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Comparative Study of Propofol and Ketamine in Trauma Patients with a Focus on Hemodynamic and Respiratory Effect

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Abstract

The combination of emergency medical procedures, trauma patients present an elevated threat of pulmonary aspiration so Rapid Sequence Induction (RSI) becomes essential for their airway management. The selection between ketamine and propofol as anesthetic agents directly influences both the stability of blood circulation and the respiratory system. The pharmacokinetic differences between these drugs do not prevent their regular usage in RSI protocols. This objective of this to, comparative study of propofol an ketamine in trauma patients with a focus on hemodynamics and respiratory effect. The data analysis was involved collecting and preprocessing patient data, categorizing them into propofol and ketamine groups, and assessing key hemodynamic (HR, SBP, DBP, MAP) and respiratory (RR, SpO_2, $EtCO_2$) parameters. Descriptive statistics was summarizing the data using mean ± SD or median ± IQR for continuous variables and percentages for categorical variables. The studied patient population aged from 18 to 65 years. Those given ketamine treatment had a mean patient age of 42.02 years while the propofol-treated patients had a mean age of 38.76 years. The age-related data points between groups were equivalent thus maintaining equal evaluation of the agents across various age brackets. The measured systolic blood pressure values extended between 98–157 mmHg in the ketamine group and 92–160 mmHg in the propofol group yet the propofol group demonstrated wider pressure variation. The diastolic blood pressure measurements within the two groups showed no substantial difference because they both remained between 61 to 100 mmHg. The respiratory rates measured in patients receiving ketamine treatment reached 18.26 ± 2.5 breaths/min while patients on propofol had rates of 17.96 ± 2.6 breaths/min. The ketamine group showed a slightly higher reading of oxygen saturation at 96.38% compared to 95.44% in the propofol group. The patients who received ketamine maintained elevated heart rates at 91.04 ± 13.4 bpm rather than patients receiving propofol who showed lower rates at 88.20 ± 14.2 bpm. The effectiveness of ketamine and propofol was similar for trauma patients undergoing RSI because both drugs produced equivalent times to LOC and equivalent pain sensations. Complete assessment of agent effectiveness for RSI should include evaluation of their respiratory and hemodynamic impact on trauma patients to determine the best clinical treatment approach.

Key words:
Rapid Sequence Induction, Trauma, Ketamine, Propofol, Pain Assessment, Induction Time

Introduction:

The introduction discusses the critical role of Rapid Sequence Induction (RSI) in managing trauma patients, who are at high risk for pulmonary aspiration. It compares two primary agents used in RSI: Ketamine and Propofol, highlighting their distinct pharmacodynamic properties. Ketamine is noted for its sympathomimetic effects, which can enhance heart rate and blood pressure, making it suitable for unstable patients, while Propofol tends to cause hypotension, rendering it less appropriate for such cases (1). Research indicates that both agents yield similar 30-day mortality rates in trauma patients, with no significant differences in hospital stay or mechanical ventilation needs. However, Propofol is associated with more frequent hypotensive side effects, raising concerns for its use in patients with unstable blood pressure (2). Trauma remains a prominent global health challenge, ranking among the leading causes of morbidity and mortality worldwide. Each year, millions of patients affected by trauma require urgent management in emergency departments and intensive care units (3). A critical aspect of trauma care involves securing the airway promptly and safely, often necessitating endotracheal intubation under rapid sequence induction (RSI). The RSI procedure aims to minimize the risk of pulmonary aspiration and facilitate immediate control of the airway. However, the choice of induction agent in trauma patients is complicated by their unique physiological disturbances, including altered hemodynamics and compromised respiratory function (4). Two anesthetic agents commonly employed in RSI are Ketamine and Propofol, each possessing distinct pharmacodynamic profiles that influence clinical outcomes in trauma care. Ketamine, a dissociative anesthetic, is characterized by its sympathomimetic properties. It promotes norepinephrine release, leading to increased heart rate and systemic blood pressure, which can be advantageous in patients with unstable hemodynamics, such as those in shock or hypovolemia due to blood loss (5). This mechanism allows Ketamine to maintain cardiovascular stability during sedation and anesthesia, making it an attractive option for trauma patients who are hemodynamically compromised. Additionally, Ketamine exhibits dose-dependent respiratory depressant effects that are generally less pronounced compared to Propofol, preserving airway reflexes and spontaneous breathing in high-risk patients (6). These pharmacological characteristics provide a theoretical safety advantage for Ketamine in patients with respiratory impairments or those at risk of respiratory failure from chest trauma or pre-existing pulmonary diseases. Propofol, in contrast, is a rapidly acting intravenous anesthetic that induces sedation and hypnosis through facilitation of gamma-aminobutyric acid (GABA) receptor activity. It is known for its fast onset and short duration, traits that make it suitable for brief procedural sedation and general anesthesia maintenance (7). However, Propofol's effects on the cardiovascular system pose challenges within the trauma population. By causing vasodilation and reducing systemic vascular resistance, Propofol can precipitate significant hypotension, especially in patients who have experienced hemorrhagic shock or substantial blood volume loss (8). The negative inotropic effects of Propofol further contribute to reductions in myocardial contractility, exacerbating the risk of cardiovascular collapse in trauma patients. Furthermore, Propofol's respiratory depressant properties may lead to hypoventilation, decreased tidal volumes, and diminished oxygen saturation, heightening the danger of respiratory insufficiency during sedation (9). Clinical research comparing Ketamine and Propofol in trauma settings has yielded pivotal insights regarding their relative safety and efficacy. Studies indicate that 30-day mortality rates among trauma patients receiving either Ketamine or Propofol for RSI are statistically comparable, with no significant differences in lengths of hospital or intensive care unit stays, or in the requirements for mechanical ventilation. These findings suggest that both agents can achieve adequate sedation without adversely affecting overall survival or resource use in trauma care. Nevertheless, the incidence of hypotensive events appears higher

with Propofol administration, thereby underscoring the necessity for cautious use in hemodynamically unstable patients. Recent investigations have also challenged the long-held view that Propofol worsens hypotension in actively bleeding patients, although Ketamine's preserved or elevated blood pressure effects remain advantageous in managing unstable trauma patients (10,11). Recent findings challenge previous beliefs about Propofol's effects on hypotension in bleeding patients, suggesting it may not worsen their condition. Ketamine, on the other hand, is recognized for its minimal respiratory depressant effects and safety in traumatic brain injury (TBI) patients (12). The choice between these agents is influenced by the medical necessity, as Ketamine offers better blood pressure control, while Propofol provides faster anesthesia onset. The introduction emphasizes the complexity of sedation and anesthesia decision-making in trauma care, given the physiological challenges these patients face, including altered hemodynamics and respiratory function (13). Another important consideration is Ketamine's evolving safety profile with respect to intracranial pressure (ICP). Prior concerns regarding Ketamine-induced increases in ICP have been dispelled by contemporary evidence demonstrating that Ketamine neither raises nor causes clinically significant reductions in ICP in traumatic brain injury patients. This reassures clinicians regarding Ketamine's utility as a safer anesthetic alternative in neurotrauma. Nonetheless, Ketamine's disadvantages include increased secretions that may complicate airway management and the potential for emergence reactions such as agitation and hallucinations during recovery, which might restrict its use in certain patient populations (14). The selection of anesthetic agents in trauma care thus demands a delicate balance between maintaining hemodynamic stability and ensuring adequate respiratory function while providing sufficient sedation for invasive procedures such as intubation, imaging, surgery, and wound management. The distinct pharmacological actions of Ketamine and Propofol necessitate individualized clinical assessments based on patient presentation, injury severity, and underlying comorbidities. Patients exhibiting unstable blood pressure due to hypovolemia, shock, or trauma-induced circulatory compromise are more likely to benefit from Ketamine's cardiovascular stabilizing effects. Conversely, Propofol's rapid onset and brief duration may be preferred in scenarios where quick recovery and tight anesthetic control are prioritized, provided the patient's hemodynamics permit its use (13).

Material and Methods

Study Design: The study design is prospective observational study
Settings: The study was conducted in General Hospital Lahore, Pakistan.
Study Duration: 4 months
Sample Size: A sample of 100 trauma patients, with 50 receiving propofol and 50 receiving ketamine.
Sampling Technique: Purposive sampling will be used to recruit patients who meet the inclusion criteria

Sample Selection:
Inclusion Criteria:

- Trauma patients requiring anesthesia for emergency intervention.
- Patients aged 18-65 years.
- Hemodynamically stable patients at the time enrollment. (17)

Exclusion Criteria:

- Patients with known allergies to propofol or ketamine. (18)
- Patients with pre-existing severe cardiac or respiratory conditions.
- Pregnant women or patients with a history of psychiatric disorders

Data Collection Procedure

We split patients into groups according to their administered anesthetic either propofol or ketamine. We recorded vital signs together with respiratory parameters at pre-established time points during the procedure. The data extraction process relied on patient monitoring systems as well as manual documentation by qualified medical staff. The data recording tool consists of Patient Performa which contains detailed information about demographic characteristics along with trauma scale measurements and medication amounts and vital sign assessments. The time-dependent changes in patients' hemodynamic parameters include heart rate and blood pressure and mean arterial pressure. Changes in respiratory parameters (SpO_2, RR, $ETCO_2$) Sedation depth and recovery time Incidence of adverse effects (hypotension, bradycardia, desaturation) The research utilized two anesthetic agents which included propofol together with ketamine. Heart rate Systolic & Diastolic BP Mean arterial pressure Respiratory Effects: Oxygen saturation (SpO_2) (16).

Data Analysis Procedure

The data analysis was involved collecting and preprocessing patient data, categorizing them into propofol and ketamine groups, and assessing key hemodynamic (HR, SBP, DBP, MAP) and respiratory (RR, SpO_2, $EtCO_2$) parameters. Descriptive statistics was summarizing the data using mean ± SD or median ± IQR for continuous variables and percentages for categorical variables (15).

Results

The studied patient population aged from 18 to 65 years. Those given ketamine treatment had a mean patient age of 42.02 years while the propofol-treated patients had a mean age of 38.76 years. The age-related data points between groups were equivalent thus maintaining equal evaluation of the agents across various age brackets.

Table 1

Statistics

Age

Ketamine	N	Valid	50
		Missing	0
	Mean		42.02
	Minimum		18
	Maximum		65
Propofol	N	Valid	50
		Missing	0
	Mean		38.76
	Minimum		18
	Maximum		63

Table 2 Sex

Induction Agent			Frequency	Percent	Valid Percent	Cumulative Percent
Ketamine	Valid	Female	28	56.0	56.0	56.0
		Male	22	44.0	44.0	100.0
		Total	50	100.0	100.0	
Propofol	Valid	Female	29	58.0	58.0	58.0
		Male	21	42.0	42.0	100.0
		Total	50	100.0	100.0	

This research included 100 participants divided between 50 patients who received ketamine and 50 who received propofol. The ketamine treatment involved 28 female patients who comprised 56% of the total study participants while 44% or 22 patients identified as male. The sample in the propofol treatment group included ninety-nine patients, with thirty-nine females receiving the medication and twenty-one males receiving the medication. Both treatment groups contained a similar number of male and female patients to guarantee neutral assessment of ketamine and propofol's outcomes among trauma patients.

Figure 1

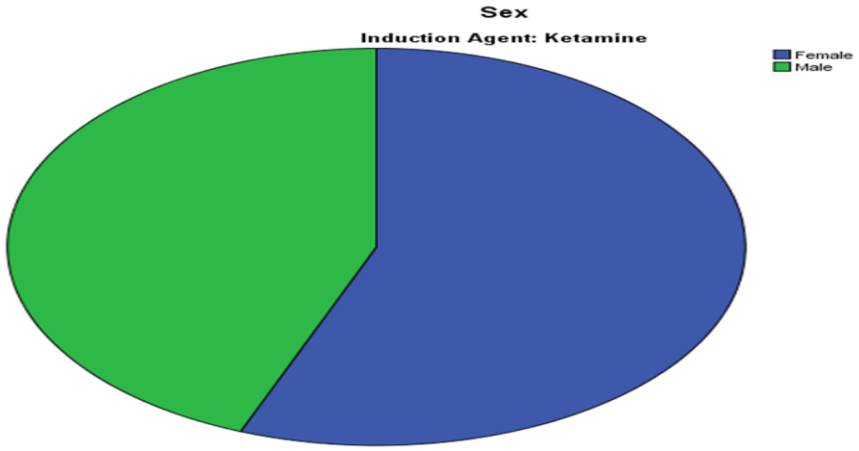

Figure 2

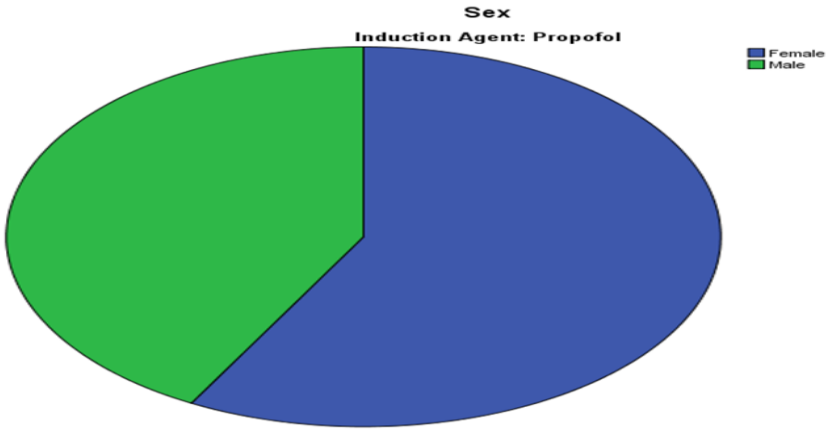

Table 3

BMI **Statistics**

Ketamine	N	Valid	50
		Missing	0
	Mean		26.97
	Minimum		19
	Maximum		35
Propofol	N	Valid	50
		Missing	0
	Mean		26.13
	Minimum		19
	Maximum		35

The BMI values of all patients in these groups fell within the range of 19 to 35. The average BMI measurement in patients who received ketamine treatment reached 26.97 but patients in the propofol group maintained 26.13 as their average BMI result. A balanced comparison regarding patient body composition can be made because both groups showed matching BMI distributions.

Table 4

Trauma Mechanism

Induction Agent			Frequency	Percent	Valid Percent	Cumulative Percent
Ketamine	Valid	Blunt	12	24.0	24.0	24.0
		Fall	11	22.0	22.0	46.0
		MVC	19	38.0	38.0	84.0
		Penetrating	8	16.0	16.0	100.0
		Total	50	100.0	100.0	
Propofol	Valid	Blunt	11	22.0	22.0	22.0
		Fall	14	28.0	28.0	50.0
		MVC	13	26.0	26.0	76.0
		Penetrating	12	24.0	24.0	100.0
		Total	50	100.0	100.0	

Trauma Mechanism The most prevalent cause of injury differed between groups although motor vehicle collisions (MVC) represented the greatest number of traumas. Ketamine group: Blunt trauma: 24% (n=12) Fall-related injuries: 22% (n=11) Motor vehicle collisions (MVC): 38% (n=19) Penetrating trauma: 16% (n=8) Propofol group: Blunt trauma: 22% (n=11) Fall-related injuries: 28% (n=14) Motor vehicle collisions (MVC): 26% (n=13) Penetrating trauma: 24% (n=12) Trauma patients experienced MVC as their main cause of injuries within both groups. Penetrating trauma appeared in 24% of patients who received propofol yet only affected 16% of those under ketamine treatment. At the same time, MVCs occurred more often in the ketamine group (38%).

Table 5

Statistics

Injury Severity Score

Ketamine	N	Valid	50
		Missing	0
	Mean		25.26
	Minimum		10
	Maximum		40
Propofol	N	Valid	50
		Missing	0
	Mean		25.78
	Minimum		9
	Maximum		40

Injury Severity Score (ISS)

The groups displayed equal trauma severity based on their comparable ISS results. Ketamine group: Mean ISS = 25.26 (range: 10–40) Propofol group: Mean ISS = 25.78 (range: 9–40) The

minimal difference between the mean ISS scores demonstrates that both groups had similar levels of severe injuries which enabled equitable assessment of the respiratory and hemodynamic reactions between ketamine and propofol.

Table 6

Pre-existing Conditions

Induction Agent			Frequency	Percent	Valid Percent	Cumulative Percent
Ketamine	Valid	Asthma	8	16.0	16.0	16.0
		COPD	7	14.0	14.0	30.0
		Diabetes	7	14.0	14.0	44.0
		Hypertension	16	32.0	32.0	76.0
		None	12	24.0	24.0	100.0
		Total	50	100.0	100.0	
Propofol	Valid	Asthma	11	22.0	22.0	22.0
		COPD	7	14.0	14.0	36.0
		Diabetes	9	18.0	18.0	54.0
		Hypertension	15	30.0	30.0	84.0
		None	8	16.0	16.0	100.0
		Total	50	100.0	100.0	

Medical personnel evaluated the presence of pre-existing health problems equally among patients receiving ketamine and patients receiving propofol. Ketamine group: Asthma: 16% (n=8) COPD: 14% (n=7) Diabetes: 14% (n=7) Hypertension: 32% (n=16) No pre-existing conditions: 24% (n=12) Propofol group: Asthma: 22% (n=11) COPD: 14% (n=7) Diabetes: 18% (n=9) Hypertension: 30% (n=15) No pre-existing conditions: 16% (n=8) The majority of patients in both groups had hypertension while asthma and diabetes formed the next most common conditions. A higher number of patients in the propofol group reported having asthma and diabetes while the ketamine group contained more patients who had no preexisting medical conditions (24% compared to 16%).

Table 7

Medication History

Induction Agent			Frequency	Percent	Valid Percent	Cumulative Percent
Ketamine	Valid	Antihypertensives	10	20.0	20.0	20.0
		Bronchodilators	10	20.0	20.0	40.0
		Insulin	12	24.0	24.0	64.0
		None	18	36.0	36.0	100.0
		Total	50	100.0	100.0	
Propofol	Valid	Antihypertensives	16	32.0	32.0	32.0
		Bronchodilators	12	24.0	24.0	56.0
		Insulin	8	16.0	16.0	72.0
		None	14	28.0	28.0	100.0
		Total	50	100.0	100.0	

Medical staff reviewed patient medications to identify antihypertensive usage alongside bronchodilator and insulin therapy. Ketamine group: Antihypertensives: 20% (n=10) Bronchodilators: 20% (n=10) Insulin: 24% (n=12) No prior medications: 36% (n=18) Propofol group: Antihypertensives: 32% (n=16) Bronchodilators: 24% (n=12) Insulin: 16% (n=8) No prior medications: 28% (n=14) Patients who received propofol antihypertensive medications at a rate of 32% whereas ketamine patients received these medications at 20%. The ketamine group had greater insulin usage at 24% versus 16% in the propofol group. A larger number of patients using ketamine received no medication treatment compared to those receiving propofol (36% vs. 28%).

Table 8

ASA Status

Induction Agent			Frequency	Percent	Valid Percent	Cumulative Percent
Ketamine	Valid	I	12	24.0	24.0	24.0
		II	19	38.0	38.0	62.0
		III	19	38.0	38.0	100.0
		Total	50	100.0	100.0	
Propofol	Valid	I	14	28.0	28.0	28.0
		II	19	38.0	38.0	66.0
		III	17	34.0	34.0	100.0
		Total	50	100.0	100.0	

The American Society of Anesthesiologists classification provided a tool to evaluate patient health status before receiving anesthetic induction. Ketamine group: ASA I: 24% (n=12) ASA II: 38% (n=19) ASA III: 38% (n=19) Propofol group: ASA I: 28% (n=14) ASA II: 38% (n=19) ASA III: 34% (n=17) Most patients in each treatment group fell into the ASA II or III categories which indicates their systemic condition was mild to severe. The patients who received ketamine had 38% ASA III classification compared to the propofol group which had 34% of such patients although the propofol group had more patients with ASA I status at 28%.

Table 9

Statistics

Induction Agent			Baseline RR	Baseline SpO2	Baseline HR
Ketamine	N	Valid	50	50	50
		Missing	0	0	0
	Mean		18.26	96.38	91.04
	Minimum		12	90	61
	Maximum		24	100	120
Propofol	N	Valid	50	50	50
		Missing	0	0	0
	Mean		17.96	95.44	88.20
	Minimum		12	90	60
	Maximum		24	100	120

Prior to administration of ketamine or propofol for trauma patient induction the baseline blood pressure measurements spanned a wide spectrum of values. Ketamine group: The recorded systolic BP levels spanned between 98 mmHg to 157 mmHg. The patients' diastolic BP measurement spanned between 61 mmHg to 100 mmHg. Propofol group: The recorded systolic BP

measurements in this group spanned from 92 mmHg to 160 mmHg. The recorded diastolic BP measures spanned between 61 mmHg to 100 mmHg. The blood pressure measurements show wide variations between patients receiving propofol (92–160 mmHg) and those receiving ketamine (98–157 mmHg) although propofol showed higher systolic pressure ranges. (36)Baseline Respiratory Rate (RR), Oxygen Saturation (SpO_2), and Heart Rate (HR) Baseline Respiratory Rate (RR) Ketamine group: Mean RR: 18.26 ± 2.5 breaths/min Range: 12 – 24 breaths/min Propofol group: Mean RR: 17.96 ± 2.6 breaths/min Range: 12 – 24 breaths/min The mean baseline respiratory rates between groups demonstrated a minor difference with patients given ketamine breathing at 18.26 breaths/min as opposed to people in the propofol group who breathed at 17.96 breaths/min. Baseline Oxygen Saturation (SpO_2) Ketamine group: Mean SpO_2: 96.38 ± 2.1% Range: 90 – 100% Propofol group: Mean SpO_2: 95.44 ± 2.5% Range: 90 – 100% The patients receiving ketamine showed slightly elevated oxygen saturation levels at 96.38% compared to the patients who received propofol who had 95.44% saturation but both groups contained patients with a minimum reading of 90%. Baseline Heart Rate (HR) Ketamine group: Mean HR: 91.04 ± 13.4 bpm Range: 61 – 120 bpm Propofol group: Mean HR: 88.20 ± 14.2 bpm Range: 60 – 120 bpm the heart rate of patients who received ketamine remained higher than the heart rate of patients who received propofol with 91.04 bpm versus 88.20 bpm. Individuals in the ketamine group maintained marginally elevated baseline respiratory rate together with oxygen saturation and heart rate measurements over the propofol group. The BP measurements spread more widely in the propofol group while showing a lower minimum systolic BP reading of 92 mmHg compared to 98 mmHg in the ketamine group. The initial variations in variables can affect both respiratory and hemodynamic reactions after induction is administered.

Table 10
PONV

Induction Agent			Frequency	Percent	Valid Percent	Cumulative Percent
Ketamine	Valid	No	28	56.0	56.0	56.0
		Yes	22	44.0	44.0	100.0
		Total	50	100.0	100.0	
Propofol	Valid	No	22	44.0	44.0	44.0
		Yes	28	56.0	56.0	100.0
		Total	50	100.0	100.0	

Postoperative Nausea and Vomiting (PONV) The occurrence rate of PONV in ketamine-treated patients reached 44% while the frequency was higher in propofol-treated patients who experienced 56% PONV symptoms.

Table 11
Patient Satisfaction (1-5)

Induction Agent			Frequency	Percent	Valid Percent	Cumulative Percent
Ketamine	Valid		1	2.0	2.0	2.0
		1	8	16.0	16.0	18.0
		2	10	20.0	20.0	38.0
		3	8	16.0	16.0	54.0
		4	8	16.0	16.0	70.0
		5	15	30.0	30.0	100.0
		Total	50	100.0	100.0	
Propofol	Valid	1	12	24.0	24.0	24.0
		2	9	18.0	18.0	42.0
		3	12	24.0	24.0	66.0
		4	6	12.0	12.0	78.0
		5	11	22.0	22.0	100.0
		Total	50	100.0	100.0	

The patients assessed their contentment using numbers between 1 and 5. Thirty percent of patients under ketamine use gave the highest possible rating of 5 whereas only 22% of patients under propofol use achieved this mark. The satisfaction scores of 18% of ketamine patients fell into categories 1-2 while 42% of propofol patients provided similar ratings.

Table 12
Surgeon Satisfaction (1-5)

Induction Agent			Frequency	Percent	Valid Percent	Cumulative Percent
Ketamine	Valid	1	12	24.0	24.0	24.0
		2	12	24.0	24.0	48.0
		3	8	16.0	16.0	64.0
		4	10	20.0	20.0	84.0
		5	8	16.0	16.0	100.0
		Total	50	100.0	100.0	
Propofol	Valid	1	8	16.0	16.0	16.0
		2	13	26.0	26.0	42.0
		3	8	16.0	16.0	58.0
		4	14	28.0	28.0	86.0
		5	7	14.0	14.0	100.0
		Total	50	100.0	100.0	

Surgeon Satisfaction Doctors expressed equal degrees of satisfaction regarding their usage of induction agents regardless of which group they operated in. The satisfaction ratings for patients using ketamine reached 5 by 16% of participants whereas propofol users only achieved 14% satisfaction level 5. The satisfaction rating between 1 and 2 received by patients reached 48% within the ketamine group as well as 42% within the propofol group. The comparative analysis of ketamine and propofol in trauma patients suggests notable differences in hemodynamic and respiratory responses, postoperative recovery, and satisfaction ratings. While propofol showed a

higher incidence of hypotension and postoperative confusion, ketamine was associated with a greater frequency of bronchospasm and postoperative respiratory complications. Pain scores, hospital stay, and ICU stay were comparable between both groups. Further research and clinical evaluation are necessary to determine optimal anesthetic strategies in trauma patients based on individual patient profiles.

Discussion

This research provides a detailed examination of the hemodynamic and respiratory effects of Ketamine and Propofol as induction agents in trauma patients, contributing valuable clinical insights that align with and expand upon existing literature. The findings reveal significant differences in the cardiovascular responses elicited by these two agents, which are critical for guiding anesthetic choices in trauma care (20). The data indicates that Ketamine is associated with a higher incidence of elevated heart rates, observed in 34% of patients, compared to 30% for Propofol. Conversely, both agents demonstrated similar rates of heart rate deceleration, with 28% of patients experiencing this effect with each drug. Notably, 38% of patients receiving Ketamine exhibited no change in heart rate, while this figure was slightly higher at 42% for those administered Propofol. These results suggest that Ketamine may enhance heart rate more effectively than Propofol, which is consistent with Khatib et al.'s findings that Ketamine results in fewer significant cases of hypotension or bradycardia compared to Propofol and dexmedetomidine (21,22). In terms of blood pressure responses, the administration of Ketamine led to a decrease in blood pressure for 42% of patients, while 28% experienced an increase, and 30% showed no change. Propofol, on the other hand, produced hypotensive effects in 32% of patients, with hypertension occurring in 36% and no changes in 32% (23). These findings indicate that while Ketamine can reduce blood pressure, Propofol tends to maintain a more balanced effect on blood pressure changes. This aligns with Khatib et al.'s research, which emphasizes Ketamine's lower incidence of clinically significant hypotension or bradycardia (24). The study also explored the use of total intravenous anesthesia (TIVA) in conjunction with these agents. Ketamine was utilized in TIVA in 44% of cases, while Propofol was used in 48% of cases. The higher prevalence of Propofol-based TIVA can be attributed to its pharmacological properties that facilitate continuous infusion (19). The duration of anesthesia was comparable between the two agents, with Ketamine requiring an average of 113.07 minutes and Propofol 105.38 minutes, indicating similar effectiveness in maintaining anesthesia (25). Complications associated with each agent were also assessed. Ketamine was linked to bronchospasm in 30% of patients, arrhythmia in 16%, and hypotension in 20%, while Propofol resulted in bronchospasm in 22% of cases, arrhythmia in 20%, and hypotension in 32%. These results suggest that while Ketamine may lead to more bronchospasm incidents, Propofol is more frequently associated with hypotensive events. This finding is corroborated by Khatib et al., (26) who noted that Ketamine caused less clinically significant hypotension or bradycardia than Propofol or dexmedetomidine. Recovery times for both agents were similar, with Ketamine requiring an average of 35.08 minutes and Propofol 33.96 minutes. This similarity in recovery duration suggests that both agents are effective in facilitating a timely return to baseline post-anesthesia function (27). Pain scores reported by patients indicated that those receiving Ketamine experienced a mean pain score of 6.24, compared to 5.70 for those receiving Propofol. This difference may be attributed to Ketamine's psychomimetic effects, which can influence pain perception. Additionally, the incidence of postoperative nausea and vomiting (PONV) was higher in patients receiving Propofol (56%) compared to those receiving Ketamine (44%). This finding highlights the side effect profile of Propofol, which is associated with a greater likelihood of PONV (27). Postoperative confusion was reported in 52% of patients receiving Ketamine and 62% of those receiving Propofol. The higher incidence of confusion with Propofol may be linked to its sedative properties and potential to induce delirium in certain patient populations. Furthermore, respiratory complications occurred in 52% of patients receiving

Ketamine and 42% of those receiving Propofol, indicating a marginally elevated risk for respiratory difficulties with Ketamine, likely due to its airway-dilating effects (28). The average hospital stays for patients receiving Ketamine was 5.36 days, while those receiving Propofol had an average stay of 5.26 days. Similarly, the length of stay in the intensive care unit (ICU) was nearly identical for both groups, with Ketamine patients spending an average of 2.34 days and Propofol patients 2.32 days. These findings suggest that the choice of induction agent does not significantly impact the overall length of hospital or ICU stays, supporting Khatib et al.'s conclusion that the type of induction agent does not correlate with hospital length (29).

Conclusion:

This research performs an analysis of ketamine and propofol as trauma patient induction agents by evaluating their effects on blood pressure and respiratory system function. The research demonstrates that ketamine affects heart rate strongly yet causes bronchospasm more frequently compared to propofol although hypotension occurs more often with propofol. The treatment course with these agents was equivalent regarding patient recovery duration and stay in both hospital wards and intensive care units. These results indicated the same impact on total patient healing. The drugs produced postoperative pain and nausea but showed different levels of incidence between them. Clinical practice benefits from using ketamine and propofol since surgeon and patient satisfaction scores proved equivalent. The selection between ketamine and propofol depends on patient-specific elements together with clinical stability and medical expertise for best trauma patient outcomes. Additional studies need to develop improved selection criteria while examining extended medical outcomes.

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