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Original Research Article

A Comparative Evaluation of Two Doses of Intranasal Midazolam as a Premedicant for Paediatric Patients by Two Delivery Methods

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ABSTRACT

Introduction: Intranasal midazolam as a Premedication in paediatric patients has advantage of rapid absorption directly into the systemic circulation. Our study compared two doses (0.2 mg/kg and 0.25 mg/kg) of intranasal midazolam administered by two different methods (drops and spray) to find safe dose and administration method.

Material and method: A prospective, randomized, double blind study was conducted in the department of Anaesthesiology at PGIMS Rohtak after Ethical clearance. 120 patients of either sex and age 2-8 years, ASA status I/II, posted for elective surgery under general anaesthesia were enrolled during 2015-17. Patients were randomly allocated to one of the four groups: Group A (n=30) – received 0.20 mg/kg intranasal midazolam drops. Group B (n=30) - received 0.25 mg/kg intranasal midazolam drops. Group C (n=30) - received 0.20 mg/kg intranasal midazolam spray. Group D (n=30) - received 0.25 mg/kg intranasal midazolam spray. The response to drug administration was assessed as satisfactory or unsatisfactory. Heart rate, oxygen saturation, respiratory rate and sedation level (Ramsay sedation score) were assessed immediately prior to and at 5, 10, 15, 20, and 25 minutes of drug administration. Parent-child separation was assessed at 20 minutes using ease of separation score system. The response to mask acceptance /or iv. cannulation was assessed at 25 minutes using induction score system.

Results: The satisfactory response was greatest and statistically significant in study group D (80%) compared to group A (56.70%), B (66.70%), and C (73.30%). The mean sedation score achieved was significantly more with 0.25 mg/kg than 0.2 mg/kg of intranasal midazolam irrespective of method of drug administration and also highest in study group D (3.20) as compared to group B (2.97). The best and significant mean parent-child separation score at 20 minutes was achieved in study group D (1.13 ± 0.43) compared to group A (1.53 ± 0.68), B (1.20 ± 0.48) and C (1.43 ± 0.63). In study group D, 28 out of 30 (93.40%) patients had excellent to good induction score as compared to either of group A or B (25 out of 30) and group C (26 out of 30). The mean induction score was best and statistically significant in study group D (1.30±0.60) compared to group A (2.00±0.59), B (1.40±0.77), and C (1.77±0.77).

Conclusion: Intranasal midazolam spray 0.25 mg/kg is a safe and effective premedication.

Key words: Premedication, intranasal midazolam, drops and spray, Ramsay sedation score, ease of separation and induction score.

INTRODUCTION

Effective premedication in children undergoing operations is must to allay anxiety concerning the anaesthesia and surgery. It decreases the trauma of parental separation and facilitates smooth induction of general anaesthesia without prolonging the post-anaesthetic recovery time. [1] In children sedative premedication is advantageous in providing adequate

anxiolysis, sedation and facilitate smooth induction.

Midazolam is commonly used for premedication by various routes in children because of its rapid onset of action, predictable duration and rapid recovery. It has sedative, hypnotic and anxiolytic properties. [2] It has been used for preoperative sedation by oral, intranasal, sub-lingual, intra-muscular, intra-venous and rectal routes. [3-8] Advantage of faster and reliable onset, ease of administration and no fear of needle prick have favored its intranasal route for premedication in children. Midazolam with high hepatic clearance has much higher systemic availability after intranasal rather than oral route. [9] Intranasal route has the advantage of rapid absorption of the drug directly into the systemic circulation from an area rich in blood supply, without the disadvantage of passing through the portal circulation. [10] The bioavailability of midazolam via intranasal route has been reported to be 50-80% as compared to 15-27% via oral route. [11,12] The average time to peak plasma concentration and maximal effect is 10 minutes and recovery time is 30 minutes. [13]

Numerous studies have been conducted in past for establishing safety, efficacy and acceptability of the intranasal route and an appropriate dose of midazolam with conflicting and contradictory results. We tried to find the exact dose and method of administration of intranasal midazolam in terms of better acceptability, sedation score, ease of parental separation and smooth induction.

Aim and Objectives: To evaluate and compare the efficacy of two doses for two delivery methods of intranasal midazolam as premedicant in the paediatric patients with regard to-

1. Acceptability of method of drug administration.
2. Sedation score.
3. Ease of parent-child separation.
4. Ease of mask acceptance/ or iv. cannulation.
5. Complications, if any.

MATERIAL AND METHODS

Preparation- A prospective, randomized, double blind study was conducted in the department of Anaesthesiology at PGIMS Rohtak after Ethical clearance. 120 patients of either sex and age 2-8 years, ASA status I/II, posted for elective surgery under general anaesthesia were enrolled during 2015-17. Patients having history of allergic reaction to midazolam, refusal to take medication, respiratory system dysfunction (rhinorrhea, bronchial asthma and nasal polyp), and epilepsy and raised intracranial tension were not included in the study. All patients or their parents were explained about the procedure and written informed consent was obtained for their participation in the study. Patients were kept nil per orally for 6 hours prior to the procedure. Patients were randomly allocated to one of the four groups by using a sealed envelope method.

Anaesthetic Technique- The study drug was given 25 minutes before induction by a second anaesthesiologist blinded to the study as follows:

- Group A (n=30) - patients received intranasal drops of midazolam 0.20 mg/kg.
- Group B (n=30) - patients received intranasal drops of midazolam 0.25 mg/kg.
- Group C (n=30) - patients received intranasal spray of midazolam 0.20 mg/kg.
- Group D (n=30) - patients received intranasal spray of midazolam 0.25 mg/kg.

In group A & B, the commercially available preservative free injectable formulation of midazolam (Mezolam, Neon Lab Ltd) was administered drop by drop with the help of a dropper. In group C & D, the commercially available intranasal spray (Midacip, Cipla Ltd) was used which delivers 0.5 mg per metered dose (0.5 mg = 0.1 ml). The calculated drug volume was divided into two parts for each nostril.

Observation- The response to method of drug administration was assessed as satisfactory or unsatisfactory. Satisfactory means drug accepted willfully, not spitted and swallowed easily without sneezing, nasal irritation and crying. Unsatisfactory means do not like taste of drug seen by facial expression, nasal irritation, sneezing and crying. [14] Patients were monitored for heart rate (HR) and oxygen saturation (SpO_2) using the standard pulse oximeter at baseline and thereafter every 5 minutes interval. The respiratory rate and sedation level (Ramsay sedation score[15]) were assessed immediately prior to and at 5, 10, 15, 20, and 25 minutes of drug administration. The patients were separated from parents at 20 minutes of drug administration and the anxiety to parent-child separation was assessed using ease of separation score [4] system. The response to mask acceptance /or iv. cannulation was assessed at 25 minutes using induction score [4] system. Patients were given general anaesthesia either by inhalation or intravenous induction using standard anaesthesia protocol. The side effects if any, were observed and managed appropriately.

Statistical Analysis- The data were compiled and analyzed with SPSS version 18.0 software. Continuous variables were presented as mean ± SD. Categorical variables were expressed as frequencies and percentages. Nominal categorical data between the groups was compared using chi- square test or Fischer's exact test as appropriate. ANOVA test was used to determine any significant difference between the groups and in subgroups OR t-test was used to see the difference between groups and also for subgroups within a group. A p-value <0.05 was taken to indicate a significant difference. Sample size was calculated keeping in view at the most 5% risk, with minimum 80% power and 5% significance level (significant at 95% confidence level). However, the consideration of past data played an important role in calculating the sample size.

Formula: Sample Size = n / [1 + (n/population)]

In which n = Z × Z [P (1-P)/(D×D)]

P = True proportion of factor in the population, or the expected frequency value (0.5)

D = Maximum difference between the sample mean and the population mean, (0.2 or 20%)

Or Expected Frequency Value minus (-) Worst Acceptable Value

Z = Area under normal curve corresponding to the desired confidence level (1.96)

The calculation came to be 26 but sample size was kept 30 in each sub-group for safer side and normality of the data. If we decrease the gap between population proportion and sample proportion sample size will increases. Confidence Level/ Value for Z (90% / 1.645, 95% / 1.960, 99% / 2.575, 99.9% / 3.29)

RESULTS AND OBSERVATION

When the data was subjected to relevant statistical tests like Chi-square, Pearson correlation, linear regression, ANOVA, the following observations and the results were obtained:

Demographic Profile: The patients in all four groups were comparable in terms of sex distribution, weight and ASA class status. The mean age in group A was significantly less than group C. (Table 1.)

Vitals: There was statistically no significant change in mean pulse rate, mean respiratory rate and mean SpO_2 at 0, 5, 10, 15, 20 and 25 minutes of drug administration among all study groups.

Drug Acceptability: The satisfactory and unsatisfactory response to the intranasal midazolam administration in our study population of 120 patients was 69.20% and 30.80% respectively irrespective to the dose and method of drug administration. The satisfactory response in study group A, B, C and D was 56.70%, 66.70%, 73.30% and 80.00% respectively. The satisfactory response was greatest in study group D, in

which the intranasal midazolam was administered as spray in a dose of 0.25 mg/kg, though not statistically significant (p value >0.05) Table 2.

Ramsay Sedation Score (RSS): The onset and maximum level of sedation was observed at 10 and 20 minutes of drug administration respectively in all study groups. This increase in mean sedation score in all study groups was progressive and statistically significant at 10 minute, 15 minute and 20 minute of drug administration. (p value <0.05).

The mean sedation score was significantly more with 0.25 mg/kg than 0.2 mg/kg of intranasal midazolam irrespective of method of drug administration (p value < 0.05). However, the mean sedation score at 20 minute was highest in study group D (3.20), though not statistically significant as compared to group B (2.97), (Table 3).

Parent child Separation Score at 20 Minutes: The excellent (1) parent-child separation score was found in study group A, B, C and D in 17 (56.70%), 25 (83.30%), 19 (63.30%) and 27 (90%) patients respectively. The good scores (2) in study group A, B, C and D was found in 10 (33.30%), 4 (13.30%), 9 (30%) and 2 (6.70%) patients respectively. Similarly, the fair score (3) in study group A, B, C and D was found 3 (10%), 1 (3.30%), 2 (6.70%) and 1 (3.30%) patients respectively. Thus, the number of patients achieving excellent score were greater with spray as compared to drop method and further, the score was more with 0.25 mg/kg (90%) as compared to 0.2 mg/kg (63.30%) dose of intranasal midazolam, although the difference was slightly non-significant i.e. p value = 0.066 (Table and Bar Diagram 4).

The mean parent-child separation scores at 20 minute were 1.53 ± 0.68, 1.20 ± 0.48, 1.43 ± 0.63 and 1.13 ± 0.43 in study group A, B, C and D respectively. Thus, the best mean parent-child separation score was achieved in study group D, in which the spray formulation of intranasal medazolam was used in a dose of 0.25 mg/kg. Also, it was statistically significant among the study groups. (p- value < 0.05, Table. 5).

Induction Score at 25 Minutes: The patients showing the **excellent** induction score (1) in study group A, B, C and D were 5 (16.70%), 23 (76.70%), 12 (40%) and 23 (76.70%) respectively. The patients showing **good** score (2) in study group A, B, C and D were 20 (66.70%), 2 (6.70%), 14 (46.70%) and 5 (16.70%) respectively. Similarly, the patients showing **fair** score (3) in study group A, B, C and D were 5 (16.70%), 5 (16.70%), 3 (10%) and 2 (6.70%) respectively. Only one patient of study group C was found to carry **poor** induction score. Further, the patients carrying the excellent to good induction score were 25 out of 30 (83.40%) in either of the study group A or B. In study group C, 26 out of 30 (86.70%) patients were found to carry excellent to good induction score, while in study group D, 28 out of 30 (93.40%) patients were found to carry excellent to good induction score. Thus, the maximum patients in study group D (93.40%) showed excellent to good induction score, in which 0.25 mg/kg intranasal midazolam spray was used. Also, it was statistically significant among all the study groups (Bar Diagram 6).

The mean induction scores in group A, B, C and D were 2.00±0.59, 1.40±0.77, 1.77±0.77 and 1.30±0.60 respectively. The best statistically highly significant induction score was in study group D (1.30±0.60) among all the study groups (Table 7).

Complications: In our study, none of the patient showed signs of bradycardia, apnea, desaturation, coughing, vomiting or any other complications.

Table 1. Demographic Profile

		A	B	C	D	Total	P- value
No. of Patients		30	30	30	30	120	**0.036**
Age (mean±SD)		3.75±1.63	4.58±1.80	5.15±2.09	4.73±1.96	4.55±1.92	
Weight (mean±SD)		13.83±3.83	15.72±3.61	16.17±4.23	14.95±4.01	15.17±3.98	0.114
Sex	Male	28	25	24	26	103	0.494
	Female	2	5	6	4	17	
ASA Class	I	14	12	15	17	58	0.629
	II	16	18	15	13	62	

Table 2. Response to Drug Administration

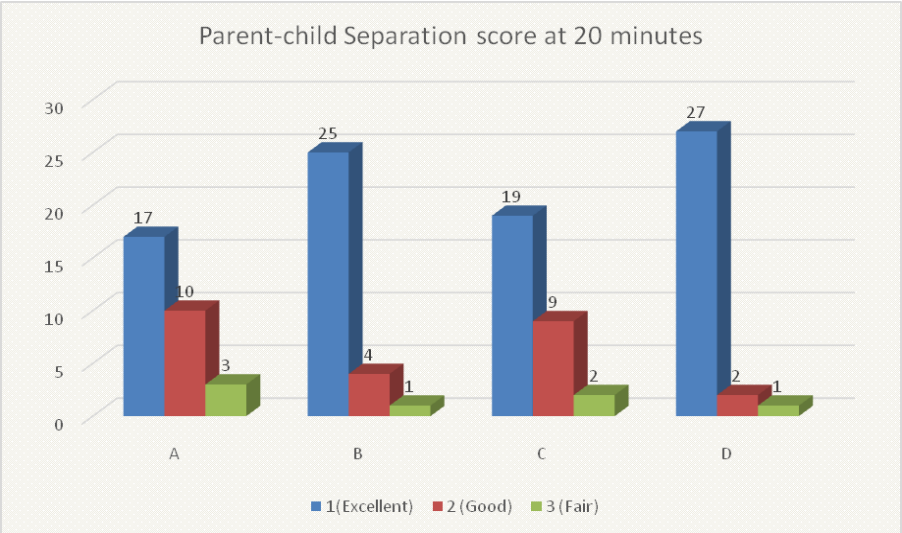
Response to Drug Administration		Study Group					P- value
		A (n=30)	B (n=30)	C (n=30)	D (n=30)	Total (n=120	
Satisfactory	Count	17	20	22	24	83	0.243
	% within Group	56.70%	66.70%	73.30%	80.00%	69.20%	
Unsatisfactory	Count	13	10	8	6	37	
	% within Group	43.30%	33.30%	26.70%	20.00%	30.80%	

Table 3. ANOVA Post hoc test- Comparison of Mean Ramsay Sedation Score between Study Groups

Dependent variable	Study Group (I)	Study Group (J)	Mean difference (I-J)	p- value
RSS at 20 Min. (A=2.27, B=2.97, C=2.13, D=3.20)	A	B	-070000	**0**
		C	0.13333	0.798
		D	-0.93333	**0**
	B	C	0.83333	**0**
		D	-0.23333	0.384
	C	D	-1.06667	**0**

Table 4. Parent-child Separation score Study Group Cross tabulation (Pearson Chi-square test)

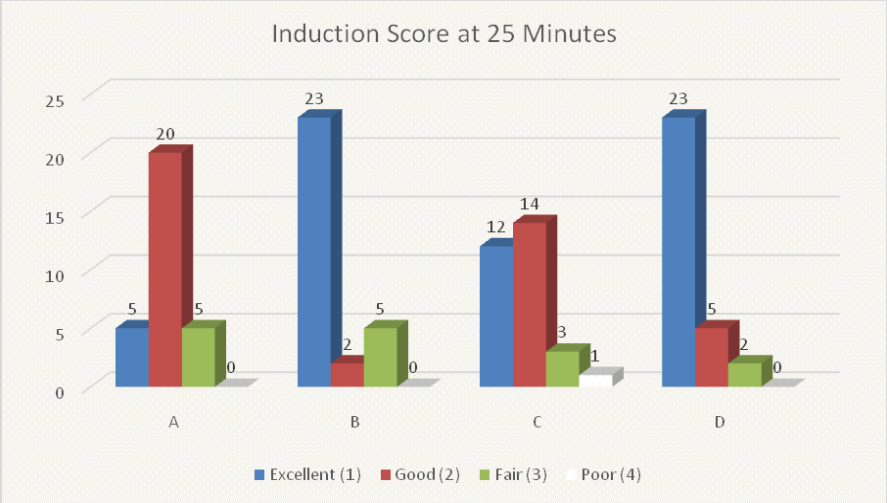
Parent-child Separation score at 20 minutes		Study Group				Total (n=120)	p-value
		A (n=30)	B (n=30)	C (n=30)	D (n=30)		
1(Excellent)	Count	17	25	19	27	88	**0.066**
	% within Group	56.70%	83.30%	63.30%	90.00%	73.30%	
2 (Good)	Count	10	4	9	2	25	
	% within Group	33.30%	13.30%	30.00%	6.70%	20.80%	
3 (Fair)	Count	3	1	2	1	7	
	% within Group	10.00%	3.30%	6.70%	3.30%	5.80%	



Bar Diag. Table 4. Parent- Child Separation Score at 20 Minutes

Table 5. Mean Parent-child Separation Score

		N	Mean	Std. Deviation	p- value
Parent-child Separation score at 20 minutes	A	30	1.53	0.68	**0.021**
	B	30	1.20	0.48	
	C	30	1.43	0.63	
	D	30	1.13	0.43	
	Total	120	1.33	0.58	



Bar Diagram- 6. Induction Score at 25 Minutes

Table 7. Mean Induction Score at 25 Minutes

		N	Mean	Std. Deviation	p- value
Induction Score at 25 Minutes	A	30	2.00	0.59	**<0.001**
	B	30	1.40	0.77	
	C	30	1.77	0.77	
	D	30	1.30	0.60	
	Total	120	1.62	0.74	

DISCUSSION

Midazolam is most commonly used pre-anaesthetic medication by various routes in children undergoing operations to allay anxiety pertaining to the anaesthesia and surgery because of its rapid onset of action, predictable duration and rapid recovery. It has sedative, hypnotic and anxiolytic properties. [2] We conducted a prospective, randomized, double blind study in our institute to evaluate and compare the safety, efficacy and acceptability of two doses for two delivery methods in the form of drops and spray of intranasal midazolam to find out a minimum suitable and effective dose. Our results and observations obtained are being discussed in the background of already existing literatures-

Demographic Profile:- Our four study groups were comparable in terms of sex distribution, weight and ASA class status similar to the comparable study groups in the studies done by Somvanshi et al, [16] Bhakta et al, [17] Griffith et al, [18] Raval et al, [14] Deshmukh et al [19] and Koppal et al. [20] However, the mean age in our group A was significantly less than group C. Other groups had non-significant differences.

Vitals:- Our all four study groups were comparable in vitals (mean pulse rate, mean respiratory rate and mean SpO_2 at every 5 minutes) similar to the study groups in Bhakta et al [17] and Raval et al [14] study.

Drug Acceptability:- In our study, the satisfactory response to the 0.25 mg/kg intranasal midazolam spray was 80% (Group D). However, the Raval et al [14] study showed 53.33% satisfactory response to the same dose. This might be due to the difference in the delivery of nasal spray; in our study, we used commercially available intranasal midazolam spray (Midacip) while Raval et al used atomizer device to deliver midazolam. Similarly, 56.70% patients in our study group A and 73.30% patients in group C showed satisfactory response, whereas the Griffith et al [18] study showed 50% satisfactory response to both 0.2 mg/kg drops and 0.1 mg/kg spray of intranasal midazolam. This might be due to lesser dose used by Griffith et al in spray group. In our study group C, 73.30% patients showed the satisfactory response to 0.2 mg/kg intranasal midazolam spray whereas Deshmukh et al [19] study showed 23% satisfactory response to the same dose. This might be due to the difference in mean age and weight in our study group C (5.15 ± 2.09 and 16.17 ± 4.23) and Deshmukh et al [19] study (3.2 ± 1.2 and 12.3 ± 2.2).

Ramsay Sedation Score (RSS):- The sedation score in our study group A was 2.27±0.45 while in Somvanshi et al [16]

study it was 3.64±0.5 inspite of same dose and method of administration in both studies (0.20 mg/kg intranasal midazolam drops). In our study group A, the age, weight and sex distribution were 3.75 ± 1.63, 13.83 ± 3.83 and 28:2 respectively while in Somvanshi et al [16] study the age, weight and sex distribution were 6.16 ± 2.35, 15.78 ± 3.1 and 20:5 respectively. Thus, the large difference in the sedation score might be due to the large difference in the demographic profile between our and Somvanshi et al [16] study. The sedation score in our study group B was 2.97±0.76 with 0.25 mg/kg intranasal midazolam drops, while in Somvanshi et al [16] study it was 3.76±0.7 with 0.3 mg/kg intranasal midazolam drops. This difference might be due to lesser dose of midazolam used in our study.

In our study, the maximum dose of intranasal midazolam spray used was 0.25 mg/kg in study group D. In Koppal et al [20] study, the transnasal group received 0.5 mg/kg midazolam dispensed through a drug atomizer. Here, the degree of sedation was assessed at 15 and 30 minutes of drug administration as 3.90 ± 0.83 and 4.63 ± 0.67 respectively while in our study, the level of sedation at 15 and 25 minutes was 2.73 ± 0.52 and 3.2 ± 0.55 respectively. We observed the level of sedation to peak at 20 minutes with no further increase at 25 minutes. In our study, we were able to achieve adequate sedation score at almost half the dose used by Koppal et al in their study. Further, the level of sedation in Koppal et al [20] study was excessive (≥ 5) in some patients, which appears to be undesirable.

Similar to our study group C, Deshmukh et al [19] also used 0.20 mg/kg intranasal midazolam spray in their study, wherein the mean age, weight and sex distribution were 3.2±1.2, 12.3±2.2 and 23/7 respectively. In our study group C, the mean age, weight and sex distribution were 5.15±2.09, 16.17±4.23 and 24/6 respectively. The mean sedation score in our study group C was 2.13±0.43 while it was more than 3 in 77% patients in the study done by Deshmukh et al. This difference in sedation score might be due to the large difference in the demographic profile of these studies.

In our study, the significant change in sedation score occurred at 10 minutes and thereafter, the significant change in sedation score continued at every 5 minutes interval to become maximum at 20 minutes. While, Bhakta et al [17] observed significant change in sedation score at 5 and 10 minutes in groups I (0.2 mg/kg) and II (0.3 mg/kg) respectively and thereafter, the significant change in sedation score continued at every 5 minutes interval, which was almost similar to our study. In our study, the mean sedation scores in study group A and B were 2.27±0.45 and 2.97±0.76 respectively. None of the patients in our study showed excessive sedation level of 5, while Bhakta et al [17] observed one patient in sedation level of 5 (asleep) in group II of their study.

In our study group C and D, the patients showed mean sedation score of 2.13±0.43 and 3.2±0.55 respectively. Similar results were reported by Baldwa et al [21] in their study i.e. 63% and 76% patients adequately sedated with 0.2 mg/kg and 0.3 mg/kg of intranasal midazolam spray respectively. In our study, none of the patients was found to carry excessive sedation score in any of the four study groups similar to as reported in the study done by Griffith et al. [18]

Parent child Separation Score:- In our study, the excellent to good parent-child separation score was shown by 93.30% patients, which was contrary to the study results reported by Deshmukh et al, [19] wherein 73% patients showed acceptable parental separation score. This difference could be attributable to the difference in demographic profile of our and the study done by Deshmukh et al. [19] If we look at the favorable score in our study; the excellent to good parent-child separation score was seen in 90% patients while in the study by Somvanshi et al, [16] it was 92%. Thus, the favourable parental separation

score in our study and the study done by Somvanshi et al [16] was almost similar. In our study group B, we used 0.25 mg/kg of intranasal midazolam drops while Somvanshi et al [16] used 0.3 mg/kg of intranasal midazolam drops in their study. The favorable parent-child separation score (excellent to good) in both our study and Somvanshi et al [16] study revealed the same score of 96% inspite of less dose in our study.

Similar to our study group A, Eskandarian et al [22] evaluated the parent-child separation score at 20 minutes with 0.2 mg/kg intranasal midazolam drops. In our study, the excellent, good and fair parent-child separation score were seen in 60.90%, 26.10% and 13% patients (2-4 years) respectively, while in Eskandarian et al [22] study it was seen in 55.2%, 31% and 10.3% patients respectively. Thus, the parent-child separation score at 20 minutes was almost similar in our study group A and Eskandarian et al [22] study.

Similar to our study group C and D, Baldwa et al [21] used intranasal midazolam in a dose of 0.2 and 0.3 mg/kg with the help of drug atomizer. In our study, the excellent to good parent-child separation score was shown by 84.70% and 92.30% patients respectively. However, Baldwa et al [21] reported easy parent-child separation at 20 minutes in 60% children in 0.2 mg/kg midazolam group and in 73.3% of children in 0.3 mg/kg midazolam group. Thus, a better separation score was observed in our study in spite of lesser dose used (0.25 mg/kg as compared to 0.3 mg/kg).

Similar to our study group A and B, Bhakta et al [17] also used intranasal midazolam drops in a dose of 0.2 and 0.3 mg/kg and reported easy parental separation at 10 minutes in 80% patients in both midazolam groups. In our study, the excellent to good parent-child separation score was shown by 90% and 96.60% patients group A and B respectively. In our study group A, a better separation score was achieved as compared to Bhakta et al [17] inspite of same dose and mehtod. Similarly, in our study group B a better separation score was achieved inspite of lesser dose (0.25 mg/kg as compared to 0.3 mg/kg in the study by Bhakta et al[17]). In our study, we observed the sedation score for 25 minutes after drug administration while the peak sedation score was seen at 20 minutes, the moment when the parent-child separation was carried out. However, Bhakta et al [17] separated the child at 10 minutes of drug administration, the moment at which the sedation might have not reached at its peak. This might be the reason of lower parental separation score in Bhakta et al [17] study inspite of use of equal or more doses of intranasal midazolam drops.

In our study group D, we used 0.25 mg/kg of intranasal midazolam spray formulation. The mean age and weight were 4.73±1.96 years and 14.95±4.01 kg respectively. Koppal et al [20] used transnasal midazolam 0.5 mg/kg dispensed through a drug atomizer. The mean age and weight were 45.06±24.02 and 12.36±3.44 respectively. In Koppal et al [20] study, the parent separation score at 30 minutes was 1.73±0.74 while in our study, the separation score at 20 minutes was 1.13±0.43. Inspite of lesser dose of intranasal midazolam used in our study group D, a better separation score was achieved, which might be due to the difference in demographic profile between our and Koppal et al [20] study in terms of age and weight.

In our study, the group D matches with the transnasal group of Raval et al [14] study in which 0.25 mg/kg midazolam was dispensed through a drug atomizer. The parent-child separation score in our study was 1.13±0.43 while in Raval et al [14] study it was 1.66±0.60. Thus, the parent-child separation score in our study and Raval et al [14] study was excellent to good and almost similar.

Induction Score: In our study group C, the excellent to good induction score was shown by 86.70% patients, which was similar to the satisfactory mask acceptance by 87% patients reported by Deshmukh et al

[19] with 0.20 mg/kg intranasal midazolam spray.

In our both study group A and B, the excellent to good induction score was seen in 83.40% patients. While Somvanshi et al [16] repoted the favorable induction score of 80% and 84% with 0.2 and 0.3 mg/kg intranasal midazolam drops respectively. Thus, the excellent to good induction score in our study was almost similar to Somvanshi et al [16] study irrespective of the dose (0.2/0.25/0.3 mg/kg) of intranasal midazolam drops used. We observed excellent to good induction score in 83.40% patients in our both study group A and B. However, Bhakta et al [17] reported 80% mask acceptance in both the midazolam groups (0.2 and 0.3 mg/kg intranasal drops). Thus, the induction score was almost similar in our and Bhakta et al [17] study. In our study group D, the excellent to good induction score was found in 93.40% patients, which was similar to the induction score 1.5 ± 057 in Raval et al [14] study. In our study group C and D, the excellent to good induction score was found in 93.40% and 86.70% patients respectively which was contrary to the study results (16.6% and 33.3% with 0.2 and 0.3 mg/kg dose of IN midazolam) reported by Baldwa et al. [21] This large difference could be attributed to the large difference in the demographic profile of these studies.

Limitations- (a) The drug dose was calculated based on per kg body weight, while the commercially available intranasal midazolam spray delivered 0.5 mg in one puff of 0.1 ml volume. Hence, the dose was calculated by rounding off to the nearest hundredth instead of the exact value. (b) The exact equal division of the drug volume was not possible in both the nostrils. (c) We assessed the sedation score at every 5 minutes time interval, not in between.

CONCLUSION

Intranasal midazolam spray in the dose of 0.25 mg/kg is a safe and effective premedication for children. It not only ensures good patient acceptability, optimum sedation level to relax and calm the child without excessive sleepiness, but also allows significantly easier parent-child separation and smooth induction of anaesthesia. However, further studies wherein the exact dose calculation and delivery may be possible with continuous assessment of sedation level are recommended in future.

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