MAR Clinical Case Reports (2023) 4:10

Research Article

Comparison of Midazolam with Ketamine as Premedication in Children

Dr. Aman Agarwal MD[1], Dr. Parmanand Mandawaria MD*[2], Dr. Rajendra Prasad Koduri MD, EDAIC[3]

***Correspondence to:** Dr. Parmanand Mandawaria.

Received: 27 September 2023

Published: 01 October 2023

Abstract

Background: Fear of operation, injections, physicians and peculiar operation theatre environment where children are separated from their parents prior to anesthesia invariably produce traumatic experiences in tender mind of young children. Midazolam and Ketamine are useful for premedication in children to allay anxiety, allow separation from parents and to ensure smooth induction.

Introduction

Anxiety is a normal reaction of a child to a strange situation. The main reason for premedicating children before surgery is to decrease their anxiety and allow smooth separation from parents.

Anesthesiologists have been confronted for a long time with the problems imposed by pre-anesthetic preparation of children who require surgical intervention. The chief problem is to prevent psychic and emotional trauma, mucous secretions during general anaesthesia, reflex hyperactivity and respiratory depression. Davenport and Werry (1970) stressed that to allay the anxiety of the patients is of particular importance in pediatric practice where separation from parents is needed.

These problems can be reduced by psychological preparation. However pharmacologic adjunct may be more reliable and better suited for efficient use of operating room time than just psychological preparation. It is very important to have a sedated child in the operation theatre as "an anesthetic room littered with equipment and obvious presence of syringes and needles will only increase any anxiety".

An ideal premedication in children should always be safe and preferably easy to administer. It should at least lessen the salivary secretion, suppress the undesirable reflexes and if possible, prevent preoperative and postoperative nausea and vomiting. One can never be affirmative about the properties of an ideal premedicate and it is best left to the discretion of the anesthesiologist and should be tailored according to the need of the patient.

Premedication may be administered orally, intramuscular, intravenously, rectally or nasally. Orally the onset is delayed, intramuscular injection hurts and may result in abscess formation. Rectal medication sometimes makes the patient feel uncomfortable and occasionally causes burn. Nasal medication can cause irritation. IV administration may cause pain. Thus no premedication or route of administration is ideal. Orally chloral

hydrate and barbiturates were widely used.

Ketamine is commonly used for pre-anesthetic sedation in children because of many reasons. It has a rapid predictable onset of action (1 to 2 minutes) after IV injection It provides sufficient sedation without concomitant cardio-respiratory depression and adequate amnesia to preclude any emotional trauma that may be associated with the induction of anaesthesia. It is compatible with all generally accepted anesthetic agents and techniques. It has broad margin of safety However, there are certain drawbacks associated with the use of ketamine. It has stimulant action on heart rate, stroke index, blood pressure and myocardial Oxygen It increases cerebral oxygen consumption, cerebral blood flow and CSF pressure. It can be dangerous in patients with intracranial pathology, in whom they are most marked It also stimulates tracheobronchial secretions.

Therefore, controversy exists regarding the idealness of ketamine as a premedicate in children. Midazolam, a water soluble benzodiazepine has been used as premedication in children by various routes - I.M., I. V., P.O. It has advantage of rapid onset and relatively short duration of action.. Although intramuscular route is painful but it is easy to administer and onset of effect is rapid. In our study we have compared midazolam (0. 05mg/kg X IV) and ketamine (0.5 mg/kg x IV) in children in 2-12 years age group.

Aims of Study

The aims and objectives of the present study are to compare Midazolam with Ketamine as a premedicate in children with regards to -

- Onset and degree of preoperative sedation.
- Facilitation of induction.
- Effect on vital parameters- Heart rate, Blood Pressure, Respiration and O2 Saturation.
- Complications.

PHARMACOLOGY OF MIDAZOLAM

Midazolam is a short acting, water soluble benzodiazepine used as a sedative and anaesthetic induction agent. Because of its water solubility, it is well tolerated locally at the sites of intravenous or intramuscular injection. Another notable feature of midazolam is the good cardiovascular stability associated with its use.

MECHANISM OF ACTION:

Midazolam has anxiolytic, hypnotic, anticonvulsant, muscle relaxant and anterograde amnestic effects. The mechanism of action of midazolam is not clearly understood, however, it is probably similar to that of other benzodiazepines i.e. through interference with the reuptake of the inhibitory neurotransmitter gamma-aminobutyric acid (GABA), thereby, causing accumulation of GABA.

PHARMACOKINETICS:

Midazolam is rapidly absorbed following intramuscular administration with a bioavailability greater than 90%. The peak effect of midazolam is reached within 15-30 minutes following intramuscular injection. Midazolam is widely distributed in the body including cerebrospinal fluid and brain. It is extensively bound to plasma proteins. Midazolam is rapidly metabolized to 1-hydroxy-methyl midazolam and 4-hydroxymidazolam. The pharmacological activity of these metabolites is negligible as compared to that of parent compound. Midazolam is excreted mainly through the renal route a s glucuronide conjugates. Less than 0.03% of an intravenous dose is excreted unchanged. The elimination half-life of midazolam is about 2.5 hours.

Midazolam is INDICATED

- for preoperative sedation
- for conscious sedation prior to short diagnostic or endoscopic procedures
- for induction of general anesthesia prior to administration of other anesthetic agents.

Midazolam is CONTRAINDICATED in patients with a known hypersensitivity to benzodiazepines. patients with acute narrow angle glaucoma.

DOSAGE AND ADMINISTRATION:

Midazolam is a potent sedative agent and requires slow administration and individualization of dosage. Midazolam injection is compatible with 5% Dextrose in water, 0.9% sodium chloride and lactated Ringer's solution.

The recommended dose of midazolam for **Preoperative sedation** in pediatric patients below the age of years is 3.75 to 7.5 mg X PO administered about 1 hour before surgery.

PRECAUTIONS:

Impairment of psychomotor skills may occur following midazolam sedation or anaesthesia. Possible adverse effects on the patient's ability to drive or perform other tasks requiring alertness and coordination should be kept in mind when midazolam is administered for an outpatient procedure.

ADVERSE REACTIONS:

Fluctuation in vital signs are the most frequently seen effects following parenteral administration of midazolam. Apnea may occur in some patients following intravenous administration. Local effects at the I.V. site include pain during injection, redness and phlebitis.

PHARMACOLOGY OF KETAMINE

Ketamine was synthesized in 1962 by Stevens and first used in humans in 1965 by Corssen and Domino. It was chosen from among 200 phencyclidine derivatives and proved to be the most promising in laboratory animal testing. Ketamine was released for clinical use in 1970 and is still used in variety of clinical settings. Ketamine is different from most other anaesthetic induction agents because it has significant analgesic effect. It usually does not depress the cardiovascular and respiratory systems, but it does possess some of the worrisome adverse psychological effects found with other phencyclidines. Ketamine has a molecular weight of 238, is partially water soluble, and forms a white crystalline salt with a pa of 7.5. It has lipid solubility 5 to 10 times that of thiopental. Ketamine is prepared in slightly acidic solution.

METABOLISM of Ketamine is by hepatic microsomal enzymes responsible for most drug detoxification. These products are conjugated to water soluble glucuronide derivatives and excreted in urine.

PHARMACOKINETICS of ketamine has not been as well studied as those of many other intravenous anesthetics. Ketamine pharmacokinetics have been examined after bolus administration of anesthetizing doses (2 to 2.5 mg/kg) , following a sub-anaesthetic dose (0.25 mg/kg) and after continuous infusion. The high lipid solubility of ketamine is reflected in its relatively large volume of distribution, nearly 3L/Kg. Clearance is also relatively high, ranging from 890 to 1,227 ml/min, which accounts for the relatively short elimination half-life of 2 to 3 hours.

The **RESPIRATORY** effects of ketamine are minimal. There can be a transient (1 to 3 minute) decrease in minute ventilation after the bolus administration of an anesthetizing dose of ketamine (2mg/kg-IV). Unusually high doses can produce apnoea, but this is seldom seen.

Ketamine is a bronchial smooth muscle relaxant. when it is given to patients with reactive airway disease and bronchospasm, pulmonary compliance is improved. A potential respiratory problem, especially in children, is the increased salivation that follows ketamine.

Ketamine also has unique **CARDIOVASCULAR** effects, it stimulates the cardiovascular system and is usually associated with increase in blood pressure, heart rate, and cardiac output. The increase in hemodynamic variables is associated with increased work and myocardial Oxygen consumption.

INDICATIONS:

Ketamine has an important niche in the practice of anesthesiology when its unique sympathomimetic activity and broncho-dilating capabilities are indicated during induction of anaesthesia.

Ketamine is particularly suited for **SEDATION** of the pediatric patients undergoing different procedures. Paediatric patients have less adverse emergence reaction than adults, which makes its use in pediatrics more versatile.

DOSES AND ROUTES OF ADMINISTRATION:

Ketamine can be administered intravenously, intramuscularly , orally and rectally. The vast majority of clinical use involves the intravenous and intramuscular routes, by which the drug rapidly achieves therapeutic levels, The dose depends on the desired therapeutic effect and the route of administration.

MATERIAL AND METHODS

The present study titled "Comparison of Midazolam with Ketamine as a premedicate in children" was undertaken in the Departments of Anesthesiology, in various SEHA Hospitals, UAE. The study comprised of sixty children requiring general anaesthesia for various routine surgical operations. 'All patients were ASA grade I or II aged 2-12 years, and were of either sex. The patients were divided into two groups and premedication given as follows.

GROUP A patients received midazolam 0. 05 mg/Kg X IV with Glycopyrrolate 0.01 mg/kg in preoperative room with parents side by side

GROUP B patients received ketamine 0.5 mg/Kg x IV with Glycopyrrolate 0.01 mg /kg in preoperative room with parents side by side

SELECTION OF PATIENTS

Children booked for elective surgery were selected for this study.

The patients with diseases of cardiovascular system, respiratory system and central nervous system were excluded from the study.

PREANAESTHETIC ASSESSMENT

A thorough preoperative examination was done in Anesthesiology OPD and all relevant investigations were done. All ASA grade I & II patients were put up for surgery within 3-5 days. All patients were examined clinically again on the day of operation and parameters noted down on prescribed proforma. IV Cannula was inserted in the ward after applying EMLA cream for the prescribed duration. Premedication was given 15-30 minutes before induction of anaesthesia in preoperative room and they were observed for the following parameters.

OBSERVATIONS:

I Patients were observed every five minutes for Heart Rate, Respiratory Rate, Blood Pressure and Oxygen Saturation.

II Sedation scoring was done between 5 minutes and 10 minutes according to following criteria.

1. Asleep
2. Drowsy, responds to verbal commands or gentle stimulation
3. Awake, calm and quiet
4. Awake, anxious, distressed

III Facilitation of induction was judged according to the following criteria.

1.Excellent, unafraid, cooperative or asleep.

2. Good, slight fear or crying but easily reassured

3. Fair, moderately fearful or crying, not amenable to reassurance.

4.Poor, crying needs restraint.

IV The patients were also assessed for presence of any side effects or complications during perioperative period.

1. Increased secretions
2. Nausea/Vomiting
3. Restlessness
4. Laryngospasm

ANAESTHETIC TECHNIQUE

Most of the patients underwent Surgery for Hernia, Hydrocele, Undescended testes and Phimosis. Induction was done with inhalational Anaesthetic Sevoflurane. Airway was managed with Classic LMA. All patients received Fentanyl for analgesia. All patients received Ondansetron for Nausea/Vomiting. During surgery the patients were monitored for heart rate, blood pressure, respiration and 02 Saturation. The progress was recorded in computerized chart automatically. After Surgery patients were shifted to PACU when child was calm, free of pain, normal respiration and well Oxygenated.

The data was analyzed statistically for assessment of clinical significance. If the 'P' value was less than 0.05 the change was considered significant. The 'P' value was calculated from 't' value of the data.

OBSERVATIONS

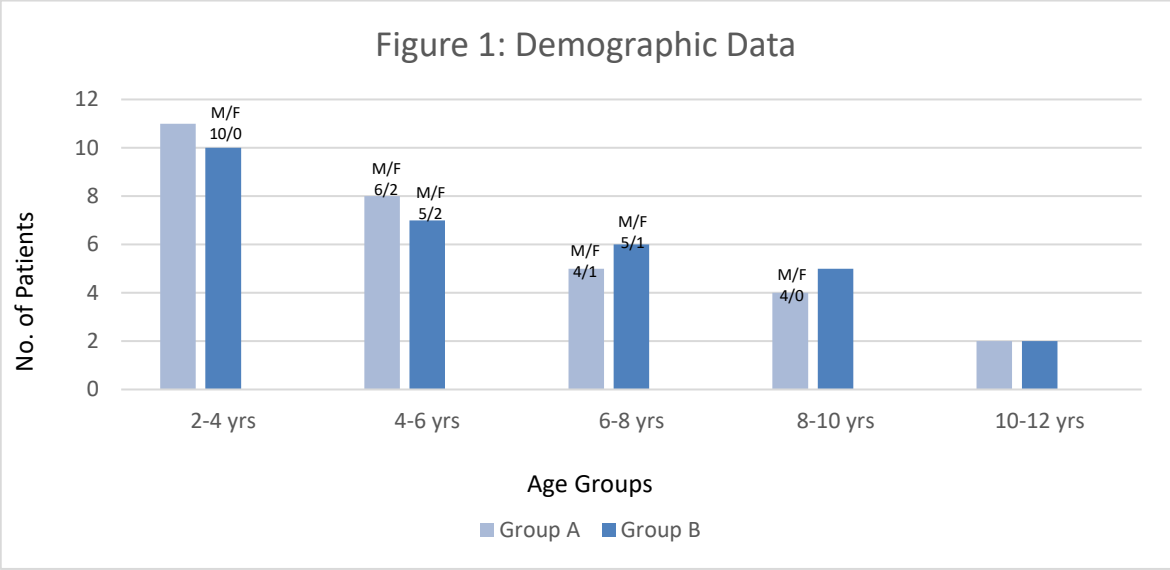
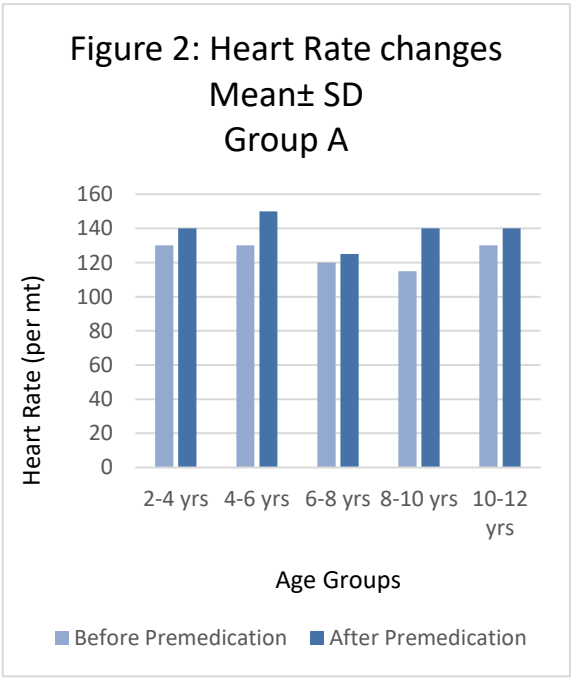


Table 1: Demographic Data

	2-4 yrs	4-6 yrs	6-8 yrs	8-10 yrs	10-12
GROUP A MIDAZOLAM					
No. of Pts	11	8	5	4	2
Sex M/F	10/1	6/2	4/1	4/0	2/0
Bodywt (kg)	11.8 ±3.48	13.62 ±1.65	17.4 ±2.87	22.5 ±4.33	21.5 ±8.5
GROUP B KETAMINE					
No of Pts	10	7	6	5	2
Sex M/F	10/0	5/2	5/1	3/2	1/1
Body wt (kg)	10.8 ±0.74	13.6 ±2.5	14.7 ±2.47	21.6 ±2.15	24.5 ±0.5

Table 1 Figure 1: The number of patients and their weights were comparable in all age groups In both Group A and Group B



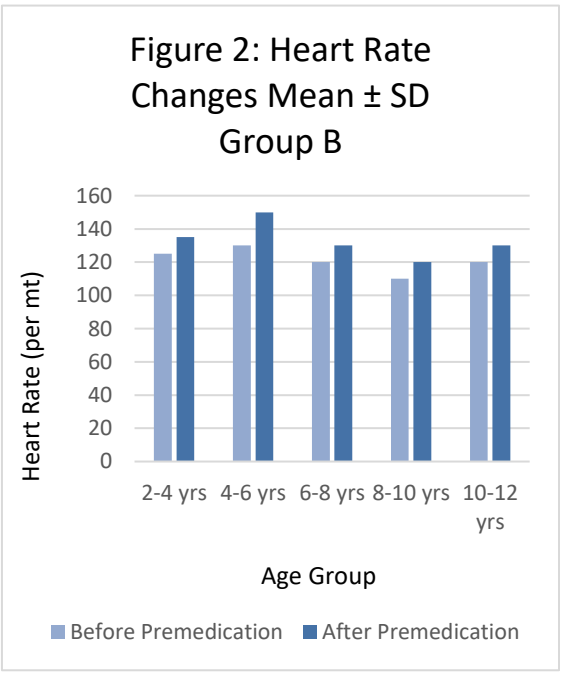
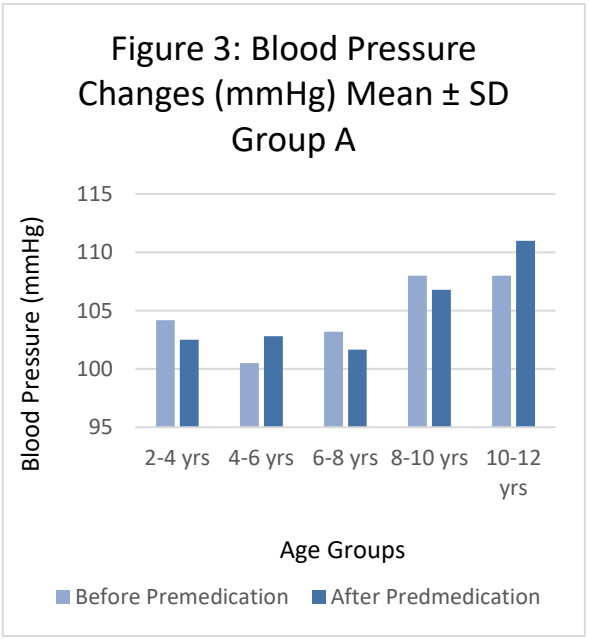


Table 2. Heart Rate Changes Mean ±SD

Age Group	Group A			Group B		
	Before premedication	After Premedication	t value	Before premedication	After Premedication	t value
2-4 yrs	129.6 ±11.17	138.18 ±16.36	7.6	124.0 ±16.8	134.6 ±16.8	8.05
4-6 yrs	127.75 ±9.29	144.25 ±9.13	9.42	130.5 ±12.94	146.0 ±10.02	12.12
6-8 yrs	114.4 ±17.31	122.8 ±20.4	4.34	119.0 ±15.13	131.33 ±17.38	7.49
8-10 yrs	105.5 ±21.96	130.5 ±16.6	11.42	110.4 ±9.91	119.6 ±11.95	6.22
10-12 yrs	123.0 ±3.0	137.0 ±5.0	9.89	113.0 ±3.0	122.0 ±2.0	8.08

Table 2 Figure 2 : In Group A patients , changes in heart rate in all age groups were satisfactorily significant after premedication when compared to control value. In Group B also the heart rate changes after premedication were satisfactorily significant after premedication when compared to control value.



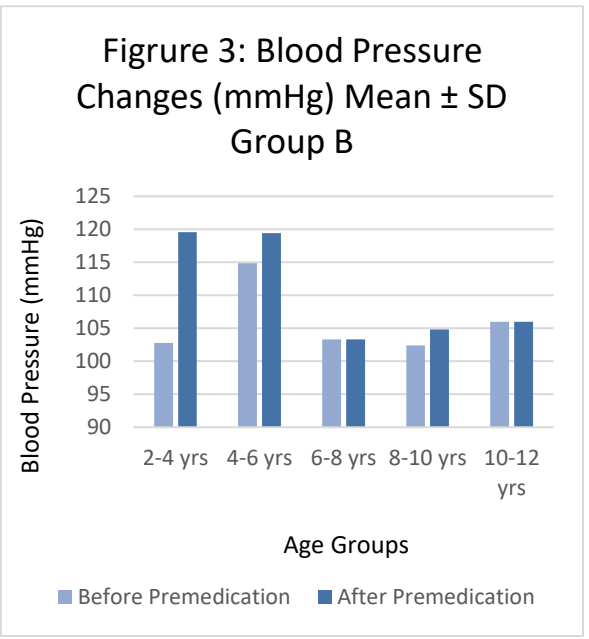
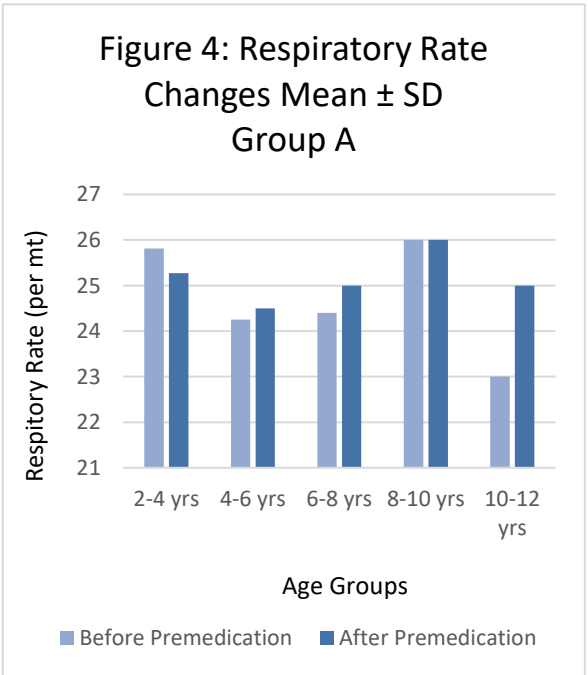


Table 3: Blood Pressure Changes (mmHg) Mean ±SD

Age Group	Group A			Group B		
	Before premedication	After Premedication	t value	Before premedication	After Premedication	t value
2-4 yrs	104.18 ±8.79	102.5 ±3.82	2.21	102.8 ±6.76	119.55 ±20.9	14.24
4-6 yrs	100.5 ±6.3	102.8 ±20.48	1.77	114.85 ±13.4	119.4 ±15.48	3.16
6-8 yrs	103.2 ±5.74	101.66 ±6.87	3.4	103.33 ±6.28	103.33 ±6.28	0
8-10 yrs	108.0 ±4.6	106.8 ±7.54	0.97	102.4 ±4.63	104.8 ±5.15	2.42
10-12 yrs	108.0 ±8.0	111.0 ±1.0	2.0	106.0 ±2.0	106.0 ±2.0	0

Table 3 Figure 3 : In Group A patients, the change in Systolic BP after premedication was satisfactorily significant in 6 to 8 years age group only.

In Group B, changes in Systolic BP were satisfactorily significant after premedication in 2-4 years, 4-6 years in 8-10 years age groups while changes in 6-8 years and 10-12 years age groups were insignificant.



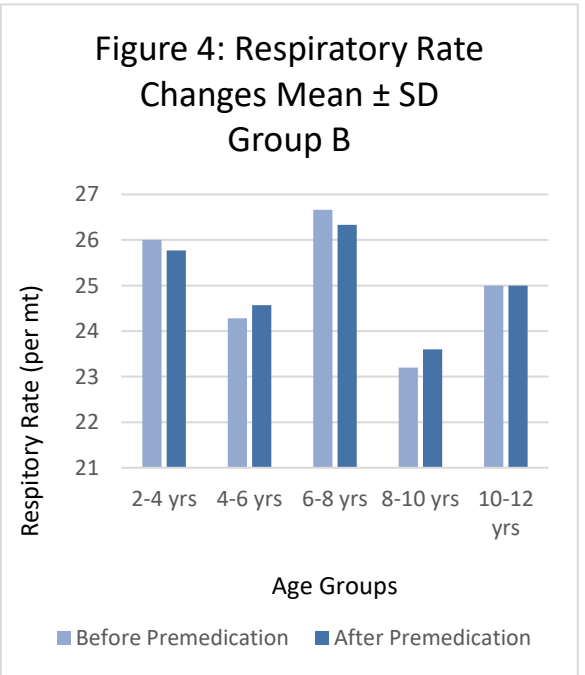
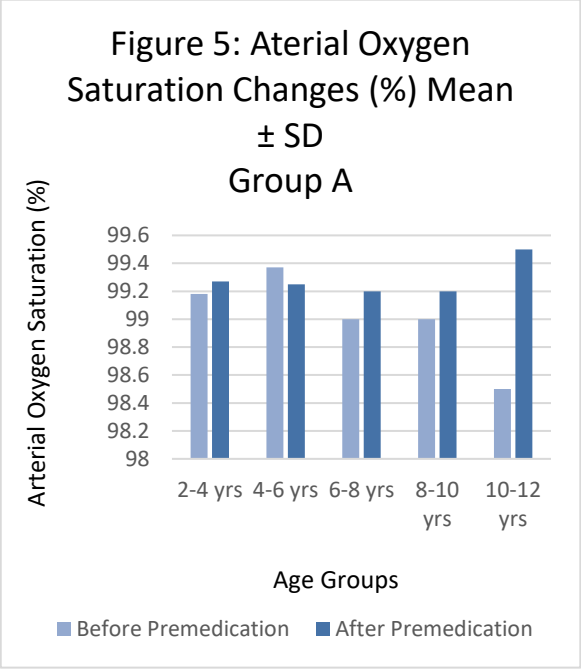


Table 4: Respiratory Rate Changes Mean ± SD

Age Group	Group A			Group B		
	Before premedication	After Premedication	t value	Before premedication	After Premedication	t value
2-4 yrs	25.81 ±3.35	25.27 ±3.44	0.97	26.0 ±4.0	25.77 ±3.82	0.36
4-6 yrs	24.25 ±2.72	24.5 ±2.39	0.44	24.28 ±2.49	24.57 ±2.32	0.49
6-8 yrs	24.4 ±2.33	25.0 ±1.52	1.61	26.66 ±4.85	26.33 ±4.81	0.52
8-10 yrs	26.0 ±1.41	26.0 ±1.26	0	23.2 ±1.6	23.6 ±1.49	0.88
10-12 yrs	23.0 ±1.0	25.0 ±1.0	2.82	25.0 ±1.0	25.0 ±1.0	0

Table 4 Figure 4 : Respiratory Rate change was not statistically significant in any age group in both Groups A and B



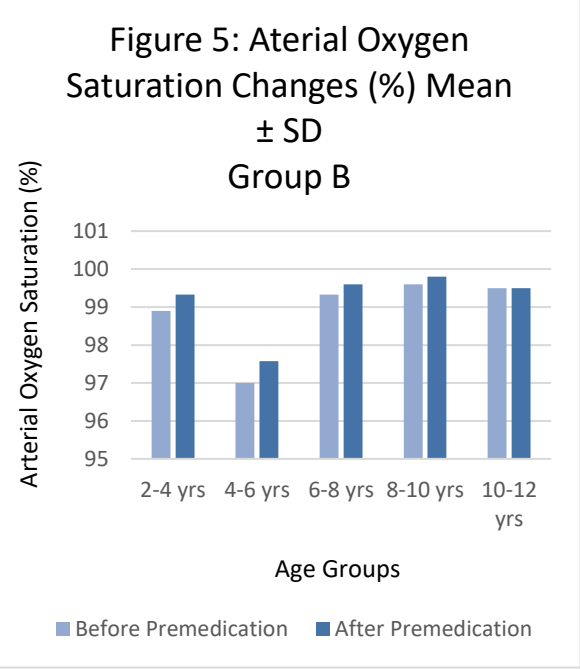
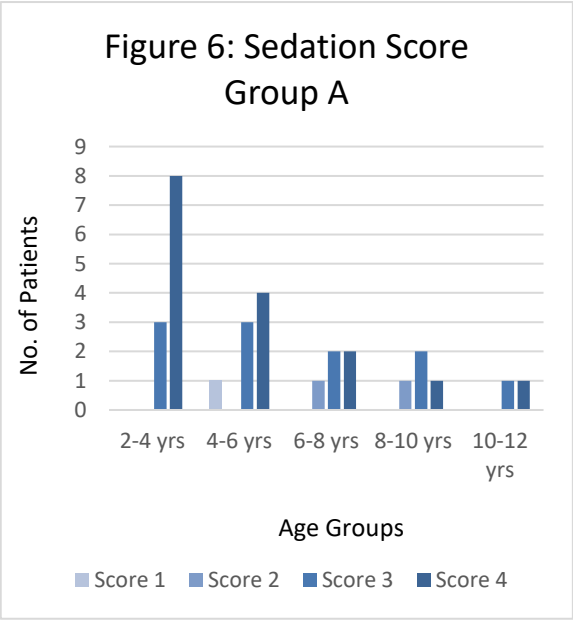


Table 5 Figure 5 : Change in Arterial O2 Saturation was not satisfactorily significant in any age group in both Groups A and B

Table 5. Arterial Oxygen Saturation Changes (%) Mean ±SD

Age Group	Group A			Group B		
	Before premedication	After Premedication	t value	Before premedication	After Premedication	t value
2-4 yrs	99.18 ±0.83	99.27 ±0.96	0.31	98.9 ±1.37	99.33 ±1.24	1.57
4-6 yrs	99.37 ±0.69	99.25 ±0.96	0.37	97 ±2.67	97.57 ±2.49	0.93
6-8 yrs	99 ±0.89	99.2 ±0.37	1.33	99.33 ±0.74	99.6 ±0.74	0.93
8-10 yrs	99 ±1.22	99.2 ±1.16	0.36	99.6 ±0.48	99.8 ±0.4	0.13
10-12 yrs	98.5 ±0.5	99.5 ±0.5	2.0	99.5 ±0.5	99.5 ±0.5	0



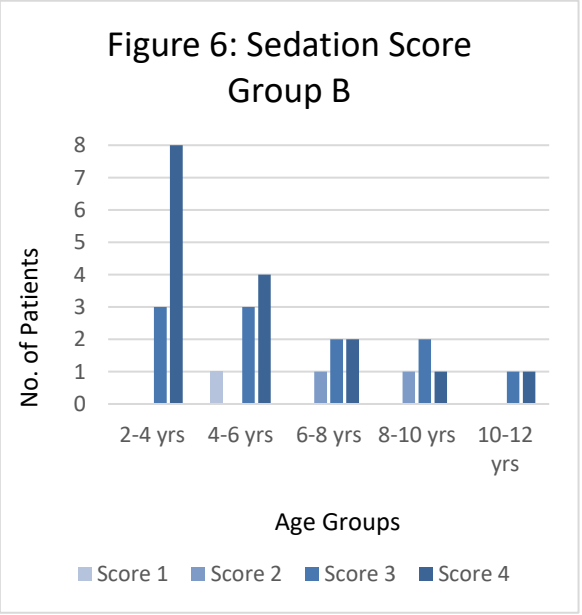
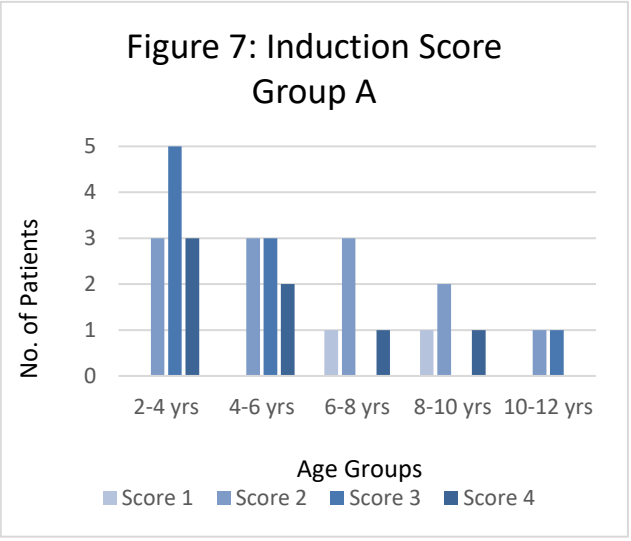


Table 6: Sedation Score

	Sedation Score	Age Group	2-4 Yrs	4-6 Yrs	6-8 Yrs	8-10 Yrs	10-12 Yrs
		No. of Pts	11	8	5	4	2
Group A Midazolam	1		-	1	-	-	-
	2		-	-	1	1	-
	3		3	3	2	2	1
	4		8	4	2	1	1
		No. of Pts	10	7	6	5	2
Group B Ketamine	1		7	6	6	5	2
	2		2	-	-	-	-
	3		1	1	-	-	-
	4		-	-	-	-	-

Table 6 Figure 6 : In Group A, 1 patient had score 1, 2 patients had score 2, 11 patients had score 3 and 16 patients had score 4. In Group B, 26 patients had score 1, 2 patients had score 2, 2 patients had score 3 and none patient had score 4



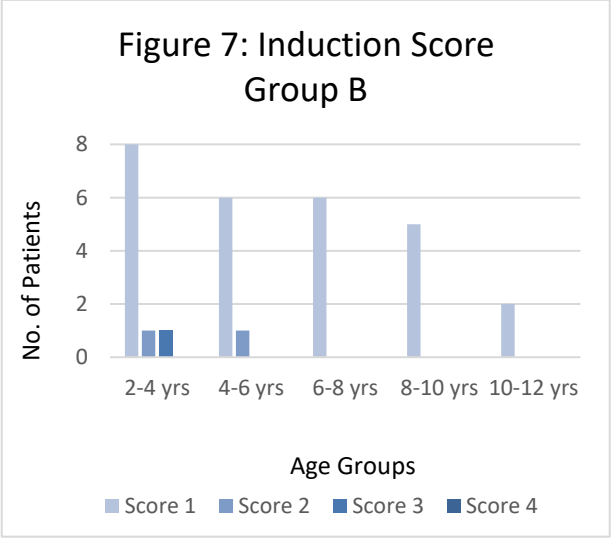


Table 7: Induction Score

Column1	Score 1	Score 2	Score 3	Score 4
2-4 yrs	8	1	1	0
4-6 yrs	6	1	0	0
6-8 yrs	6	0	0	0
8-10 yrs	5	0	0	0
10-12 yrs	2	0	0	0

Table 7 Figure 7 : In Group A, 2 patients had score 1, 12 patients had score 2, 9 patients had score 3 and 7 patients had score 4. In Group B, 27 patients had score 1, 2 patients had score 2, 1 patient had score 3 and none patient had score 4

The patients were observed for any complication during study period such as increased secretions, nausea/ vomiting, restlessness and laryngospasm. No patient had any complication. The patients were examined in the recovery room every half an hour for any respiratory problem, nausea/ vomiting and emergence delirium. At the end of two hours none of our patients had any complication and they were shifted to ward. No patient stayed back in Post Anesthesia Care Room because of delayed recovery from anaesthesia

Discussion

This study entitled "Comparison of Midazolam with Ketamine as premedicate in children", was conducted in Departments of Anesthesiology, in different SEHA Hospitals, UAE.

Anxiety is a normal and healthy reaction to a strange situation. The strange environment of OR, the doctors in peculiar dresses, equipment and instruments around the OT table, needles and syringes are more than enough to make children anxious and afraid. An effective premedication allays children's anxiety, especially in younger age category and lessens the psychologic trauma of separation from parents when they are transported to the operating room. The anesthesiologist's visit may have a calming effect, but a pharmacologic preparation is better than placebo in alleviating the patient’s anxiety. In children side effects

of excessive salivation, purposeless movements, emergence reactions and rarely prolonged behavioural changes after induction were our main concern.

Our study comprised of sixty children requiring general anaesthesia for various routine surgical operations. All patients were ASA grade I and II, aged 2-12 years and were of either sex. The patients were divided into two groups and premedication given as follows.

GROUP A patients received midazolam 0. 05 mg/KgX IV with Glycopyrrolate 0.01 mg/kg in preoperative room with parents side by side.

GROUP B patients received ketamine 0.5 mg/Kg x IV with Glycopyrrolate 0.01 mg /kg in preoperative room with parents side by side.

The premedication was given 15-30 min before induction of anaesthesia and patients were observed for change in heart rate, blood pressure, respiratory rate and Oxygen saturation. Sedation scoring was done 5 to 10 min after premedication. Facilitation of induction was also judged and score was given. The patients were also assessed for presence of any side effects/complications during study period. During stay in PACU observation was done for nausea/vomiting or emergence delirium.

The change in heart rate was significant statistically in all age groups. Nearly all the patients were anxious and often crying when first seen in preoperative room before giving premedication. The drugs used for premedication did not have any calming effect on heart rate and it further increased after premedication being highly significant statistically in both groups. Rita et al (1974) have also reported increased heart rate after Ketamine 2.5mg/kg IM premedication. Fragen et al (1983) reported no change in heart rate after midazolam 0.08mg/kg xIM premedication. But we observed statistically significant change in heart rate after midazolam , may be because we used Glycopyrrolate in premedication in both groups.

Within **Group A**, in 2-4 yrs age group systolic *BLOOD PRESSURE* changed from 104.18 ‡ 8.79 to 102.5 ‡ 3.82, in 4-6 yrs age group from 100.5 $ 6.3 to 102.8 ‡ 20.48, in 8-10 yrs age group from 108 +4.6to106.8+ 7.54 and in 10-12 yrs age group from 108 ‡ 8.0 to 111 ‡ 1.0. The change in BP was statistically significant in 6-8 yrs age group only. The BP in this age sub-group changed from 103.2‡5.74 to 101.6616.87.

Within **Group B**, in 2-4 yrs age group systolic BIOOD PRESSURE changed from 102.8 ‡ 6.76 to 119.55 ‡ 20.9, in 4-6 yrs age group from 114.85 ‡ 13.4 to 119.4 ‡ 15.48, in 6-8 yrs age group from 103.33 ‡ 6.28 to 103.33 ‡ 6.28 (no change), in 8-10 yrs age group from 102.4 ‡ 4.63 to 104.8 ‡ 5.15 and in 10-12 yrs age group B remained the same 106 ‡ 2.0 after premedication. With ketamine, the change in BP was highly significant in younger sub-groups (t value > 3), while in older children (6-12yrs), the change was significant in one sub-group only and insignificant in two other sub-groups. Rita et al (1974) have also concluded rise in BP with ketamine 2.5mg / kgxIM premedication. Fragen et al (1983) have reported stable haemodynamics after midazolam 0.08mg/kg×IM premedication. Our observation is same. The change in systolic BP was insignificant after midazolam premedication. The intergroup comparison does not carry much importance because the change in heart rate was highly significant in both midazolam and ketamine groups.

In our study there were no significant **RESPIRATORY RATE** and **OXYGEN SATURATION** changes with ketamine 0.5 mg/ kgxIV and midazolam 0.05mg/kg XIV. In midazolam group, only 10% patients had *SEDATION SCORE 1 or 2*. 36.66% patients had score 3 which means patients were awake but quiet. 53.33% patients were awake, anxious and distressed scoring 4. In Ketamine group 93.33% patients scored 1 or 2. They were asleep, drowsy and responding to gentle stimulation. 6.66% patients had score 3 and no patient had score 4. This is in sharp contrast to midazolam group. Rita et al (1974) reported good sedative effect of ketamine 2.5mg/kgxIM in paediatric patients. Rita et al (1985) reported good sedative effect of midazolam 0. 08mg/kg xIM in paediatric patients. Our finding in case of midazolam is different.

In midazolam group ***FACILITATION OF INDUCTION*** was seen in only 46.66% patients after premedication while the remaining 53.338 patients were fearful and crying. When we see the ketamine group we find that 908 patients were asleep and induction was greatly facilitated after premedication. Rest 10% patients were moderately fearful and crying. Rita et al (1974) reported smooth induction of anaesthesia in most patients premedicated with ketamine 2.5mg/kg × IM. Rita et al (1985) reported smooth induction of anesthesia with midazolam 0.08mg / kg XIM. Our findings are similar as far as ketamine is concerned but we observed no facilitation of induction in 53.33% patients in midazolam group.

When we come to evaluate **COMPLICATIONS** we state that neither of our patients had any respiratory problem, nausea/vomiting, increased secretions or emergence delirium. The whole thing looks quite unnatural but none of our patients had delayed recovery. Rita et al

(1974) studied ketamine as a premedicant in children and found that out of 60 patients only 1 had hiccups and 2 cases had coarse tremors of upper extremities before induction while a second study from the same

author (1985) using midazolam as premedicant in children demonstrated a shorter length of stay in recovery room and less incidence of vomiting and sleepiness postoperatively in comparison to pentazocine.

Summary

The study entitled " Comparison of Midazolam with ketamine as premedicant in children", comprised of 60 patients, ASA grade I and II, aged 2-12 yrs of either sex, posted for routine surgical procedures. The study was conducted in the Departments of Anesthesiology, in SEHA Hospitals, UAE The patients were divided into 2 groups of 30 patients each.

Group A patients received midazolam 0.05mg/kg x IV with Glycopyrrolate 0.01mg/kg with parents by the side

Group B patients received Ketamine 0.5mg/kg x IV with Glycopyrrolate 0.01mg/kg with parents by the side

In the preoperative room heart rate, systolic blood pressure, respiratory rate and Oxygen saturation were recorded. The premedication was given in preoperative area with full monitoring Following observations were made.

1. Heart rate, systolic blood pressure, respiratory rate and Oxygen saturation were recorded every 5 min till the patients were shifted to operation room. The mean value of these observations was taken as the value after premedication. for calculating statistical significance.
2. Sedation score
3. Facilitation of induction
4. Complications.

In Post Anaesthesia Care Unit the patients were closely watched for emergence delirium, nausea/vomiting and delayed recovery for two hours before shifting to the ward. In both groups there was significant rise in heart rate in all patients. This is attributed more to Glycopyrrolate. Ketamine caused significant rise in BP in lower age groups. Midazolam caused no significant rise in BP. The effect of ketamine and midazolam on

respiratory rate and Oxygen saturation was insignificant. Ketamine had better sedative effect than midazolam. In ketamine group 93.33% patients had score 1 or 2 which means they were asleep, drowsy and responding to gentle stimulation. 6.66% patients had score 3 and no patient had score 4. In midazolam group only 10% patients had sedation score 1 or 2. 36.66% patients had score 3 which means patients were awake and quiet. 53.33% patients were awake, anxious and distressed having score 4.

Induction of anesthesia was greatly facilitated by ketamine in 90% of the patients. In midazolam group 46.66% patients had easy induction after premedication while the remaining 53.33% patients were fearful and crying. Patients were observed for any complication during perioperative period. No patient had any complication in either ketamine or midazolam group. No patient stayed back in Post Anaesthesia Care Room due to delayed recovery in either midazolam or ketamine group.

Conclusion

This study entitled "Comparison of Midazolam with Ketamine as pre-medicate in children" comprised of 60 patients, ASA grade I and II aged 2-12 yrs of either sex posted for routine surgical procedures. The patients were divided into 2 groups of 30 patients each.

The patients were observed after premedication and following conclusions were drawn.

1. Ketamine and midazolam both caused significant
2. increase in heart rate. It can be attributed to Glycopyrrolate used with premedication in both groups.
3. Ketamine caused significant rise in BP in lower age groups. Midazolam did not cause significant rise in BP in any age sub-group
4. Respiratory rate and oxygen saturation were not significantly changed with midazolam or ketamine.
5. Ketamine 0.5mg/kg X IV is a good sedative while midazolam 0.05mg/kg x IV is not a good sedative.
6. Induction is greatly facilitated with ketamine 0.5 mg/kg- IV, but not facilitated with midazolam 0.05mg / Kg- IV.
7. In our study we did not come across any complication with midazolam or ketamine with above mentioned doses.

Therefore, ketamine 0.5mg/kg-IV with Glycopyrrolate 0.01mg/kg-IV is a **better** premedicant when compared to midazolam 0.05 mg/kg-IV with Glycopyrrolate 0.01mg/kgxIV as regards to preoperative sedation, and facilitation of induction.

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