Original Article

A Comparative Study of Intravenous Infusion of Ketamine-Propofol and Ketamine-Dexmedetomidine for Deep Sedation and Analgesia in Pediatric Patients Undergoing Day Care Surgeries at Niloufer Hospital

Lavanya Bachula[1], Gnaneshwari[1], Seelam Santhosh Kumar[1], P.V. Shiva[1*]

Abstract

Background: to compare intravenous infusion of ketamine-propofol and ketamine-dexmedetomidine for deep sedation and analgesia in pediatric patients.

Materials and Methods: A total of 60 children aged 3-12 were divided into two groups, to receive drug dosage of Ketamine 2mg/kg and propofol 2 mg/kg IV. In group KP (Ketamine + Propofol) and 2mg/kg ketamine injection; also 1µg/kg dexmedetomidine for group KD (Ketamine + dexmedetomidine). In both groups, hemodynamic changes (MAP, Heart rate, and SpO2), pain, and sedation were assessed intraoperatively at 5, 10, 15, 20, and 30 minutes and post-operatively at 5, 10, 15, 30, and 60 minutes up to 6 hours. Both groups were similar in age distribution and weight from 9-30 Kg.

Results: Preoperative heart rate, mean arterial pressure, and SpO2 were statistically insignificant (P>0.05). MAP levels intraoperatively and postoperatively were higher in the KP group. Heart rates were lower in the KD group. Postoperatively pain scores were less in the KD group. Intraoperatively, sedation scores were similar in both groups.

Conclusion: the ketamine-propofol group had stable intra and post-operative hemodynamic parameters and early recovery scores.

Keywords: Ketamine, Propofol, Dexmedetomidine, Intravenous, Anesthesia, Daycare

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Introduction

The present study involves administering a combination of drugs for anxiolytic, hypnotic, amnestic, and analgesic effects. Ideally, it should result in less physiological disturbance and more rapid recovery than general anesthesia. It typically involves the administration of local anesthesia in combination with IV sedatives, anxiolytic, and analgesic drugs, a common practice during daycare surgeries.

Daycare surgeries in children, like circumcision, herniotomy, diagnostic cystoscopy, and primary dressings, are usually done under local anesthesia (1) with sedation under monitored anesthesia care (MAC) or general anesthesia. Patients may feel discomfort due to pain, noisy suction,

manipulation of instruments, and position. There are many advantages of local anesthesia supplemented with intravenous sedation, such as less bleeding, cost-effectiveness, postoperative analgesia, and early patient mobilization. Several drugs, such as ketamine, propofol, benzodiazepines, and opioids, have been used for MAC alone or in combination (2-4).

Dexmedetomidine is a highly selective α2 adrenoceptor agonist with eight times higher receptor specificity than clonidine (1). It provides excellent sedation and analgesia with minimal respiratory depression. (2). Dexmedetomidine can be safely and effectively used for procedural sedation and surgeries under 13 MAC (3).

Dexmedetomidine has sedative and analgesic properties and has been used as a single agent and adjunct in many painful procedures (5). It also allows patients to respond to verbal commands during sedation (6). It has been used in various clinical fields, such as sedation in ICU, awake intubation, shockwave lithotripsy, endoscopic examination (7, 8), and as an adjuvant to anesthetics (9, 10). The aim is to compare the efficacy of ketamine–propofol combination with ketamine–dexmedetomidine combination in pediatric short surgical procedures. The intraoperative hemodynamics and postoperative recovery, sedation, and analgesic scores were compared in ketamine-propofol with the ketamine-dexmedetomidine combination.

The study's primary objective was to compare the intraoperative hemodynamic parameters in children who were given Ketamine-Propofol combination and Ketamine Dexmedetomidine combination anesthesia. Moreover, the secondary objective was to compare the sedation, recovery, and analgesic scores in the KP and KD groups and to evaluate the incidence of side effects like PONV in the two groups.

Methods

After obtaining approval from the Hospital Ethics Committee, children of either sex undergoing daycare surgeries under general anesthesia were enrolled to compare ketamine -Propofol with ketamine-Dexmedetomdine at Niloufer hospital, Hyderabad. Sixty patients posted for elective surgeries were divided randomly into two groups, i.e., 30 children in the ketamine-propofol group (Group KP) and 30 children in the ketamine-Dexmedetomidine group (Group KD).

Inclusion Criteria: In this prospective randomized study, all 60 patients were randomly assigned based on a simple computerized random division into two groups. All the 60 children who underwent elective daycare surgeries with an average duration of 30 mins were taken under study. The surgeries done for the study groups were circumcision, cystoscopy, herniotomy, urethral calibration, I&D, and suturing. The study cases had a fasting period of 6 hrs for solid food and 2 hrs for clear fluids. We considered children for this study ASA grade I and II, 3-12 years of age of either sex, whose parents were given informed written consent.

Exclusion Criteria

1) ASA grade III or greater
2) Known allergy or contraindication to either study drug
3) Parent's refusal
4) Seizure disorder
5) Psychological disorders, neuromuscular disorders, coagulopathies
6) Ingestion of psychotropic or sedative medication
7) Congenital heart disease
8) Full stomach patients.

The basic Investigations required were CBP, BT, CT, ESR, CUE, RBS, Blood Urea, Serum creatinine, HIV, and HBsAg.

Preoperative assessment: A pre-anesthetic check-up was done for all children, including a detailed history and general physical and systemic examination. Basic investigations were done, including baseline investigations, HIV, and HBsAg. Children were kept nil per clear oral fluids for two hours. They were counseled regarding sedation, local anesthesia, and the operative procedure and took consent from parents/guardians for this study. The children were randomly divided into two equal groups, Group KP (Ketamine-propofol) and group KD (Ketamine-dexmedetomidine).

In the operating room, NIBP and ECG monitors were used along with a pulse oximeter. On arrival in the operation theatre, after confirming adequate NBM status, the child's heart rate, non-invasive blood pressure, oxygen saturation, respiratory rate, and ECG were monitored. Intravenous access was secured, and ringer lactate 4 ml/kg was started. Both groups' children were pre-medicated with glycopyrrolate 6-8 mcg/Kg group KP (n = 30) injection Ketamine 2mg/kg I.V loading dose and injection. Propofol 2 mg/kg I.V loading dose, and propofol 100mcg/kg/min is infused as maintenance dose by an infusion pump. A dose of 1mg/kg of Inj. Ketamine I.V. was given as a rescue analgesic when required.

Group KD (n = 30) received the injection. Dexmedetomidine 1mcg/kg bolus infusion throughout 10min followed by Inj. Ketamine 2mg/kg bodyweight I.V. was given. Children were maintained at 1mcg/kg/hr intraoperatively. A dose of 1mg/kg of Inj. Ketamine I.V. was given as a rescue analgesic when required. During the intraoperative period, patients were monitored for HR, NIBP, and SpO_2.

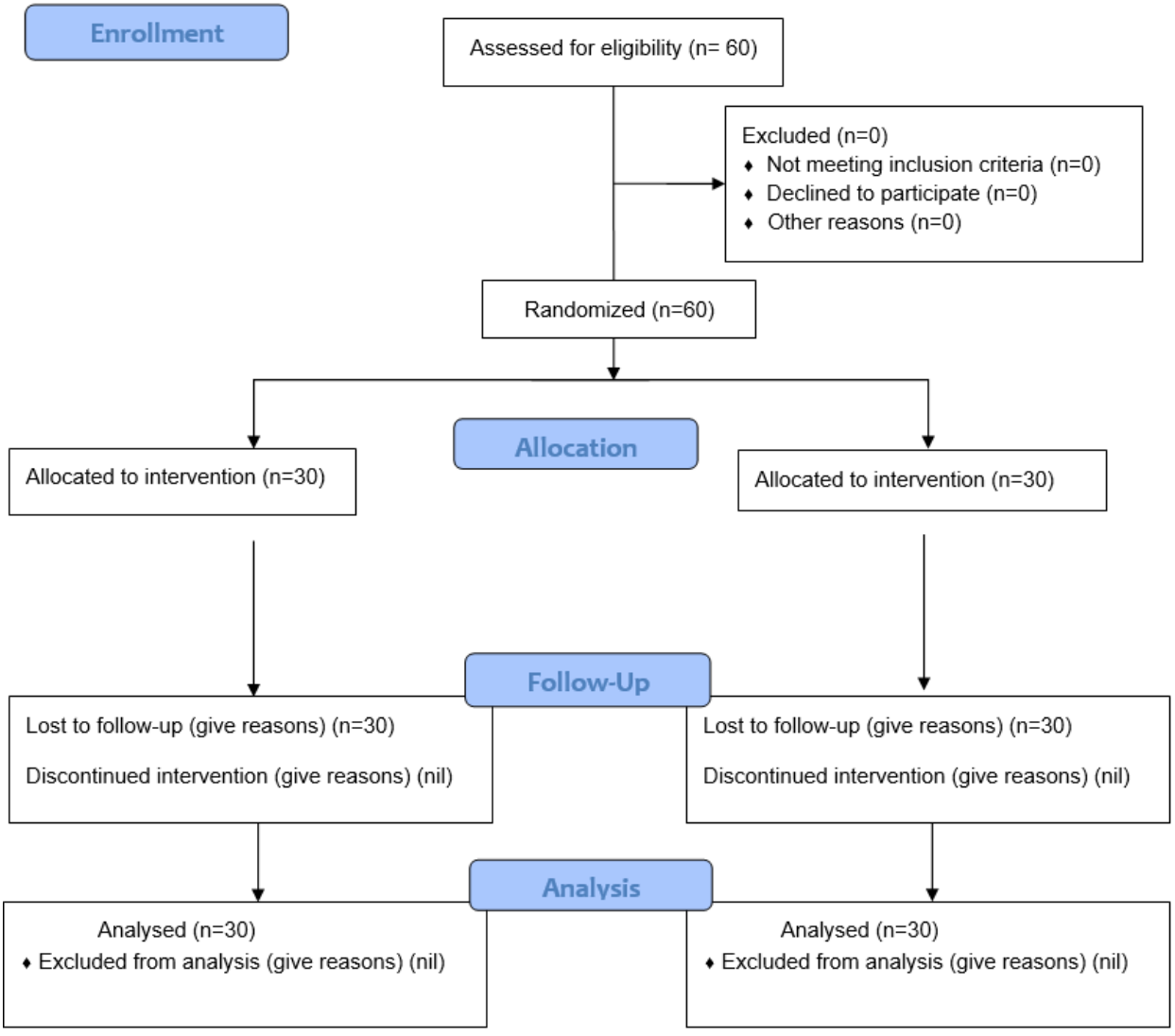

Figure 1. CONSORT flow diagram for the enrolled patients.

Postoperatively, recovery, sedation, and analgesic scores were monitored for 6 hours.

The pain was measured by FLACC PAIN SCALE from 0 to 10. Pain scores five and above indicated the use of rescue analgesics in the form of 1mg/Kg ketamine intravenously.

Ramsay Sedation Score measured sedation

1- Patient anxious and agitated or restless
2- Patient cooperative, oriented, and tranquil
3- Patient responds to verbal commands while sleeping
4- Patient exhibits brisk response to a light glabellar tap or loud voice while sleeping
5- The patient exhibits a sluggish response to a light glabellar tap or loud voice
6- Patient exhibits no response

Aldrete score:

Criteria Point Value
• Oxygenation:
– SpO2 > 92% on room air 2
– SpO2 > 90% on oxygen 1
– SpO2 > 90% on oxygen 0
• Respiration
– Breathes deeply and coughs freely 2
– Dyspnoeic, shallow or limited breathing 1
– Apnoea 0
• Circulation
– Blood pressure +/- 20 mm Hg of normal 2
– Blood pressure +/- 20 - 50 mm Hg of normal 1
– Blood pressure more than +/- 50 mm Hg of normal 0
• Consciousness
– Fully awake 2
– Arousable on calling 1
– Not responsive 0
• Activity
– Moves all extremities 2
– Moves two extremities 1
– No response 0

Sedation, recovery, and analgesic scores were monitored every 5, 10, 15, 30, and 60 min up to 6 hours postoperatively. Complications like desaturation, hypotension, and PONV were noted in both groups. Cardiovascular events were defined as a single episode variation in heart rate (HR) and Systolic blood pressure (SBP) by >20% from the patient baseline. Persistent (> the 30s) or recurrent HR <60bpm if occurred, treated with a bolus dose of I.V. atropine 0.01mg/kg and repeated as necessary. If detected, hypotension (>20 mmHg of preoperative level) is treated with IV fluid RL 10ml/kg. The Surgical procedure lasted for less than 30 minutes in almost all the patients; after the completion of the surgery, patients were shifted to the PACU for monitoring.

Statistical Analysis: The data thus collected was entered into an excel sheet. It was further subjected to statistical analysis in MS Excel and SPSS v.16. Data was expressed in frequencies and percentages when qualitative and Mean ± SD when quantitative. The Chi-square test and Fisher's exact tests were applied for qualitative data. The unpaired Student t-test was used to compare the trends for all parameters in the two groups. A p-value of <0.05 was considered significant.

Results

The age distribution of the enrolled patients was calculated and showed the same age range in both groups. The mean age was 5.9 in the KP group and 5.46 in the KD group. The patients' weights were calculated, ranging from 9 to 30Kgs. The mean weights of the KP and KD groups were 15.9 and 14.86 kg, respectively. Preoperative baseline characteristics were tabulated in table 1, and the results have shown almost similar in both the groups, with whatever differences observed statistically insignificant p values (P>0.05).

When heart rate was observed, it showed significantly lower in the KD group compared to the KP group at 5min, 10min, 15min, 20min, and 30 min intraoperatively; 5min, 10min, 15min, 30min, and 60min postoperatively (P<0.05). The results are shown in Table 2. Systolic blood pressure (SBP) and Diastolic blood pressure (DBP) was observed to be significantly lower in the KD group compared to the KP group at 15, 20, and 30 min intraoperatively (P<0.05). The data is given in figure 2. The KD group's systolic and diastolic blood pressures were significantly (P<0.05) lower compared to the KP group postoperatively at all time points. The results are shown in Figure 3.

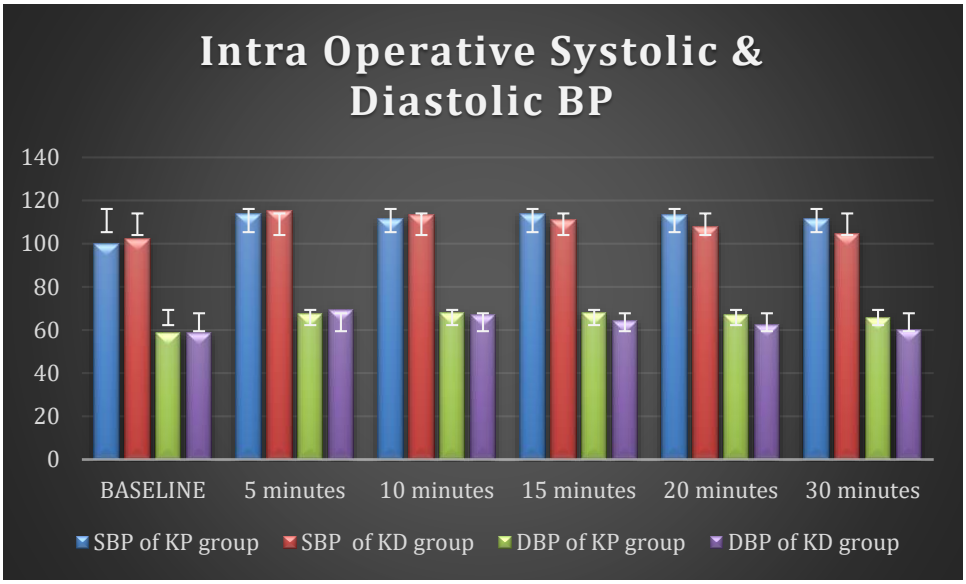

Figure 2. Intra Operative Systolic & Diastolic Blood Pressure.

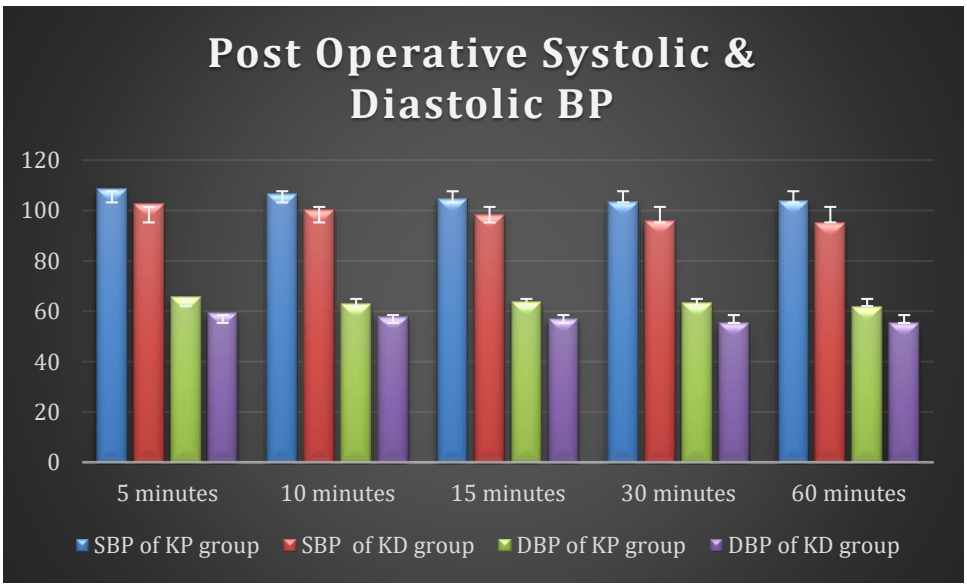

Figure 3. Post Operative Systolic & Diastolic Blood Pressure.

Mean arterial blood pressure (MAP) was significantly lower in the KD group compared to the KP group at 20min, 30 min intraoperatively; 5min, 10 min, 15 min, 30 min, and 60 min postoperatively ($P<0.05$), which was shown in table 3. No statistically significant difference in SpO_2 was observed between the two groups ($P>0.05$). The results are shown in Table 4. Postoperative pain scores were significantly lower in the KD group, which was depicted in table 5, compared to the KP group at 10 min, 15 min, 30 min, and 60 min ($P<0.05$).

It was observed that the sedation scores were statistically insignificant intraoperatively, which is shown in table 6. Sedation scores were significantly lower in the KD group compared to the KP group at 5 min, 10 min, 15 min, 30 min, and 60 min postoperatively ($p<0.05$). Post-operative recovery scores were significantly decreased (Figure 4) in the KD group compared to the KP group at 10,15, 20, and 30 mins ($P<0.05$). The initial recovery rate at 0, 5, and 10 mins was high in the KP group. However, it gradually decreased as the time increased and was shown a high recovery rate in KD groups with increased time points.

Table 1: Baseline measurements of both the groups.

S.NO.	Variable	Ketamine- propofol Group		Ketamine-Dexmedetomidine Group			
		MEAN	**SD**	**MEAN**	**SD**	**t test**	**p value**
1	AGE (Yrs)	5.9	2.761	5.467	2.692	0.6150	0.5409
2	WEIGHT(kgs)	15.9	6.337	14.466	5.322	0.6844	0.4965
3	Heart rate (BPM)	111.066	9.916	108.2	10.212	1.1028	0.2747
4	SBP(mm HG)	99.966	9.775	102.233	11.334	0.8296	0.4102
5	DBP(mm HG)	58.766	8.169	58.466	5.550	0.1664	0.8684
6	MAP(MM HG)	72	7.464	72.466	6.714	0.2542	0.8002
7	SP02 (%)	99.633	0.490	99.7	0.479	0.5427	0.5894
8	SEDATION SCORE	1.266	0.899	1.333	0.479	0.3603	0.7200

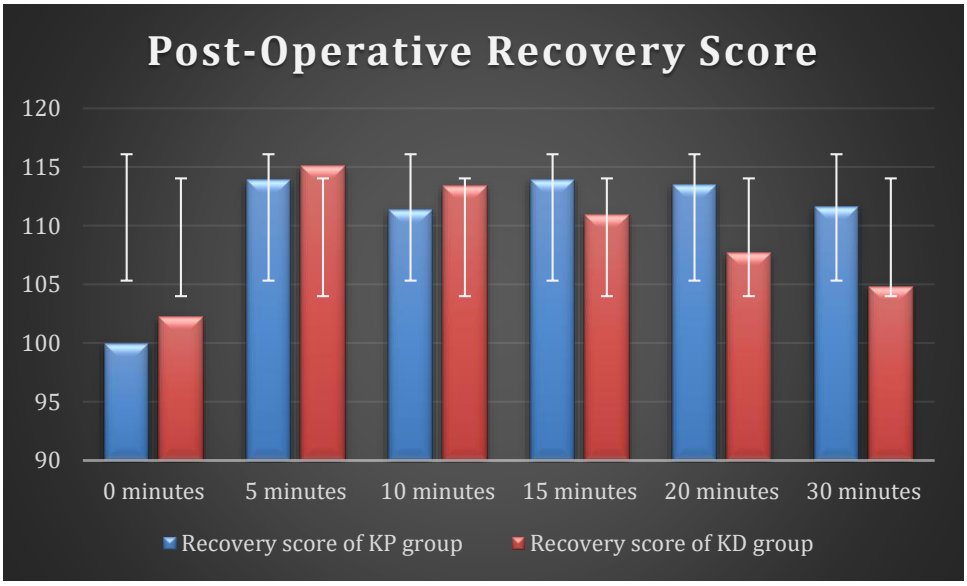

Figure 4. Post-Operative Recovery Score for the study Participants.

Discussion

In recent years, there has been an increased number of daycare surgeries in the pediatric age group. Children are excellent candidates for daycare surgeries as they are usually healthy and free from systemic diseases. Most of the time, they require minor and short surgical procedures. Thus, anaesthesiologists face the task of managing daycare anesthesia in children. The study was chosen to compare propofol with Dexmedetomidine. Because it has additional analgesic, hypnotic, sedative, and anxiolytic properties with very low respiratory depression for perioperative hemodynamic stabilization, sedation, and pain when combined with ketamine for elective short surgical

Table 2: Heart rate trend among the study participants.

INTRA OPERATIVELY							
S.NO		**Ketamine-Propofol Group (KP)**		**Ketamine-Dexmedetomidine Group (KD)**			
	TIME(MIN)	MEAN	SD	MEAN	SD	t test	p value
1	BASELINE	111.066	9.916	108.2	10.212	1.102	0.274
2	5 minutes	103.866	8.764	85.6	6.355	9.241	<0.0001
3	10 minutes	104.033	7.388	84.133	6.420	11.1361	<0.0001
4	15 minutes	102.5	7.161	80.6	5.424	13.3527	<0.0001
5	20 minutes	102.033	6.178	79.2	5.108	15.6011	<0.0001
6	30 minutes	102.1	6.919	79.933	5.037	14.1867	<0.0001
POST OPERATIVELY							
S.NO		**Ketamine-Propofol Group**		**Ketamine-Dexmedetomidine Group**			
	TIME(MIN)	MEAN	SD	MEAN	SD	t test	p value
1	5 minutes	100.466	6.306	79.933	5.165	13.7971	<0.0001
2	10 minutes	101.366	6.702	80.5	6.941	11.8451	<0.0001
3	15 minutes	106.966	14.359	82.666	7.457	8.2261	<0.0001
4	30 minutes	110.5	8.182	83.733	7.002	13.6139	<0.0001
5	60 minutes	110.666	7.756	85.733	7.820	12.3991	<0.0001

procedures in children. A combination of ketamine with either propofol or dexmedetomidine allows usage of a lower dose, adds synergism, and decreases side effects.

Daycare surgeries in children, like incision and drainage of abscess, circumcision, herniotomy, cystoscopy, dressing, DJ stent removal, and suturing, are usually done under local anesthesia with sedation under monitored anesthesia care (MAC) or general anesthesia. Patients may feel discomfort due to pain, noisy suction, manipulation of instruments, and positional changes. There are many advantages of local anesthesia supplemented with intravenous sedation, such as less bleeding, Cost-effectiveness, postoperative analgesia, and early patient mobilization. The demographic data between the two groups were age, gender, and weight. All the patients were between 3-12 years of age, and the mean age was 5.9 in group 74 KP and 5.46 in group KD. In both groups, gender distribution was almost similar. The mean weight in group KP was 16.4 and 14.86 in group KD. The difference in the mean values of the demographic parameters was insignificant ($p>0.05$). The difference in mean values was not significant. Procedural sedation with ketamine and dexmedetomidine for daycare anesthesia in pediatric patients has been assessed (11).

Ketamine is associated with tachycardia, increased blood pressure, and increased cardiac output. Dexmedetomidine causes cardiovascular depression, i.e., bradycardia and hypotension. Hence when used in combination, dexmedetomidine limits the

Table 3: Mean Arterial Blood Pressure trend among the study participants.

INTRA OPERATIVELY							
		Ketamine-Propofol Group		**Ketamine-Dexmedetomidine Group**			
S.NO	**TIME(MIN)**	**MEAN**	**SD**	**MEAN**	**SD**	**t test**	**p value**
1	BASELINE	72	7.464	72.466	6.714	0.2542	0.8002
2	5 minutes	82.466	8.093	84.233	6.003	0.9605	0.3408
3	10 minutes	82.3	8.910	82.433	5.069	0.0711	0.9436
4	15 minutes	82.966	9.539	79.433	4.825	1.8102	0.0754
5	20 minutes	81.8	10.226	77.3	4.136	2.2344	0.0293
6	30 minutes	80.866	8.500	74.666	3.386	3.7115	0.0005
POST OPERATIVELY							
S.NO		**Ketamine-Propofol Group**		**Ketamine-Dexmedetomidine Group**			
	TIME(MIN)	MEAN	SD	MEAN	SD	t test	p value
1	5 minutes	79.5	8.881	73.533	3.530	3.4198	0.0012
2	10 minutes	77.266	5.514	71.4	3.001	5.1180	<0.0001
3	15 minutes	77.033	7.676	70.6	2.978	4.2795	<0.0001
4	30 minutes	76.366	6.880	68.966	3.221	5.3354	<0.0001
5	60 minutes	75.433	6.495	68.333	3.198	5.3716	<0.0001

sympathomimetic action of ketamine, as observed in our study. Compared to the ketamine propofol group, there was a significant difference in intraoperative and postoperative mean heart rates. In the KD group, heart rate decreased from 5 minutes of the procedure to below preoperative levels (108.2 ± 10.21 at baseline, 79.2 ± 5.1 at 20 minutes). Low rates were maintained constantly throughout the postoperative period. In contrast, group KP showed stable heart rate levels intraoperatively and post-operatively.

In another study (12) with upper gastrointestinal endoscopy, all patients received ketamine 1mg/kg, KD group received dexmedetomidine one µg/kg as a loading dose. KP group received propofol 1mg/kg as a loading dose. HR was significantly lower in group KD during the procedure compared to group KP. It is comparable to our study. In Mester et al. (13), Retrospective case series using dexmedetomidine and ketamine for sedation during cardiac catheterization, two patients required a decrease in dexmedetomidine infusion because of a decrease in heart rate.

Dexmedetomidine shows a biphasic cardiovascular response where an initial bolus dose results in a transient increase of blood pressure and a

Table 4: SpO_2 trend among the study participants.

INTRA OPERATIVELY							
		Ketamine-Propofol Group		Ketamine-Dexmedetomidine Group			
S.NO	**TIME(MIN)**	**MEAN**	**SD**	**MEAN**	**SD**	**t test**	**p value**
1	BASELINE	99.633	0.490	99.7	0.466	0.5427	0.5894
2	5 minutes	99.766	0.504	99.8	0.406	0.2877	0.7746
3	10 minutes	99.633	0.490	99.8	0.406	1.4374	0.1560
4	15 minutes	99.6	0.498	99.8	0.406	1.7049	0.0936
5	20 minutes	99.7	0.466	99.866	0.345	1.5681	0.1223
6	30 minutes	99.733	0.449	99.833	0.379	0.9322	0.3551
POST OPERATIVELY							
		Ketamine-Propofol Group		**Ketamine-Dexmedetomidine Group**			
S.NO	**TIME(MIN)**	**MEAN**	**SD**	**MEAN**	**SD**	**t test**	**p value**
1	5 minutes	99.733	0.449	99.9	0.305	1.6852	0.0973
2	10 minutes	99.733	0.449	99.9	0.305	1.6852	0.0973
3	15 minutes	99.666	0.479	99.866	0.345	1.8557	0.0686
4	30 minutes	99.666	0.546	99.8	0.406	1.0787	0.2852
5	60 minutes	99.7	0.466	99.833	0.379	1.2128	0.2301

reflex decrease in heart rate through the action of peripheral α-2B receptors, which lasts for 5-10 minutes and is followed by a decrease in blood pressure of 10-20%, below baseline values mediated by inhibition of central sympathetic outflow overriding the direct stimulant effects, as shown in the present study where there was a significant difference between both the groups concerning intraoperative and postoperative MAP.

In the KD group, MAP was increased in the first 5 minutes intra-operatively owing to the action of ketamine; after 20 min, MAP decreased to near preoperative levels. Moreover, due to dexmedetomidine action, low values were maintained constantly throughout the postoperative period (72.46 ± 6.71 at baseline,71.4 ±3.001 at 10 minutes postoperatively).

In a study by Koruk et al. (14), there was not much difference in MAP levels in both groups when compared to baseline values, probably due to the low dose of ketamine (1mg/kg) and only bolus dose of dexmedetomidine (1µg/kg) over 10 min. In our study, MAP's initial rise was due to a higher dose of ketamine,

Table 5: Post-op Pain Score among study participants.

		Ketamine-Propofol Group (KP)		Ketamine-Dexmedetomidine Group (KD)			
S.NO	**TIME(MIN)**	**MEAN**	**SD**	**MEAN**	**SD**	**t test**	**p value**
1	5 minutes	0.1	0.305	0.1	0.305	0.0000	1.0000
2	10 minutes	1.366	0.614	0.833	0.592	3.4228	0.0011
3	15 minutes	3.266	0.868	2.5	0.682	3.8007	0.0003
4	30 minutes	5.066	0.739	3.9	0.402	7.5915	0.0001
5	60 minutes	6.4	0.563	5.733	0.520	4.7668	0.0001

i.e., 2mg/kg. In another study (11), Ketamine 2mg/kg, dexmedetomidine one µg/kg (over 30min) where MAP values observed were statistically insignificant intraoperatively and postoperatively when compared to baseline values. In our study, we noticed a drop in MAP and heart rate intraoperatively, probably due to faster administration of dexmedetomidine (10 min). In contrast, in their study, dexmedetomidine was administered over 30 min.

Dilek Gunay et al. (15) ketamine-propofol (KP) and ketamine-dexmedetomidine (KD) combinations for deep sedation and analgesia during pediatric burns dressings, no statistically significant differences in diastolic pressure were found between the two groups. Systolic blood pressure values in group KD showed a significant increase after induction. In our study, SBP and DBP were significantly decreased in the KD group compared to the KP from 20 minutes intraoperatively, which continued in the postoperative period to 60 minutes. SBP increased from baseline (102.23± 11.33) in the KD group to (115.06 ±7.5) at 5 min, comparable to the Dilek Gunay study.

Dexmedetomidine-induced sedation qualitatively resembles normal sleep. Stimulation of α-2A receptors in the nucleus coeruleus inhibits noradrenergic neurons, which produces sedation branded as arousable sedation, distinguished from sedation induced by drugs acting on the GABA system, which produces a clouding consciousness. Our study showed significantly high mean sedation scores (2.066±0.6) at 60 minutes postoperatively in the KD group compared to the KP group (1.1±0.3). It was also reflected in the study of Bergese et al. (16). They found that sedation scores were higher in the ketamine-dexmedetomidine group with a mean of 1.8±0.8 at the end of the first hour. The sedation score in our study was more due to the use of ketamine 2mg/kg and dexmedetomidine bolus dose of 1µg/kg followed by infusion of 1µg/kg per hour as compared to the above study, where they have used a lower dose of ketamine (1mg/kg) and only bolus dose of dexmedetomidine (1µg/kg).

Infusion of dexmedetomidine after bolus dose prolonged the sedation in our study (2.066±0.6), which is similar to the study done by Tosun et al. (17), where the sedation score was (2.03±1.33). The sedation scores of our study are similar to another study (11), where they used a similar dose of dexmedetomidine. Hence dexmedetomidine provides a dose-dependent increase in anxiolysis and sedation and can be used as a direct infusion of a bolus dose of 1µg/kg followed by an infusion of 0.5µg/kg per hour for profound sedation.

Dexmedetomidine, with its α-2 stimulation of adrenoceptors in the locus coeruleus, terminates the propagation of pain signals leading to analgesia. At the spinal cord, stimulation of α-2 receptors at the substantial gelatinosa of the dorsal horn leads to inhibition of the firing of nociceptive neurons and inhibition of release substance P. The pain scores were reduced postoperatively at 30 minutes in another study

Table 6: Sedation Score among the study participants.

		Ketamine-Propofol Group		Ketamine-Dexmedetomidine Group			
Intra operatively							
S.NO	**TIME(MIN)**	**MEAN**	**SD**	**MEAN**	**SD**	**t test**	**p value**
1	BASELINE	1.266	0.899	1.333	0.479	0.3603	0.7200
2	5 minutes	6	0	6	0	N/A	N/A
3	10 minutes	6	0	6	0	N/A	N/A
4	15 minutes	6	0	6	0	N/A	N/A
5	20 minutes	6	0	6	0	N/A	N/A
6	30 minutes	5.633	0.490	5.566	0.504	0.5221	0.6036
Post operatively							
1	5 minutes	5.2	0.406	5.566	0.504	3.0975	0.0030
2	10 minutes	3.933	0.520	5.5	0.572	11.1027	<0.0001
3	15 minutes	3.033	0.182	5.233	0.817	14.3961	<0.0001
4	30 minutes	1.8	0.406	3.6	0.621	13.2881	<0.0001
5	60 minutes	1.1	0.305	2.066	0.639	7.4726	<0.0001

(11), where they used a similar dose of dexmedetomidine (1µg/kg) but in the form of infusion over 30 minutes. Our study showed significantly lower pain scores (3.9±0.4) at 30 minutes compared to the KP group, which was more (5.06±0.7).

Hence the difference in pain scores in the study groups was attributed to the additional analgesic action of dexmedetomidine in the KD group compared to the KP group, where propofol lacks analgesic activity. There was no significant difference between both groups in respiratory rate, and mean values of SpO2 at all points of time showed no significant difference statistically (P>0.05). The other researchers observed that none of the patients had respiratory depression and a fall in oxygen saturation (11). In the study of Mester et al. (13), two patients developed upper airway obstruction that responded to the repositioning of the airway. No central apnea was noted.

Dexmedetomidine prolongs the sedation when added to ketamine, as observed in our study, in the time taken to achieve a mean Aldrete recovery score of 7.8 in the KD group at 30 minutes and 8.466 at 15 minutes in the KP group which was statistically significant. Time taken for resumption of mental orientation and time to discharge from PACU were longer in the KD group, as reflected in another study (11), where recovery scores showed the patient had an Aldrete score of 8 after 30 minutes of the postoperative period which supported the present study. None of the patients had postoperative agitation, and none had postoperative nausea and vomiting in the KD group. In a study by Tosun et al. (17), the recovery time was longer in the KD group (49.54min) vs. KP group (23.16 min) in their study, the ketamine-dexmedetomidine group required more ketamine (2.03+/-1.33), more frequently as supplemental doses, their ketamine- propofol doses were similar to our study doses.

In another study (12), recovery time in group KP (15.5+/-3.9 min) was shorter than that in group KD (17.2+/-4.8 min) but did not reach statistical significance. The recovery scores of the KP group were comparable to our study. However, our KD group recovery time was longer, probably due to lower doses of ketamine in the Mogahed study. In Amit shah, et al. (18), a study of Children (2 to 17 years) requiring procedural sedation and analgesia for management of an isolated orthopedic extremity injury were randomized to receive either ketamine/propofol or ketamine. Ketamine/propofol patients received a bolus dose of ketamine 0.5 mg/kg and propofol 0.5 mg/kg, followed by propofol 0.5 mg/kg and saline solution placebo every 2 minutes, titrated to deep sedation. Ketamine patients received a bolus dose of ketamine 1.0 mg/kg and an intralipid placebo, followed by ketamine 0.25 mg/kg, an Intralipid placebo every 2 minutes, as required. Median recovery time was faster with ketamine/propofol (10 minutes) than with ketamine (12 minutes). Our recovery time was longer due to the higher dose of ketamine (2mg/kg). In our study, both groups' cardiovascular and respiratory events are comparable. No groups showed serious adverse effects of the drugs that required the abandonment of the surgical procedure.

This prospective observational study reveals that anesthesia with a Ketamine-dexmedetomidine combination produces stable hemodynamic parameters during the perioperative period compared to ketamine-propofol. Ketamine-dexmedetomidine makes a perfect combination by one ameliorating the side effects of another drug. A smooth postoperative recovery without respiratory depression, nausea, and vomiting is an added advantage. The other studies with this combination Yerramilli et al. (11), Tosun et al. (17), and Dilek Gunay et al. (15), which were done on the pediatric age group, had similar reports.

Conclusion

The study concluded that both the KP and KD combinations were effective for sedation and analgesia. However, our results showed that the Ketamine-propofol group had stable intraoperative and post-operative hemodynamic parameters and early recovery scores. In contrast, the ketamine-dexmedetomidine group showed significantly lower MAP and heart rate parameters intraoperatively and postoperatively. Furthermore, the KP group has shown better postoperative recovery, whereas the KD group has shown delayed recovery. Nevertheless, the pain scores were better in the Ketamine-Dexmedetomidine group than in the KP group. We recommend using a ketamine plus propofol combination for daycare surgeries for a higher recovery rate and stable post-operative hemodynamic parameters. However, more studies with increased patient enrollments are recommended for better analysis.

Acknowledgment

None.

Conflicts of Interest

The authors declare that they have no conflict of interest.

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