine-induced postoperative nausea and vomiting, and pruritus in parturient undergoing cesarean section — a randomized control trial. BMC Anesthesiol 2019; 19:177.
2. Hailu Yimer, Nugusu Ayalew, Zewditu Abdisa, Adugna Aregawi, Effect of sub-hypnotic dose of propofol on prevention of postoperative nausea and vomiting as part of multimodal antiemetic in patients undergoing open abdominal surgery: A prospective cohort study, Gondar University Hospital, Northwest Ethiopia, 2016 International Journal of Surgery Open,Volume 10.
3. Mehernoor F. Watcha, Paul F. White; Postoperative Nausea and Vomiting: Its Etiology, Treatment, and Prevention. Anesthesiology 1992; 77:162–184.
4. Kim, Eu-Gene et al. "Antiemetic effect of propofol administered at the end of surgery in laparoscopic assisted vaginal hysterectomy." Korean journal of anesthesiology vol. 66, 3 (2014): 210-5.
5. Safavi MR, Honarmand A. Low dose intravenous midazolam for prevention of PONV, in lower abdominal surgery-preoperative vs intraoperative administration. Middle East J Anesthesiol. 2009; 20:75–81.
6. Honarmand A, Safavi M, Khalili G, Mohammadnejad F. Prophylactic administration of haloperidol plus midazolam reduces postoperative nausea and vomiting better than using each drug alone in patients undergoing middle ear surgery. Saudi J Anaesth. 2012; 6:145–51.
7. Jabalameli M, Honarmand A, Safavi M, Chitsaz M. Treatment of postoperative nausea and vomiting after spinal anesthesia for cesarean delivery: A randomized, double-blinded comparison of midazolam, ondansetron, and a combination. Adv Biomed Res. 2012; 1:2.
8. Safavi M, Honarmand A, Habibabady MR, Baraty S, Aghadavoudi O. Assessing intravenous ketamine and intravenous dexamethasone separately and in combination for early oral intake, vomiting and postoperative pain relief in children following tonsillectomy. Med Arh. 2012; 66:111–5.
9. Heidari SM, Talakoub R, Yaraghi Z. Comparing the preventive effect of midazolam and midazolam-dexamethasone on postoperative nausea and vomiting in elective middle ear surgery. Adv Biomed Res. 2012; 1:9.
10. Heidari SM, Saghaei M, Shafiee Z. Effect of preoperative volume loading on the intraoperative variability of blood pressure and postoperative nausea and vomiting. Med Arh. 2012; 66:94–6.
11. Apfel CC, Läärä E, Koivuranta M, Greim CA, Roewer N. A simplified risk score for predicting postoperative nausea and vomiting: conclusions from cross-validations between two centers. Anesthesiology 1999; 91:693–700.
12. Mehernoor F. Watcha, Paul F. White; Postoperative Nausea and Vomiting: Its Etiology, Treatment, and Prevention. Anesthesiology 1992; 77:162–184.
13. Loewen PS, Marra CA, Zed PJ. 5-HT3 receptor antagonists' vs traditional agents for the prophylaxis of postoperative nausea and vomiting. Can J Anaesth. 2000; 47(10):1008-18.
14. Smith I, White PF, Nathanson M, Gouldson R. Propofol. An update on its clinical use. Anesthesiology. 1994 Oct; 81(4):1005-43.
15. Levine PA, Bauchner H. Notice of retraction: "Prevention of postoperative nausea and vomiting with antiemetics in patients undergoing middle ear surgery: Comparison of a small dose of propofol with droperidol or metoclopramide" (Arch Otolaryngol Head Neck Surg. 2001; 127[1]:25-28) Arch Otolaryngol Head Neck Surg. 2012;138:692.
16. Macario A, Weinger M, Carney S, Kim A. Which clinical anesthesia outcomes are important to avoid? The perspective of patients. Anesth ● Analg 1999; 89:652
17. Hasler WL, Chey WD. Nausea and vomiting. Gastroenterology. 2003 Dec; 125(6):1860–7.
18. Andrews, P.L.R.; Hawthorn, J. (1988). 8 The neurophysiology of vomiting. , 2(1), 141–168.
19. Shaikh, S. I., Nagarekha, D., Hegade, G., & Marutheesh, M. (2016). Postoperative nausea and vomiting: A simple yet complex problem. Anesthesia, essays and researches, 10(3), 388–396.

20. Koch, Kenneth L.; Hasler, William L. (2017). Nausea and Vomiting || the Physiology of Vomiting., 10.1007/978-3-319-34076-0(Chapter 2), 15–25.
21. Watcha MF White PF **Postoperative nausea and vomiting. Its etiology, treatment, and prevention.** Anesthesiology. 1992; **77**: 162-184
22. POST-OPERATIVE NAUSEA AND VOMITING (PONV): A REVIEW ARTICLE Dr. Saeeda Islam1 Dr. P. N. Jain2 DA, JAIN Indian J. Anaesth. 2004: PONV: A REVIEW; 48 (4) : 253-258
23. Srilata, M. (2016). Complications in Neuroanesthesia || Nausea and Vomiting., (), 345–357. doi:10.1016/b978-0-12-804075-1.00036-5
24. Rickford JK, Speedy HM, Tytler JA, Lim M. Comparative evaluation of general, epidural and spinal anaesthesia for extracorporeal shockwave lithotripsy. Ann R Coll Surg Engl. 1988; 70:69–73
25. Dent SJ, Ramachandra V, Stephen CR. Postoperative vomiting: Incidence, analysis, and therapeutic measures in 3,000 patients. Anesthesiology. 1955; 16:564–72
26. Bonica JJ, Crepps W, Monk B, Bennett B. Postanesthetic nausea, retching and vomiting; evaluation of cyclizine (marezine) suppositories for treatment. Anesthesiology. 1958; 19:532–40.
27. Crocker JS, Vandam LD. concerning nausea and vomiting during spinal anesthesia. Anesthesiology. 1959; 20:587–92.
28. Ratra CK, Badola RP, Bhargava KP. A study of factors concerned in emesis during spinal anaesthesia. Br J Anaesth. 1972; 44:1208–11.
29. Wallenborn J, Gelbrich G, Bulst D, Behrends K, Wallenborn H, Rohrbach A, et al. Prevention of postoperative nausea and vomiting by metoclopramide combined with dexamethasone: randomized double blind multicentre trial. BMJ 2006; 333:324.
30. Gan TJ, Belani KG, Bergese S, et al. Fourth consensus guidelines for the management of postoperative nausea and vomiting. Anesth Analg. 2020; 131(2):411–448.
31. Rowbotham DJ. Current management of postoperative nausea and vomiting. Br J Anaesth 1992; 69:46S–59S.
32. Wilhelm SM, Dehoorne-Smith ML, Kale-Pradhan PB. Prevention of postoperative nausea and vomiting. Ann Pharmacother 2007; 41:68–78.
33. Sébastien Pierre, MD, Rachel Whelan, Nausea and vomiting after surgery, Continuing Education in Anaesthesia Critical Care & Pain, Volume 13, Issue 1, February 2013, Pages 28–32,
34. Wilde MI, Markham A. Ondansetron. A review of its pharmacology and preliminary clinical findings in novel applications. Drugs. 1996 Nov;52(5):773-94
35. Griddine A, Bush JS. Ondansetron. [Updated 2021 Sep 29]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-
36. National Center for Biotechnology Information (2022). PubChem Compound Summary for CID 4943, Propofol. Retrieved February 2, 2022
37. Folino TB, Muco E, Safadi AO, et al. Propofol. [Updated 2021 Jul 31]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-.
38. Miller RD, editor. Miller's anesthesia. Eighth edition. Philadelphia, PA: Elsevier/Saunders; 2015. 2 p.
39. Isola S, Hussain A, Dua A, et al. Metoclopramide. [Updated 2021 Oct 19]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan
40. National Center for Biotechnology Information. PubChem Compound Summary for CID 4168, Metoclopramide Accessed Feb. 3, 2022.
41. Pierre S, Benais H, Pouymayou J. Apfel's simplified score may favourably predict the risk of postoperative nausea and vomiting. Can J Anaesth. 2002 Mar;49(3):237-42.
42. Apfel CC, Korttila K, Abdalla M, Kerger H, Turan A, Vedder I, Zernak C, Danner K, Jokela R, Pocock SJ, Trenkler S, Kredel M, Biedler A, Sessler DI, Roewer N; IMPACT Investigators. A factorial trial of six interventions for the prevention of postoperative nausea and vomiting. N Engl J Med. 2004 Jun 10; 350(24):2441-51.

43. Silva AC, O'Ryan F, Poor DB. Postoperative nausea and vomiting (PONV) after orthognathic surgery: a retrospective study and literature review. J Oral Maxillofac Surg. 2006 Sep;64(9):1385-97
44. Grabowska-Gaweł A, Porzych K, Piskunowicz G. Czynniki ryzyka i czestość wystepowania pooperacyjnych nudności i wymiotów u chorych operowanych w znieczuleniu ogólnym [Risk factors and frequency of postoperative nausea and vomiting in patients operated under general anesthesia]. Przegl Lek. 2006; 63(2):72-6. Polish.
45. Wallenborn J, Rudolph C, Gelbrich G, Goerlich TM, Helm J, Olthoff D. The impact of isoflurane, desflurane, or sevoflurane on the frequency and severity of postoperative nausea and vomiting after lumbar disc surgery. J Clin Anesth. 2007 May; 19(3):180-5.
46. Bhattarai, B., Shrestha, S., & Singh, J. (2011). Comparison of ondansetron and combination of ondansetron and dexamethasone as a prophylaxis for postoperative nausea and vomiting in adults undergoing elective laparoscopic surgery. Journal of emergencies, trauma, and shock, 4(2), 168–172.
47. Zhang, D., Shen, Z., You, J., Zhu, X., & Tang, Q. F. (2013). Effect of ondansetron in preventing postoperative nausea and vomiting under different conditions of general anesthesia: a preliminary, randomized, controlled study. Upsala journal of medical sciences, 118(2), 87–90.
48. Wilson EB, Bass CS, Abrameit W, Roberson R, Smith RW. Metoclopramide versus ondansetron in prophylaxis of nausea and vomiting for laparoscopic cholecystectomy. Am J Surg. 2001 Feb;181(2):138-41
49. Fujii Y, Itakura M. Comparison of propofol, droperidol, and metoclopramide for prophylaxis of postoperative nausea and vomiting after breast cancer surgery: a prospective, randomized, double-blind, placebo-controlled study in Japanese patients. Clin Ther. 2008 Nov;30(11):2024-9
50. Naghibi K, Kashefi P, Azarnoush H, Zabihi P. Prevention of postoperative nausea and vomiting with a subhypnotic dose of Propofol in patients undergoing lower abdominal surgery: A prospective, randomized, double-blind study. Adv Biomed Res. 2015; 4:35. Published 2015 Feb 11.
51. Kampo S, Afful AP, Mohammed S, Ntim M, Buunaaim ADB, Anabah TW. Sub-hypnotic dose of propofol as antiemetic prophylaxis attenuates intrathecal morphine-induced postoperative nausea and vomiting, and pruritus in parturient undergoing cesarean section - a randomized control trial. BMC Anesthesiol. 2019 Sep 14; 19(1):177.
52. L.A. Rosillo-Meneses, O. Carrillo-Torres, P. Gonzalez-Navarro, J.A. Garcia-Garcia, Comparison of the antiemetic efficacy of propofol versus ondansetron in nasal surgery. Randomised clinical trial, Revista Médica del Hospital General de México,Volume 81, Issue 2, 2018, Pages 72-78, ISSN 0185-1063,
53. Hailu Yimer, Nugusu Ayalew, Zewditu Abdisa, Adugna Aregawi, Effect of sub-hypnotic dose of propofol on prevention of postoperative nausea and vomiting as part of multimodal antiemetic in patients undergoing open abdominal surgery: A prospective cohort study, Gondar University Hospital, Northwest Ethiopia, 2016, International Journal of Surgery Open, Volume 10, 2018, Pages 15-20, ISSN 2405-8572,
54. Kranke P, Röhm KD, Diemunsch P, Gan TJ, Apfel CC, Eberhart L, et al. Intravenous buspirone for the prevention of postoperative nausea and Vomiting. Eur J Clin Pharmacol 2012; 68:1465-72.
55. Baxter AL, Watcha MF, Baxter WV, Leong T, Wyatt MM. Development and validation of a pictorial nausea rating scale for children. Pediatrics. 2011; 127:e1542–e1549.
56. Gan TJ, Glass PS, Howell ST, Canada AT, Grant AP, Ginsberg B. Determination of plasma concentrations of propofol associated with 50% reduction in post-operative nausea. Anesthesiology 1997; 87:779e84.
57. Karlida˘g T, Kaygusuz I, Bestas¸ A, et al. The efficacy of droperidol, metoclopramide, propofol, and ondansetron for the prevention of nausea and vomiting following middle ear surgery. Kulak Burun Bogaz Ihtis Derg. 2002; 9:331---6.

58. Splinter WM, Rhine EJ, Roberts DJ. Vomiting after strabismus surgery in children: ondansetron vs propofol. Can J Anaesth.1997; 44:8259.
59. J.Antonio Aldrete, The post-anesthesia recovery score revisited, Journal of Clinical Anesthesia, Volume 7, Issue 1, 1995, Pages 89-91.