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**Anesthesiology**

# The Efficiency of Spinal Anesthesia among 4-10 Years Children

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**Abstract** **Original Research Article**

***Objective:*** In this study our main goal is to evaluate the efficiency of spinal anesthesia among 4- 10 years children. ***Method:*** This prospective study was carried out at Cumilla Medical College hospital. A total of 50 pediatric patients 4 to 10 years of age group who were given spinal anesthesia for infraumbilical or lower extremity surgery during the 1-year period from January 2021 to December 2021 were included in the study. ***Results:*** During the study, majority patients were belong to 4-6 years age group 67%. During procedure, 80% patients' position was sitting, followed by 50% cases number of punctures was single, where as 7% cases CSF reflux showed after 2nd puncture. Mean fasting hours were 5.82± 0.1 h. Injection atropine 0.01 mg/kg was given as premedication. Most of the patients were given ketamine either alone (59%) or with midazolam (41%). Other drugs used were diazepam (3%) and fentanyl (2%). there was no significant change in the mean value of systolic blood pressure, diastolic blood pressure, respiratory rate, and oxygen saturation after subarachnoid block at all time periods. After 10 min of SAB 95% patients achieved desired peak sensory level of T10 and Bromage score of 3. ***Conclusion:*** From our study we can recommend that spinal anesthesia is ideal, safe and cost- effective for day-case surgeries and there is no additional requirement of any special drugs or equipment's for the procedure. Because of these benefits, spinal anesthesia preferred for children undergoing surgery in the lower part of the body.

**Keywords:** Spinal anesthesia (SA), subarachnoid block (SAB) general anesthesia (GA).



## INTRODUCTION

Spinal anesthesia (SA) is a kind of anaesthetic used in subarachnoid space for lower abdominal and lower limb procedures. Bier (1898) was the first to perform spinal anesthesia on children, followed by Bainbridge (1901) and Gray (1909) [1-3].

This localized use of anaesthetic was phased out due to significant advancements in general anesthesia (GA) in the mid-twentieth century. After the reduction of caudal anesthetic use, spinal anesthesia in newborns or preterm infants increased by 2.1 to 3.6 percent in 1990–2000 [3, 4]. Nowadays, spinal anesthesia is used in pediatric patients also, with up to 95.4 percent of children undergoing it, both newborns and preterm infants [4, 5]. Though it gaining popularity for infants and children, the misconceptions regarding its overall safety, feasibility, and reliability can only be better known with greater use and research.

## OBJECTIVE

To assess the efficiency of spinal anesthesia among 4-10 years children.

## METHODOLOGY

This prospective study was carried out at Cumilla medical college hospital. A total of 50 pediatric patients 4 to 10 years of age group who were given spinal anesthesia for infraumbilical or lower extremity surgery during the 1-year period were included in the study. All patients under study were subjected to detailed preanesthetic evaluation. Patients with a known contraindication to lumbar puncture were excluded.

All collected data were coding and input in SPSS-25 for further analysis. Both descriptive and inferential statistics done. Descriptive statistics included frequency distribution, percent, graph, tables and figures.

## RESULTS

In table-1 shows age distribution of the patients where majority were belong to 4-6 years age group, 67%. The following table is given below in detail:

**Table-1: Age distribution of the patients**

| Age group | % |
|---|---|
| 4-6 years | 67% |
| 7-10 years | 33% |

In figure-1 shows gender distribution of the patients where 60% were male. The following figure is given below in detail:

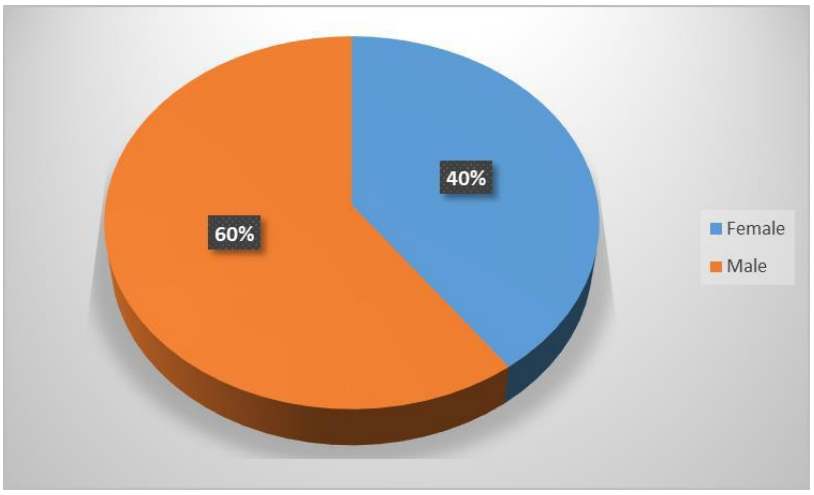


**Figure-1: Gender distribution of the patients**

In table-2 shows types of surgery where Circumcision cases seen in 48%, followed by Appendectomy seen in 21% cases, Herniotomy seen in 18% and 13% cases undergone in Lower limb orthopedic surgery. The following table is given below in detail:

**Table-2: Types of surgery**

| Types of surgery | % |
|---|---|
| Circumcision | 48% |
| Appendectomy | 21% |
| Herniotomy | 18% |
| Lower limb orthopedic surgery | 13% |

In table-3 shows procedure status of study group where 80% patients' position was sitting and20% lateral decubitus position. 50% cases number of punctures was single where as 7% cases CSF reflux showed after 2nd puncture. Mean fasting hours were 5.82 ± 0.1 h. Injection atropine 0.01 mg/kg was given as premedication. Most of the patients were given ketamine either alone (59%) or with midazolam (41%). Other drugs used were diazepam (3%) and fentanyl (2%).

The following table is given below in detail:

**Table-3: Procedure status of study group**

| Position of the patient | % |
|---|---|
| Lateral decubitus | 20% |
| Sitting position | 80% |
| **Number of punctures** | **%** |
| 1 | 50% |

| | |
|---|---|
| 2 | 35% |
| ≥ 3 | 15% |
| CSF reflux after a first blood reflux | 2% |
| CSF reflux after a 2nd puncture | 7% |
| Mean fasting hours | 5.82 ± 0.91 h |
| **Sedative Medication** | **%** |
| Ketamine Alone | 59% |
| Ketamine with midazolam | 41% |
| **Other medication** | **%** |
| diazepam | 3% |
| fentanyl | 2% |

In table-4 shows blood pressure and pulse rate status of study group where there was no significant change in the mean value of systolic blood pressure, diastolic blood pressure, respiratory rate, and oxygen saturation after subarachnoid block at all time periods. The following table is given below in detail:

**Table-4: Blood pressure and pulse rate status of study group**

| Before SAB | SBP | DBP | RR |
|---|---|---|---|
| | 87±0.21 | 65±0.11 | 22–34 |
| 15 mins after SAB | 86±0.23 | 64±0.10 | 23–37 |
| 60 mins after SAB | 89±0.24 | 66±0.13 | 22–35 |

In figure-2 shows outcome of surgery where After 10 min of SAB 95% patients achieved desired peak sensory level of T10 and Bromage score of 3. Surgery was completed in all these cases without anesthetic supplementation. The success rate of the study was 95%. Remaining 5% cases were classified as a failure and were given GA.

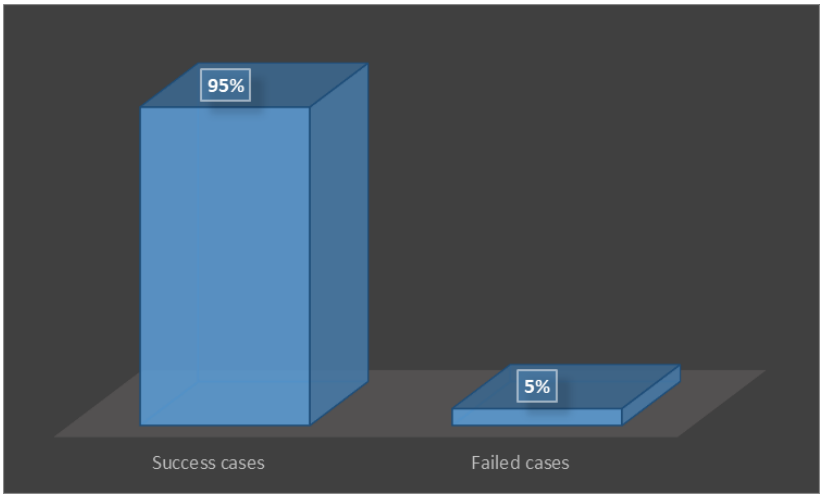


**Figure-2: Outcome of surgery**

## DISCUSSION

In one study, ketamine was used for sedation in the maximum number of patients (*n* = 56, 54.9%). Other drugs used were midazolam (*n* = 3, 2.9%), diazepam (*n* = 1, 1%), fentanyl (*n* = 7, 6.9%) or a combination of these drugs. Four (3.9%) patients in our study were not given any sedation before SAB because they were comparatively older in age (>10 years) and cooperative [6].

Which was supported to our study where most of the patients were given ketamine either alone (59%) or with midazolam (41%). Other drugs used were diazepam (3%) and fentanyl (2%). Low dose sedation does not mask the failure of the block. It is better to provide supplemental oxygen during sedation.

In a study conducted on pediatric patients aged 7 weeks to 13 years, 4 of 34 patients required GA due to failure of lumbar puncture after two attempts. Sedation prevents movement of the children during lumbar puncture and might have been an important factor for better results of our study [7].

Ketamine induces dissociative anesthesia causing functional dissociation between cortical and limbic system. Protective airway reflexes are

maintained during sedation. Ketamine having a high therapeutic index is a suitable drug for sedation in the pediatric population [8].

In our study, the desired sensory level of T10 was achieved in 95% patients after 10 min of SAB, and they were considered as successful spinal block. Where as in 5% patients, T10 level were not achieved and GA was given, and these were considered as failed spinal block. The mean peak sensory level was T 6.35 ± 1.20 and the median was T6. Mean time to two segments regression was 43.97 ± 10.72 (30-70) min. Since the level of surgery was below T10 in all the patients, adequate dermatomal level was present until the end of surgery. Thus, none of the patients required supplemental anesthesia during surgery in our study and supported by several studies [9-11].

Another conducted a study on 78 children aged between 2 and 6 years undergoing different type of surgery in the lower part of the body and reported that sensory block showed wide variation of height from T1 to T7, and the median was T4 [12].

In our study no complication was noted however in one study which conducted a study to evaluate characteristics of spinal anesthesia on 78 children aged between 2 and 6 years and reported that shivering occurred in five patients and vomiting occurred in one patient. Two patients had hypotension, which was treated with ephedrine and bradycardia was seen in one patient, which was treated with atropine [13].

## CONCLUSION

From our study we can recommend that spinal anesthesia is ideal, safe and cost-effective for day- case surgeries and there is no additional requirement of any special drugs or equipment's for the procedure. Because of these benefits, spinal anesthesia preferred for children undergoing surgery in the lower part of the body.

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