Section: Anaesthesiology

Original Research Article

EFFICACY OF PROPOFOL WITH KETAMINE PROPORTIONS AND PROPOFOL WITH FENTANYL IN MINOR GYNAECOLOGIC INTERVENTIONS

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ABSTRACT

Background: Many unpleasant procedures now employ procedural sedation and analgesia (PSA) to improve patient comfort, procedure success, and provider satisfaction. A good PSA treatment should have a fast start, short recovery period, and minimum side effects. Multiple sedative, analgesic, and dissociative drugs have been studied since no one medicine can give all these advantages. This study was designed to assess efficacy of two different dosage combinations of Propofol with ketamine and propofol with fentanyl in minor gynaecologic interventions.

Materials and Methods: Around 120 adult women receiving elective non-laparoscopic minor gynaecological procedures allocated to group KP1:1 (n=40) anaesthetised with 1:1 ratio of 2ml of 50mg/ml ketamine to 10ml of 10mg/ml propofol, group KP1:2 (n=40) with 1:2 ratio of 1 ml of ketamine and 1 ml of distilled water, and group PF (n=40) with 2ml of 50mcg.ml fentanyl and 10ml of 10mg.ml propofol. The PRST score for depth of anaesthesia, Modified Aldrete score for recovery time assessment, Wong baker FACES pain scale for postoperative pain was used and analysed.

Results: The average disparity in the duration of induction, overall drug consumption, and average recovery time was found to be statistically significant ($p<0.05$). The mean EVANS/PRST score demonstrated statistical significance at intraoperative intervals of 15 minutes ($p=0.001$) and 10 minutes ($p<0.05$). The average WB faces pain scale demonstrated a notable difference at 10 and 15 minutes postoperatively ($p=0.001$).

Conclusion: Ketamine and propofol of 1:1 ratio speed induction and reduces drug intake, but also prolongs recovery and reduces postoperative analgesia. The three groups did not differ in haemodynamics, anaesthesia depth, or side effects. The propofol: fentanyl group recovers faster and has better postoperative pain relief. This implies that propofol plus fentanyl may improve postoperative outcome.

Keywords: Ketamine, Propofol, Fentanyl, Gynaecologic procedures.

INTRODUCTION

Minor gynaecological interventions are predominantly conducted as outpatient day-case procedures, allowing patients to be discharged on the same day as their admission following the completion of the procedure. Procedural sedation represents an efficient method of anaesthesia for such interventions, ensuring sufficient anaesthetic depth and haemodynamic stability, while facilitating early recovery and minimising adverse effects during the recovery phase.[1] A multitude of pharmacological agents have been explored to fulfil the objectives of outpatient procedures conducted under sedation. Given that no singular pharmacological agent can fulfil all the demands of procedural sedation, various medications are employed in diverse combinations to

achieve a state of balanced anaesthesia, encompassing amnesia, hypnosis, and analgesia.[2]
Propofol, a fast-acting hypnotic sedative, restores cognitive and psychomotor functioning quickly. Ketamine is an amnestic and dissociative analgesic.[3] A 1:1 syringe of ketamine and propofol has been a popular chemically and physiologically stable mixture for procedural sedation and analgesia in different surgical procedures.[4] Ketofol improves sedation quality and physician and nurse satisfaction.[5] Ketofol also reduces respiratory and cardiovascular problems including hypotension and bradycardia more than propofol alone.[6]
Fentanyl serves as a highly effective opioid analgesic, exhibiting a potency that surpasses morphine by a factor of one hundred, thereby making it particularly appropriate for the management of brief episodes of severe pain.[7] When evaluating the efficacy of propofol combined with fentanyl against ketofol, it is evident that both combinations achieve effective sedation. However, ketofol demonstrates a greater depth of sedation alongside stable haemodynamics, albeit with an increased incidence of side effects.[8-10] Hence, the present study was designed to assess the efficacy of two different dosage combinations of ketamine with propofol and propofol with fentanyl in minor gynaecological procedures.

MATERIALS AND METHODS

This study was conducted in the Department of Anaesthesiology at Dr. Patnam Mahender Reddy Institute of Medical Sciences, Chevella, Rangareddy from April 2024 to April 2025. A total of 120 adult female participants undergoing elective non-laparoscopic minor gynaecological surgeries were recruited. Females between age group 18 to 50 years, weight between 40 to 70 kgs, ASA grade I and II, Mallampatti airway classes 1 and 2 and willing to participate were included. Cases undergoing emergency surgeries, undergoing laparoscopic surgeries, history of substance abuse, injury to head, psychiatric illness, cases not in study weight range, ASA and Malampatti classes and not willing to participate were excluded. Written informed consent was obtained from the study participants and study protocol was approved by the institutional ethics committee.
The study participants were randomly distributed to three study groups. Group KP1:1 (n=40) administered with 1:1 ratio of 2ml of 50mg.ml ketamine to 10 ml of 10mg/ml propofol. Group KP1:2 (n=40) administered with 1:2 ratio of 1 ml of 50mg/ml ketamine and 1 ml of distilled water to 10mg/ml propofol. Group PF (n=40) received 2ml of 50mcg.ml fentanyl and 10ml of 10mg.ml propofol. All the drug combinations were administered intravenously with 3ml as initial dose until an adequate sedation of 5-6 on Ramsay sedation scale was achieved. Two hours before the procedure oral ranitidine 150 mg was administered and with injections midazolam 0.03 mg/kg IV, and glycopyrrolate 0.2 mg IV 15 minutes before induction to all the participants.
The parameters including heart rate, systolic blood pressure, diastolic blood pressure, Oxygen saturation, end tidal CO2 and respiratory rate were recorded before induction, every 5 minutes up to 15 min intraoperatively and every 5 minutes for 15 minutes postoperatively. The PRST score for depth of anaesthesia, Modified Aldrete score for recovery time assessment, Wong baker FACES pain scale for postoperative pain, duration of surgery, total drug consumed and incidence of adverse events were recorded.
The collected data was analysed by using SPSS version 32.0. The categorical variables were represented in frequency and percentage and continuous variables were represented in mean and standard deviation. The comparison of categorical variables was done by using chi-square test and $p<0.05$ was considered as statistically significant outcome. The significant difference between different drug groups was done by using one way ANOVA.

RESULTS

Table 1: Comparison of sociodemographic and clinical profile between study groups.

Parameter	Group KP1:1 (n=40) Frequency (%)	Group KP1:2 (n=40) Frequency (%)	Group PF (n=40) Frequency (%)	p-value
Age (In years)				
18-30	10 (25%)	12 (30%)	10 (25%)	0.001
31-40	22 (55%)	21 (52.5%)	21 (52.5%)	
41-50	08 (20%)	07 (17.5%)	09 (22.5%)	
Weight	55.36 ± 6.72	55.94 ± 5.97	57.68 ± 6.26	0.085
Height	5.41 ± 1.89	5.47 ± 2.03	5.35 ± 1.46	0.293
BMI	24.75 ± 3.46	23.67 ± 2.89	24.81 ± 3.02	0.036
ASA Grade				
Grade I	24 (60%)	25 (62.5%)	22 (55%)	1.422
Grade II	16 (40%)	15 (37.5%)	18 (45%)	
Mallampati Score				
Score I	26 (65%)	16 (40%)	30 (75%)	0.041
Score II	14 (35%)	24 (60%)	10 (25%)	
Airway Intervention				
Present	-	02 (5%)	02 (5%)	0.216

Absent	40 (100%)	38 (95%)	38 (95%)	
Duration of surgery (In min)	14 ± 2.89	16 ±2.18	16 ± 2.76	0.295

Table 2: Comparison of intraoperative and drug dosage requirement between study groups.

Parameter	Group KP1:1 (n=40)	Group KP1:2 (n=40)	Group PF (n=40)	p-value
	Frequency (%)	Frequency (%)	Frequency (%)	
Duration of induction	1.2 ± 0.28	1.5 ± 0.34	1.6 ± 0.47	0.001
Total drug dosage (ml)	6.1 ± 1.77	8.3 ± 2.35	9.2 ± 1.99	0.001
Usage of Rescue analgesia				
Yes	04 (10%)	05 (12.5%)	01 (2.5%)	0.0712
No	36 (90%)	35 (87.5%)	39 (97.5%)	
Failed sedation				
Yes	-	02 (5%)	01 (2.5%)	0.951
No	40 (100%)	38 (95%)	39 (97.5%)	
Incidence of adverse effects				
Yes	06 (15%)	04 (10%)	03 (7.5%)	1.584
No	34 (85%)	36 (90%)	37 (92.5%)	
Recovery time	12 ± 3.17	10 ± 2.18	7 ± 2.23	0.001

Table 3: Comparison of EVANS/PRST scores within study groups.

Scores	Group KP1:1	Group KP1:2	Group PF	p-value
	Mean ± SD	Mean ± SD	Mean ± SD	
EVANS/PRST score				
IOP 5 min	0.11± 0.35	0.06 ± 0.23	-	1.974
IOP 10 min	0.05 ±0.11	0.37 ± 0.44	0.43 ±0.77	0.001
IOP 15 min	0.29 ± 0.38	0.71 ±0.38	0.88 ±0.16	0.05
WB faces pain scale				
POP beginning	0.92 ± 0.35	1.3 ± 0.78	1.3 ± 0.69	1.046
POP 5 min	1.6 ± 0.71	1.8 ± 1.63	1.9 ± 1.55	1.421
POP 10 min	2.1 ± 1.31	2.5 ± 1.20	1.8 ± 1.37	0.001
POP 15 min	2.7 ± 1.45	3.2 ± 1.79	1.9 ± 1.03	0.001

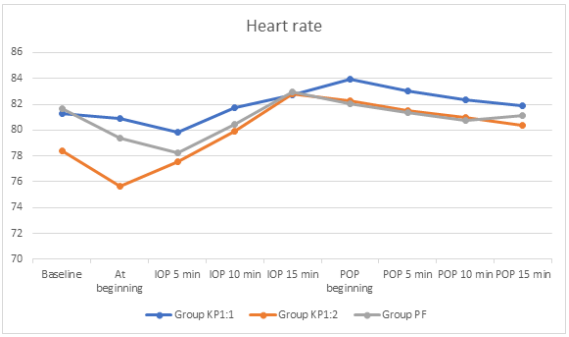

Figure 1: Comparison of mean heart rate between study groups.

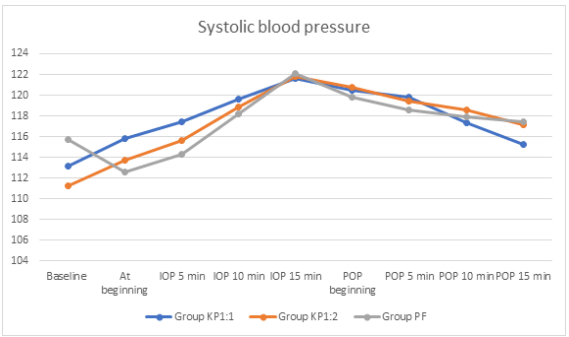

Figure 2: Comparison of mean systolic blood pressure between study groups.

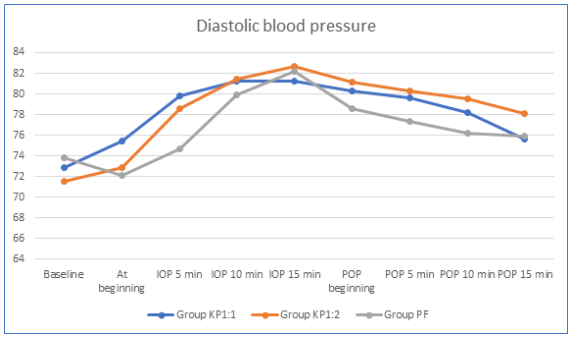

Figure 3: Comparison of mean diastolic blood pressure between study groups.

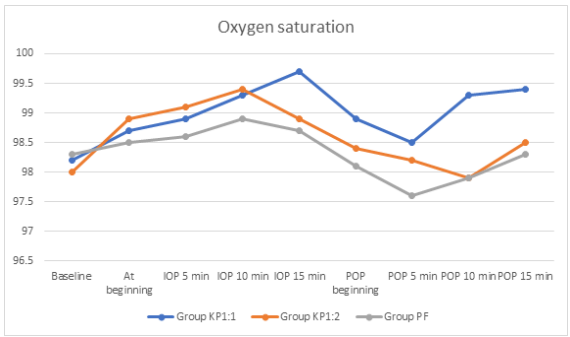

Figure 4: Comparison of mean oxygen saturation levels between study groups.

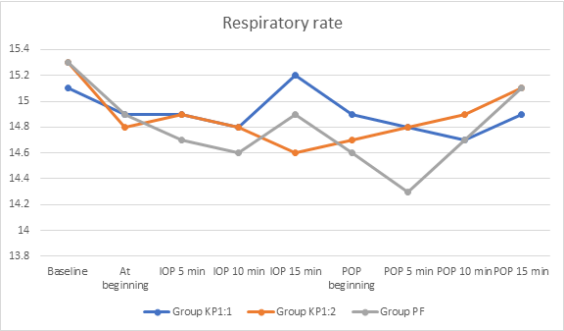

Figure 5: Comparison of respiratory rate between study groups.

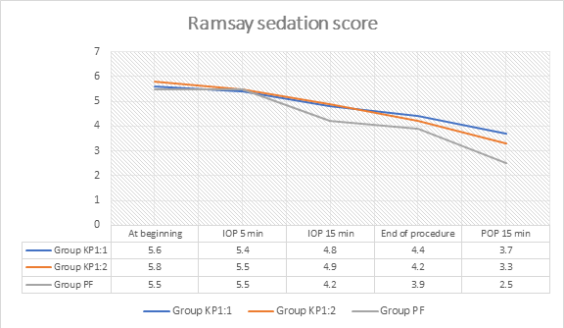

Figure 6: Comparison of Ramsay sedation score between study groups.

DISCUSSION

The predominant participant demographic fell within the age range of 31 to 40 years, exhibiting a mean BMI of 24.75 kg/m², with specific values of 23.67 kg/m² for group KP1:1 and 24.81 kg/m² for group PF, respectively. The majority of participants were classified as ASA grade I and Malampatti score I. The airway intervention was observed in 5% of both group KP1:2 and group PF. The average duration of surgery was recorded as 14 minutes for group KP1:1, 16 minutes for group KP1:2, and 16 minutes for group PF, respectively. The analysis of age, BMI, and Malampatti scores yielded statistically significant results ($p<0.05$) [Table 1]. The average duration of induction was recorded as 1.2 minutes, 1.5 minutes, and 1.6 minutes, while the mean total drug dosage amounted to 6.1 ml, 8.3 ml, and 9.2 ml for groups KP1:1, KP1:2, and PF, respectively. The use of rescue pain relief was noted at 10%, 12.5%, and 2.5%, and side effects were seen in 15%, 10%, and 7.5% of cases in groups KP1:1, KP1:2, and PF, respectively. In group KP1:2, a failed sedation rate was noted at 5%, while group PF exhibited a rate of 2.5%. The average recovery durations were 12 minutes for group KP1:1, 10 minutes for group KP1:2, and 7 minutes for group PF, respectively. The average disparity in the duration of induction, overall drug consumption, and average recovery time was found to be statistically significant ($p<0.05$) [Table 2].

The mean heart rate, mean systolic blood pressure, and mean diastolic blood pressure throughout the study did not reach statistical significance, with the exception of the induction phase ($p<0.05$). The average heart rate was notably higher in group KP1:1 throughout the entire procedure. The mean systolic and diastolic blood pressures were similar across the three study groups throughout the entire study period [Figure 1-3].

At baseline, the mean oxygen saturation was higher in group PF, which subsequently decreased throughout the study in comparison to groups KP1:1 and KP1:2. The average disparity in oxygen saturation was found to be statistically significant across all time intervals between the study groups ($p<0.05$) [Figure 4]. The average respiratory rate exhibited minor variability among the study groups during the intraoperative 15-minute mark, with group PF demonstrating a reduction at the 5-hour postoperative interval. The average disparity in respiratory rate did not reach statistical significance [Figure 5].

The Ramsay sedation score exhibited a notable reduction from the baseline to the 15-minute postoperative interval. The mean difference in Ramsay scores demonstrated statistical significance at 5 minutes, 15 minutes intraoperatively, at the conclusion of the procedure, and 15 minutes postoperatively [Figure 6]. The mean EVANS/PRST score demonstrated statistical significance at intraoperative intervals of 15 minutes ($p=0.001$) and 10 minutes ($p<0.05$). The average WB faces pain scale demonstrated a notable difference at 10 and 15 minutes postoperatively ($p=0.001$) [Table 3].

A study conducted by Damor P et al. involved the random division of 100 female participants into two groups: group P-Inj. received propofol (10 mg/ml) at a dosage of 2 mg/kg for induction and 20 mg for supplementation, while group K-Inj. was administered ketofol (10 mg/ml), which consisted of ketamine 50 mg and propofol 100 mg in a 1:2 ratio, also at 2 mg/kg for induction and 20 mg for supplementation. The findings indicated that the dosage of supplementation needed was markedly greater in the propofol group (800 mg) when contrasted with the ketofol group (20 mg) ($p = 0.00$). The reduction in SBP and DBP was notably smaller in the ketofol group compared to the propofol group ($p < 0.01$). The average awakening time and average recovery time were greater in the ketofol group compared to the propofol group ($p < 0.003$); however, the difference was minimal, less than 1-2 minutes, rendering it clinically insignificant.[1] A study conducted by Naveena P et al. involved the random allocation of 90 cases into two groups. Group A was administered propofol at a dosage of 2.0 mg/kg along with ketamine at 1.0 mg/kg, while Group B received propofol at 1.0 mg/kg and ketamine at 1.0 mg/kg. The findings indicated that group A exhibited a higher sedation score, increased recovery time, a reduced requirement for supplemental doses, and fewer emergence phenomena, all of which were statistically significant when compared to group B. Patients in group B exhibited a notable increase of 10% in

haemodynamic parameters when compared to those in group A.[2]

A randomised double-blind study conducted by Padhi PP et al. involving 140 patients scheduled for elective gynaecological procedures divided participants into two groups. Group A received a ketamine:propofol combination in a 1:4 ratio, while Group B received it in a 1:2 ratio. The findings revealed that the volume of drug required for induction and the time taken to achieve an RSS of 6 were significantly lower in Group B, with P-values of 0.002 and <0.001, respectively. The differences in haemodynamic variables, awakening time, and side effects were not statistically significant between the two groups.[3] A study conducted by Ayatollahi V et al. involving 100 cases of closed reduction of the nose revealed no significant haemodynamic changes between the two groups that were administered propofol/ketamine concentrations of 1:1 and 3:1. Nonetheless, the group administered a higher concentration of propofol experienced a decrease in hallucinations, vomiting, and recovery time. In summary, elevating the concentration of propofol may prove beneficial, resulting in reduced side effects and a shorter recovery time.[4]

Akin A et al. conducted a study involving 40 women scheduled for an endometrial biopsy, categorising them into two groups: group 1 received fentanyl at a dosage of 1 mcg/kg along with propofol at 1 mg/kg, whereas group 2 was administered ketamine at 0.5 mg/kg in combination with propofol at 1 mg/kg. The observed haemodynamic changes and levels of sedation indicate that combinations of fentanyl-propofol and ketamine-fentanyl can be administered safely to patients undergoing endometrial biopsy. Nevertheless, concerning adverse effects and patient contentment, the combination of fentanyl and propofol demonstrated greater efficacy.[5] A study conducted by Oh C et al. involving 120 women set to undergo loop electrosurgical excision procedure indicated that the combination of propofol and ketamine is superior to propofol alone in minimising procedural interference during LEEPs. Nonetheless, elevating the dosage of ketamine did not demonstrate any further advantages.[6] A study conducted by Somanathan RM and colleagues evaluated 90 cases of individuals undergoing gynaecological surgeries, which were randomly assigned to three distinct groups for analysis. Group 1 was administered a ketamine-propofol combination intravenously (IV) at a 1:1 ratio; group 2 was given ketamine-propofol at a 1:2 ratio; and group 3 received a mixture of fentanyl and propofol. The findings indicated that the demographic characteristics and surgical duration were comparable across the three groups. The heart rate, respiratory rate, and both systolic and diastolic blood pressure exhibited comparable values across the groups. The Ramsay sedation score, EVANS/PRST score, and Wong-Bakers pain score demonstrated significance at 15 minutes, at the conclusion of the procedure, and 15 minutes post-procedure.[7]

A study conducted by Mohammad Ahmed Khan et al. involving 90 cases undergoing minor elective gynaecological procedures categorised participants into three groups: Group A (Ketamine: Propofol 1:1), Group B (Ketamine: Propofol 1:2), and Group C (Fentanyl: Propofol). The findings indicated that Group A experienced the quickest induction time (1.15 ± 0.4 mins) but had the longest recovery duration (11 ± 2 mins), whereas Group C exhibited the slowest induction time (1.65 ± 0.5 mins) and the quickest recovery (6 ± 2 mins). The haemodynamic and respiratory parameters exhibited stability across the different groups. Group C demonstrated a notable reduction in postoperative pain scores ($p<0.001$). Instances of adverse effects and airway interventions were infrequent and similar in nature.[8-18] The results of the aforementioned studies align closely with those of the current investigation, particularly regarding similar haemodynamic parameters and minimal adverse effects observed across the study groups.

CONCLUSION

The combination of ketamine and propofol in a 1:1 ratio demonstrates advantages such as expedited induction and reduced drug consumption; however, it is associated with an extended recovery period and diminished postoperative analgesia. The analysis reveals no notable distinctions regarding haemodynamics, the depth of anaesthesia sustained during the procedure, or the occurrence of adverse effects among the three groups studied. The propofol: fentanyl group demonstrates enhanced postoperative pain relief and a more expedited recovery period. This finding suggests that the combination of propofol and fentanyl may be a more effective anaesthetic regimen for improving patient outcomes post-surgery. Further research is warranted to explore the long-term implications of these combinations on recovery and pain management.

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