Section: Anaesthesiology

Original Research Article

TO EVALUATE THE EFFECTIVENESS OF A SUBANESTHETIC DOSAGE OF KETAMINE IN MITIGATING EMERGING AGITATION AMONG ADULT PATIENTS UNDERGOING ELECTIVE LAPAROSCOPIC APPENDICECTOMY UNDER GENERAL ANAESTHESIA

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Abstract

Background: To evaluate the effectiveness of a subanesthetic dosage of ketamine in mitigating emerging agitation among adult patients undergoing elective laparoscopic appendicectomy under general anaesthesia. **Materials and Methods:** The total number of patients, amounting to 120, was allocated into two distinct groups. Group 1, consisting of 60 patients, received normal saline, whereas Group 2, also including 60 patients, received ketamine. This research covered patients within the age range of 20 to 50 years and classified as ASA PS I and II. In all patients, a series of routine examinations were conducted, including assessments of complete blood count, blood grouping ,PT/INR , blood sugar levels, blood urea levels, serum creatinine levels, HIV, HBsAg, HCV, chest X-ray with a posteroanterior view, and electrocardiography (ECG). **Result:** The average age of adult patients in Group 1 and Group 2 was 31.01± 3.33 and 31.11 ± 2.98, respectively, with a p-value greater than 0.05. The observed value does not demonstrate statistical significance. It was observed that the hemodynamics of Group 2 exhibited more stability in comparison to Group 1 throughout the process of extubation. This discrepancy was shown to possess statistical significance. In the present investigation, it was observed that none of the patients in group 2 had EA, as evaluated by the RSAS, in contrast to group 1. Furthermore, it was shown that patients in group 2 had either no pain or significantly reduced pain, as quantified by the NRS, in the postoperative phase in comparison to patients in group 1. The observed discrepancy has statistical significance. **Conclusion:** The levels of postoperative pain experienced by patients in Group 2 were much lower when compared to those in Group 1. No negative consequences were seen in any of the groups. Thus, it may be inferred that administering a dosage of 0.2 mg/kg of ketamine 20 minutes before to the conclusion of surgery is an efficacious method for reducing ED in adult patients after general anaesthesia.

INTRODUCTION

The phenomenon of emergence agitation (EA) has been recognised as a potential consequence of the recovery process after general anaesthesia. Emergence Agitation (EA) is a phenomenon seen in the first stages of recovery after general anaesthesia, when patients exhibit symptoms such as agitation, perplexity, and excitement. Additionally, episodes of uncontrolled crying are often observed during this period. The manifestation of this syndrome may include symptoms such as nausea, vomiting, and respiratory depression. Additionally, it has been shown that this condition may lead to an elevation in myocardial oxygen consumption, heart rate, and blood pressure.[1] The therapeutic use of ketamine, a substance that acts as an antagonist for the N-methyl-D-aspartate (NMDA) receptor, was first introduced in the 1970s for the purposes of anaesthetic induction and maintenance.[2]

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Nonetheless, the prevalence of psychotomimetic adverse effects associated with ketamine anaesthesia (administered intravenously at a dosage of 1-2 mg/kg) including dissociation, postoperative cognitive impairment, hallucinations, and nightmares, has significantly constrained the use of ketamine. In recent times, there has been a growing interest in the therapeutic use of subanesthetic ketamine at doses below 1 mg/kg. This interest stems from its potential advantages in postoperative pain management, as well as its effectiveness in reducing agitation and depression. Notably, it has been noted that the administration of subanesthetic ketamine does not lead to a substantial rise in psychotomimetic effects.[3] According to recent recommendations, it is recommended to include a subanesthetic ketamine bolus, with a maximum dosage of 0.35 mg/kg, or infusions, with a maximum dosage of 1 mg•kg−1•h−1, as a supplementary measure to opioids for perioperative analgesia. Moreover, as stated by Gorlin et al., the optimal dosage of subanesthetic ketamine for preventing postoperative complications, such as dissociative states, is recommended to be 0.1–0.3 mg/kg as a bolus and 0.1 to 0.3 mg•kg−1•h−1 as an infusion.[4] Sevoflurane is an inhalation anaesthetic that presents a potential danger hazard. Although there is a contention that youngsters are more prone to experiencing EA, studies have suggested that the incidence of EA among adults might reach up to 21.4%.[5] The prevention of this may be achieved with the administration of ketamine at a sub-anaesthetic dosage.

MATERIALS AND METHODS

This prospective research was conducted inside the department of anesthesiology after approval from the institutional ethics council. The total number of patients, amounting to 120, was allocated into two distinct groups. Group 1, consisting of 60 patients, received normal saline, whereas Group 2, also including 60 patients, received ketamine. This research covered patients within the age range of 20 to 50 years and classified as ASA PS I and II. The trial excluded individuals who had a serious systemic disease, those who had previous allergic responses to the study medicine, and individuals who were pregnant or breastfeeding. The patient's comprehensive medical history, thorough physical examination, and systemic assessment were conducted at the preoperative assessment. In all patients, a series of routine examinations were conducted, including assessments of complete blood count , blood grouping, PT/INR, blood sugar levels, blood urea levels, serum creatinine levels, HIV, HBsAg, HCV, chest X-ray with a posteroanterior view, and electrocardiography (ECG). Demographic characteristics such as age, gender, height, and weight were documented, and signed informed permission was acquired.

Methodology: Following the transfer of the patients to the operation room, standard monitors in accordance with the American Society of Anesthesiologists (ASA) guidelines, including Non-invasive blood pressure (NIBP), electrocardiogram (ECG), and Pulse Oximeter (SpO2), were appropriately attached. Additionally, an 20 Gauge Intravenous line was securely established. The baseline vital parameters of blood pressure (BP), heart rate (HR), and peripheral capillary oxygen saturation (SpO2) were recorded. The patients were assigned to each group by computer-generated randomization, ensuring that each group had a total of 60 patients. The patients had preoxygenation with 100% oxygen for a duration of 3 minutes. They were then administered premedication consisting of Inj.Glycopyrrolate at a dosage of 4µ/kg, Inj Nalbuphine at a dosage of 0.15mg/kg, Inj. Midazolam at a dosage of 0.02mg/kg, and ondansetron at a dosage of 0.1mg/kg. The patient underwent induction with intravenous administration of Propofol at a dosage of 2mg/kg. Following the confirmation of sufficient mask breathing, the patients were administered intravenous Vecuronium at a dosage of 0.1mg/kg to induce paralysis. Prior to intubation, measurements were taken for heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), and peripheral capillary oxygen saturation (SpO2). Following the successful placement of the endotracheal tube, the maintenance of anaesthesia was achieved by the use of a combination of nitrous oxide, oxygen in a ratio of 60:40, and sevoflurane at a concentration of 2%. The study medication is diluted to a volume of 5 milliliters by an anesthesiologist who is not involved in the research investigation. In the first group, a total of 60 patients were administered normal saline 20 minutes prior to the conclusion of the surgical procedure. In the second group, a total of 60 patients were administered a dosage of 0.2mg/kg of ketamine 20 minutes prior to the conclusion of the surgical procedure. During the intraoperative period, many hemodynamic variables are monitored, including heart rate, blood pressure, oxygen saturation, and end-tidal carbon dioxide (EtCO2) levels.The administration of the study medication is performed by an anesthesiologist who is not involved in the research, about 20 minutes prior to the conclusion of the surgical procedure. Following the initiation of autonomous respiration, the reversal of neuromuscular blockade is accomplished with the administration of Inj. Neostigmine at a dosage of 0.05mg/kg and Inj. Glycopyrrolate at a dosage of 8µg/kg. The assessment of emerging agitation in patients was conducted at the time of extubation and in the PACU using the Ricker sedation agitation scale. Pain levels were evaluated using the Numerical Rating Scale.

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RESULTS

The average age of adult patients in Group 1 and Group 2 was 31.01± 3.33 and 31.11 ± 2.98, respectively, with a p-value greater than 0.05. The observed value does not demonstrate statistical significance. The participants in our research were matched in terms of gender across both experimental groups. In our research, the distribution of gender among both group 1 and group 2 patients was 63.33% male and 36.67% female. The average weight distribution of adult patients in group 1 was 72.21± 6.69, whereas in group 2 it was 71.11± 6.87. The p-value, which is more than 0.05, indicates that the observed difference is not statistically significant. The average height distribution of adult patients in group 1 is 165.33± 3.69 inches, whereas in group 2 it is 165.11± 3.47 inches. The p-value, which is more than 0.05, indicates that the difference in height between the two groups is not statistically significant. The distribution of American Society of Anesthesiologists (ASA) levels was found to be similar in both groups. In group 1, the distribution of adult patients based on ASA level was 80% in ASA 1 and 20% in ASA 2. In group 2, the distribution was 86.67% in ASA 1 and 13.33% in ASA 2. The statistical analysis indicated that the p-value, which was more than 0.05, suggests that the observed differences between the two groups are not statistically significant. In the conducted investigation, it was observed that the hemodynamics of Group 2 exhibited more stability in comparison to Group 1 throughout the process of extubation. This discrepancy was shown to possess statistical significance. In the present investigation, it was observed that none of the patients in group 2 had EA, as evaluated by the RSAS, in contrast to group 1. Furthermore, it was shown that patients in group 2 had either no pain or significantly reduced pain, as quantified by the NRS, in the postoperative phase in comparison to patients in group 1. The observed discrepancy has statistical significance.

Table 1: Basic profile of the participants

Gender	Group 1		Group 2		P value
	Number/ Mean	Percentage	Number/ Mean	Percentage	
Male	38	63.33	38	63.33	0.21
Female	22	36.67	22	36.67	
Age(in years)	31.01± 3.33		31.11 ± 2.98		0.33
Height (in cm)	165.33± 3.69		165.11± 3.47		0.14
weight (in kg)	72.21± 6.69		71.11± 6.87		0.18
ASA levels					
Grade1	48	80	52	86.67	
Grade2	12	20	8	13.33	
Time toExtubate	5.11±0.58		4.11±0.33		0.01
RASS	5.09±0.47		4.06±0.15		0.01
NRS	5.22±0.26		4.23±0.14		0.01

Table 2:Heart rate (bpm) of patients

Heart Rate (bpm)	Group 1	Group 2	P value
BL	88.25±4.58	86.33±4.36	0.23
SI	90.14±2.69	90.03±3.74	0.34
15 min	94.21±3.54	94.61±4.78	0.15
30min	90.02±3.98	90.41±3.74	0.27
45min	88.74±3.74	89.47±3.66	0.22
60min	89.01±4.41	88.12±4.15	0.14
Ext	110.29±4.45	92.63±3.74	0.001
10min	107.96±4.63	88.88±3.87	0.001
20min	106.38±4.11	87.52±3.89	0.001
30min	105.34±5.85	88.64±4.66	0.001

Table 3: SBP (mm of Hg) of patients

SBP(mmHg)	Group 1	Group 2	P value
BL	113.98±6.36	114.37±6.36	0.36
SI	114.22±6.74	114.74±6.74	0.29
15 min	113.54±6.19	113.87±6.47	0.41
30min	113.11±5.85	113.44±5.74	0.44
45min	113.01±5.69	113.24±5.19	0.12
60min	113.54±4.89	113.74±4.87	0.27
Ext	129.89±6.69	120.87±6.66	0.001
10min	124.06±6.17	117.09±5.87	0.001
20min	127.99±5.33	111.94±5.19	0.001
30min	128.69±4.63	112.96±4.31	0.001

Table 4: DBP (mm of Hg) of patients

DBP (mmHg)	Group 1	Group 2	P value
BL	77.01±4.36	77.15±4.25	0.22

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SI	72.11±4.11	72.35±4.78	0.14
15 min	70.06±3.96	70.12±3.88	0.15
30min	68.98±3.58	69.05±3.65	0.34
45min	68.78±3.66	68.99±3.74	0.18
60min	69.26±3.33	69.75±3.47	0.14
Ext	79.06±3.19	71.14±3.47	0.001
10min	84.17±3.19	81.57±3.47	0.03
20min	80.04±3.11	76.22±3.21	0.001
30min	93.11±3.22	86.31±3.15	0.001

Table 5: MAP (mmhg) of patients

MAP(mmHg)	Group 1	Group 2	P value
BL	93.11±3.74	93.22±3.84	0.36
SI	88.07±3.74	88.14±3.69	0.24
15 min	87.02±3.63	87.36±3.65	0.19
30min	83.22±3.33	83.45±3.47	0.17
45min	81.98±3.63	82.31±3.54	0.33
60min	82.03±3.74	82.14±3.65	0.27
Ext	86.33±3.44	82.06±.363	0.001
10min	98.00±2.98	88.06±3.11	0.001
20min	93.33±2.89	85.69±2.98	0.001
30min	87.01±2.77	81.06±2.86	0.001

Table 6: SPO2 of patients

SPO2	Group 1	Group 2	P value
BL	100.02±6.85	100.12±6.96	0.25
SI	99.98±6.55	99.99±6.36	0.34
15 min	99.96±5.67	99.99±5.55	0.14
30min	99.95±5.63	99.98±5.36	0.11
45min	99.89±5.74	99.94±5.65	0.21
60min	99.88±5.45	99.91±5.54	0.39
Ext	99.88±5.55	99.97±5.19	0.41
10min	99.89±5.47	99.95±5.54	0.45
20min	99.89±5.44	99.97±5.25	0.22
30min	99.89±5.74	99.99±5.33	0.15

DISCUSSION

Our research contained a sample of 120 patients, with ages ranging from 20 to 50 years. The purpose of this study was to compare the mean ages of two groups utilising matched data. There is a lack of significant variance seen in the age distribution. The average age of adult patients in Group 1 and Group 2 was found to be 31.01± 3.33 and 31.11 ± 2.98, respectively. Statistical analysis revealed that there was no significant difference in age between the two groups, as shown by a p-value greater than 0.05. The observed value does not demonstrate statistical significance. In their study, Radtke et al. (2011) categorised participants into three distinct age cohorts: 18 to 39 years, 40 to 64 years, and 65 years and over. Their findings indicated that those in the younger and older age groups had a greater likelihood of acquiring EA compared to those in the middle-aged group. In contrast, several studies have shown that persons in younger age groups tend to feel EA with greater frequency. Rim et al. and Rose have shown that advanced age is associated with an increased risk of EA.[6,7]Demirey, Yozkay, et al. conducted a new research with a sample of 140 individuals below the age of 18 who had elective rhinoplasty surgery. The 70 patients in the control group (saline group) and the 70 patients in the experimental group (ketamine group) were assigned randomly to two separate groups. The administration of intravenous (i.v.) solutions occurred around twenty minutes before to the completion of the surgical procedure. Specifically, the saline group was given a 1 ml dose of saline, whereas the ketamine group got a dosage of 0.5 mg/kg of ketamine. The researchers discovered that administering a sub-anaesthetic dosage of ketamine is very effective in mitigating emergence agitation. This conclusion was reached after comparing the efficiency of ketamine to a placebo in preventing emergence agitation among patients who were set to undergo rhinoplasty.[8] The participants in our research were matched in terms of gender across both groups. In our research, the distribution of gender among patients in both group 1 and group 2 was found to be 63.33% male and 36.67% female. It is expected that the prevalence of EA in females would exceed that in males, given the aforementioned correlation between postoperative pain and EA. In contrast, the present study revealed a much greater prevalence of EA in males compared to females. The potential contribution of lower pain tolerance in men to this outcome has been suggested.[9] Prior research has also shown that males have a higher propensity to report pain and use patient-controlled analgesia to a greater extent than females. In this investigation, a noteworthy correlation was seen between the male gender and postoperative pain (NRS > 6). The average weight distribution of adult patients in group 1 was 72.21±

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6.69, whereas in group 2 it was 71.11± 6.87. The p-value, which is more than 0.05, indicates that the observed difference is not statistically significant. The average height distribution of adult patients in group 1 is 165.33± 3.69 inches, whereas in group 2 it is 165.11± 3.47 inches. The p-value, which is more than 0.05, indicates that the difference in height between the two groups is not statistically significant. The distribution of American Society of Anesthesiologists (ASA) levels was found to be similar in both groups. In group 1, the distribution of adult patients based on ASA level was 80% in ASA 1 and 20% in ASA 2. In group 2, the distribution was 86.67% in ASA 1 and 13.33% in ASA 2. The statistical analysis revealed that the p-value, which was more than 0.05, indicated a lack of significance. Choi et al. performed a research examining the impact of ketamine administration on the occurrence of emerging agitation in paediatric patients having tonsillectomy and adenoidectomy while under sevoflurane general anaesthesia. The participants were randomly assigned to one of three groups: group C, which received saline; group K0.25, which received a dosage of 0.25 mg/kg of ketamine; or group K0.5, which received a dosage of 0.5 mg/kg of ketamine. The research drugs were administered to the youngsters in each group ten minutes before the procedure concluded. No significant differences were seen in the extubation time, delivery time, postoperative nausea and vomiting, agitation, or other recovery characteristics, including the time to extubation, delivery time from the PACU, and pain, among the three groups. The ratings obtained from the Modified CHEOPS (Children's Hospital of Eastern Ontario Pain Scale) showed a statistically significant difference among the three groups. In comparison to the control group, the occurrence of emerging agitation was seen to be minimal in the K0.25 and K0.5 groups. There was no statistically significant difference seen between the K0.25 and K0.5 groups. The researchers reached the result that administering Ketamine at doses of 0.25 mg/kg and 0.5 mg/kg, 10 minutes before the completion of surgery, effectively prevented emergence agitation (EA) in paediatric patients after sevoflurane anaesthesia, without causing any delay in the recovery process. The researchers reached the conclusion that administering a dosage of 0.5 mg/kg of ketamine was effective in preventing emergence agitation (EA) after general anaesthesia with sevoflurane. However, it was observed that this dosage also resulted in a longer duration of anaesthesia due to a slower recovery process.[10] In the conducted study, the administration of the minimum subanaesthetic dosage of ketamine, namely 0.2 mg/kg, was used in order to mitigate the occurrence of emerging agitation. The assessment of emergence agitation was conducted via the Ricker Sedation-Agitation Score Scale. In the conducted investigation, it was observed that the hemodynamics of Group 2 exhibited more stability in comparison to Group 1 throughout the process of extubation. This disparity was shown to be statistically significant. In the present investigation, it was shown that none of the patients in group 2 exhibited the development of EA, as evaluated by the Revised Scale for RSAS, as compared to group 1. Furthermore, it was observed that patients in group 2 had either no pain or significantly reduced pain, as assessed by the NRS, in comparison to patients in group 1 throughout the postoperative phase. The observed discrepancy has statistical significance. Despite the implementation of pain-free techniques, EA has been shown to occur, irrespective of pain severity. It is important to note that pain serves as a significant risk factor for both paediatric and adult populations.[11] The results of this study indicate that there is a distinction between EA and postoperative pain as independent clinical occurrences. However, it is challenging to differentiate between EA and behavioural alterations that may be attributed to postoperative pain. The study revealed that there was a higher occurrence of EA when individuals had a score above five points on a numerical rating scale used for the measurement of postoperative pain.[12] The incidence of EA may be influenced by the effectiveness of postoperative pain treatment. In 2016, a research was conducted by David Dety et colleagues to investigate the use of intravenous sub-anesthetic ketamine for perioperative analgesia.[13] The topic under consideration is the administration of a subanaesthetic bolus dose of intravenous ketamine for the management of postoperative pain. The research on Caesarean Section was conducted by Anil Kumar et al. The study consisted of a total of 108 parturients, who were separated into three groups, with each group consisting of 36 parturients. Group C was administered a 2 ml dosage of 0.9% normal saline solution, while Group Ka got a dosage of ketamine at a rate of 0.15 mg per kilogramme of body weight. Additionally, Group Kb was administered a dosage of ketamine at a rate of 0.3 mg per kilogramme of body weight, after a 5-minute interval. The control group exhibited notably higher postoperative VAS ratings, whereas the Ka group (5.44 ± 1.48 h) and Kb group (6.18 ± 1.48 h) demonstrated considerably longer durations until the first analgesic need (1.45 h and 1.61 h, respectively) compared to the control group (4.97 ± 1.48 h). Furthermore, there were also observed negative consequences. When comparing with group C (mean ± standard deviation: 136.11 ± 48.71 mg), both the Ka group (mean ± standard deviation: 194.44 ± 53.15 mg) and the Kb group (mean ± standard deviation: 152.78 ± 50.63 mg) exhibited a considerably reduced total number of doses and total dosage of rescue analgesic (tramadol) necessary during a 24-hour period. The researchers reached the conclusion that the administration of sub-anesthetic dosages of intravenous ketamine at 0.15 mg/kg and 0.3 mg/kg is an effective method for reducing postoperative analgesia. Furthermore, the administration of ketamine at a dosage of 0.3 mg/kg

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resulted in an extended duration of the first need for postoperative rescue analgesics.[14] In 2019, Tan et al. conducted a meta-analysis to evaluate the efficacy of several drugs in mitigating emerging agitation among paediatric patients after ocular surgery. The researchers reached the conclusion that ketamine is an efficacious method for reducing the incidence of emerging agitation in paediatric patients.[15] In a publication from 2019 authored by Idress Ali et al, a randomised assignment was conducted on a cohort of 60 children aged 3 to 15 who were scheduled to have adenotonsillectomy. The intervention included administering a low-dose of ketamine at a dosage of 0.15 mg/kg, followed by intravenous administration of propofol at a dosage of 0.45 mg/kg. A group of 60 children, ranging in age from 3 to 15 years, were administered a solution of normal saline and dextrose 10 minutes before to the conclusion of the treatment, as an alternative to the ketofol (1:3) group. Furthermore, it was observed that the control group had a substantially greater heart rate compared to the group of children who had been administered ketofol during tracheal extubation ($P < 0.05$). The researchers reached the conclusion that the administration of ketamine and propofol results in a considerable reduction in postoperative agitation among paediatric patients who had undergone adenotonsillectomy.[16] Achyut Sharma et al. conducted a research to evaluate the impact of ketamine and the combination of ketamine with midazolam on the manifestation of developing agitation. The current study included a sample of 94 patients, aged between two and ten years, who were scheduled for ophthalmic operations. The study design was a prospective randomised controlled experiment. A total of 45 subjects were randomly allocated to two groups: group K, which received ketamine, and group KM, which received a combination of ketamine and midazolam. Group K received an intravenous administration of Ketamine at a dosage of 0.3 mg/kg, whereas Group KM received an intravenous administration of Ketamine at a dosage of 0.3 mg/kg in combination with Midazolam at a dosage of 0.03 mg/kg. The study recorded the heart rate observed throughout surgical procedures, as well as the occurrence of post-operative emergence agitation. Additionally, the study documented the duration of recovery and the time at which patients were discharged. The study revealed a significant decrease in the occurrence of agitation among participants in the ketamine group. The researchers reached the conclusion that the efficacy of ketamine as a standalone agent in reducing agitation after sevoflurane administration is comparable to the combination administration of ketamine and midazolam in ocular surgical procedures. The occurrence of emergence agitation (EA) in the control group was found to be 54.3%, but in the ketamine group, it was seen to be just 8.6% immediately after extubation. This difference was statistically significant, with a p-value of 0.001. In the ketamine group, there was a lack of occurrence of emergence agitation (EA) in the PACU with a statistically significant p-value of 0.001. Conversely, the control group exhibited an EA incidence of 28.6% in the PACU. The researchers reached the conclusion that the administration of sub-anesthetic doses of ketamine effectively prevented the development of agitation in adult patients.[17] The research conducted by Sayed et al. examined the effectiveness of ketamine in mitigating agitation among children undergoing magnetic resonance imaging while being administered face mask sevoflurane. The study included a sample of 120 children, aged 2 to 7, who were classified as ASA I or II and of either gender. The participants were randomly assigned to three groups: the saline group ($n = 40$), which was administered normal saline, the ketamine 0.25 group ($n = 40$), which received an intravenous dose of 0.25 mg/kg of ketamine 10 minutes before the procedure concluded, and the ketamine 1.0 group ($n = 40$), which received an intravenous dose of 1.0 mg/kg of ketamine prior to sevoflurane induction. There were no statistically significant variations seen among the age, weight, or ASA grade of the groups under study. In comparison to the groups administered with ketamine 0.25 and saline, the children in the ketamine 1.0 group had substantially reduced EA ratings ($P < 0.05$). Significant reductions in EA ratings were seen in the ketamine 0.25 groups as compared to the saline group ($P < 0.05$). The administration of ketamine as a premedication shown efficacy in reducing emergence agitation (EA) in children undergoing MRI scans. This effect was seen without causing any delay in recovery. Furthermore, the incidence of halting MRI scans was considerably reduced in the group receiving a ketamine dosage of 1.0 compared to the groups receiving ketamine dosage of 0.25 and saline. This difference was found to be statistically significant with a p-value of less than 0.05.[18]

According to a randomised clinical study conducted by Mohammed et al., the administration of ketamine has been seen to reduce postoperative pain and mitigate developing agitation in children after adenotonsillectomy. A total of 66 children, aged 5 to 15, who had elective adenotonsillectomy, were randomly allocated into two groups. During the induction of anaesthesia, subjects in the control group were given 5 ml of normal saline, while those in the ketamine group received a dosage of 0.25 mg/kg of ketamine in a 5 ml volume. The emerging agitation score of the ketamine group shown a significant decrease ($P = 0.002$). The pain score of the ketamine group was consistently lower than that of the control group at all time points, with statistical significance ($p < 0.05$). The group administered with ketamine exhibited a significant reduction in their intravenous paracetamol requirements ($P = 0.0036$). The researchers reached the conclusion that the administration of modest dosages of ketamine for the purpose of inducing anaesthesia resulted in a reduction of both agitation

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and pain experienced by children undergoing tonsillectomy.[12] In 2014, Manal et al. conducted a study to examine the comparative impact of intravenous administration of propofol, fentanyl, or ketamine, in small dosages, on the incidence and severity of emergence agitation caused by sevoflurane in children undergoing hypospadias repair surgery. The administration of these drugs occurred at the conclusion of the surgery, shortly before the withdrawal of sevoflurane. In comparison to the ketamine and control groups, the researchers saw a significant decrease in the occurrence of developing agitation within the propofol plus fentanyl group. Although the PACU duration was considerably extended in the fentanyl cohort, the period required for regaining consciousness was shown to be notably delayed in the propofol, ketamine, and fentanyl cohorts. With the exception of a significantly higher occurrence of vomiting seen in the fentanyl group, no significant adverse effects were reported.[19] Kim et al. conducted a study to examine the impact of preoperative administration of midazolam and ketamine on the occurrence of EA in paediatric children aged 2-6 years who were having ocular surgery under sevoflurane anaesthesia. The participants were randomised in a random manner to receive premedication with either 0.1 mg/kg of midazolam or 1 mg/kg of ketamine. The incidence of EA and postoperative pain levels were documented at 10-minute intervals in the post-anesthetic care unit. The study revealed that ketamine had superior efficacy in preventing emergence agitation compared to midazolam.[20]

CONCLUSION

In the present research, it was observed that none of the patients in Group 2 exhibited any signs of EA, however in Group 1, the occurrence of EA was evident. Furthermore, the levels of postoperative pain experienced by patients in Group 2 were much lower when compared to those in Group 1. No negative consequences were seen in any of the groups. Thus, it may be inferred that administering a dosage of 0.2 mg/kg of ketamine 20 minutes before to the conclusion of surgery is an efficacious method for reducing emergence delirium (ED) in adult patients after general anaesthesia.

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