



Original Research

Comparison of Quality of Life Measures and Post-Operative Anxiety in Children undergoing Treatment under General Anesthesia and Nitrous-Oxide Sedation

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ABSTRACT

Objective: To compare quality of life measures and post-operative anxiety in children undergoing treatment under General anesthesia and Nitrous-oxide sedation.

Study design: 70 unco-operative children aged 3-5 years received full mouth rehabilitation treatment either under general anesthesia or nitrous oxide sedation. The physical as well as the social quality of life measures was evaluated using questionnaire given to parents at 1 week, 6 months and 12 months post-operatively. The child's fear and anxiety was evaluated post-operatively for both the groups using CFSS-DS scale. Statistically analysis for comparison between the two groups was carried using Wilcoxon signed ranked test.

Result: There is no difference in the physical quality of life as well as social quality of life measures between treatment under general anesthesia and nitrous oxide sedation at 1 week, 6 months and 12 months post-operatively ($P>0.05$). Children treated under nitrous oxide sedation show decreased fear and anxiety post-operatively as compared to children treated under general anesthesia. ($P<0.05$).

Conclusion: Treatment under general anesthesia and nitrous oxide sedation shows similar improvement in post-operative physical as well as social quality of life. There is a decrease in the dental fear and anxiety post-operatively after treatment under nitrous oxide sedation.

Keywords: Dental fear; Full mouth rehabilitation; General anesthesia; Nitrous oxide

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INTRODUCTION

Dental caries is one of the most common micro-biological diseases affecting young children.¹ Long standing incidence of dental caries in childhood is intern associated with presence of swelling, pain which affects the day-to-day activities. Increased incidence of pain is also known to influence the nutrition status of the individual, thereby affecting the physical status of the child.² In addition, to the physical quality, dental caries also has direct relationship with the children's social interaction. Poor aesthetic appearance and increased dental pain causes missed school days and reduced social interaction with other children.³ Thus, dental caries directly and indirectly influences the physical as well as the social quality of life measures in children.

Management of dental caries is required for providing better quality of life. Routine restorative treatment can be managed chair-side without the need of additional behavior management techniques. However, Management of extensive caries in young child who pose behavior management problems requires pharmacological methods like General anesthesia and nitrous oxide sedation.⁴ Macpherson et al have shown behavior management problems and requirement of extensive treatment as a primary reason for undertaking treatment under general anesthesia.⁵

Oral rehabilitation under general anesthesia as well as nitrous oxide sedation require additional hospital setting, which incur additional cost to the patient.⁶ In addition to the cost, it is also associated with increased risk of morbidity associated with pharmacological behavior management procedure.⁷ Hence, higher advantage of the use of pharmacological treatment is required to provide proper justification for its indication. Post-operative quality of life is under the direct influence of the advantage of treatment using general anesthesia and nitrous oxide oxygen sedation. Previous studies by White et al⁸, have shown better post-operative quality of life with dental rehabilitation under general anesthesia. Improvement in both social and physical quality of life measures after general anesthesia has been evaluated by Klaassen et al.⁹ No previous studies have evaluated the post-operative quality of life after nitrous oxide-oxygen sedation. Nitrous oxide-oxygen sedation is known to have less cost as compared to treatment under general anesthesia.¹⁰ Hence, the present study has been undertaken with the aim of providing comparable post-operative quality of life with nitrous oxide sedation at a decreased cost than general anesthesia procedure.

Post-operative anxiety is another parameter affecting quality of life and attitude of the child towards dental treatment.¹¹ Previous bad experience creates fear and makes future appointments more difficult for young patients having behavior management problems.¹² Hence effective behavior shaping is required during the dental treatment which aids in improved behavior without any pharmacological aid in the subsequent appointments.¹³

Considering these parameters, the present study compares the post-operative physical and social quality of life measures along with the post-operative anxiety after dental treatment under general anesthesia and nitrous oxide-oxygen sedation.

MATERIALS AND METHODS

The present study is a prospective clinical trial. The sample size of the present study was based on convenience sampling with a total of 70 un-cooperative children having behavior management problems were included. Children aged 3-5 years having behavior management problems were included in the study based on the following inclusion and exclusion criteria.

Inclusion criteria:

1. Children requiring multiple dental treatment in at least two quadrants
2. Children with Frankl's 1 and 2 rating
3. Children having physical status of ASA 1.

Exclusion criteria:

1. Mentally and physically compromised children requiring special health care needs.
2. Patient with cognitive impairment.
3. Patient with obstructive respiratory condition which makes breathing difficult through nose.
4. Patient with history of systemic illness.

After their recruitment, the study design was explained to the parents with benefits and harm of each treatment. A written informed consent was obtained from parents of all the children included in the study. If the parents did not provide consent, those children were excluded from the study.

Prior to the dental procedure, all the patients were evaluated by the anesthetist for physical fitness. Prior to the treatment the patient were asked to follow a fasting of 6 hours for clear liquids and 8 hours for solids and non-clear liquids.

The patients received dental rehabilitation either under nitrous oxide-oxygen sedation or general anesthesia. This was based on the patient's acceptance of nasal hood. If patient had the ability to understand, follow instructions and were able to accept nasal hood, nitrous oxide was administered at the concentration on 30%-70% concentration. For the patients unable to follow instructions, rehabilitation was done using general anesthesia. The sample was equally divided such that 35 patients received either of the two intervention and the remaining 35 received the other.

Treatment was initiated with monitoring the vitals for both the treatment modalities. SpO₂, heart rate, respiratory rate and systolic and diastolic pressure was monitored for both the treatment throughout the procedure. Additionally, for patients undergoing treatment under general anesthesia ECG was also monitored. Nitrous oxide-oxygen sedation was administered using Matrx Porter Digital Relative analgesia machine. Initial flow rate was established by using 100% oxygen after the placement of nasal hood. Following this, nitrous oxide was administered at a concentration of 30% nitrous oxide and 70% oxygen using a rapid induction technique. Local anesthesia was used for the invasive treatment. Patients requiring treatment on the contralateral side were completed in two appointments whereas; treatment involving anterior teeth and same side was completed in a single visit. After completion of treatment, 100% oxygen was administered for 5 minutes.

All the procedure for induction with general anesthesia was carried by the anesthetist. Induction for general anesthesia was given using propofol and sevoflurane was used for the maintenance. Since general anesthesia involves the loss of protective reflex, the patient was intubated. All the dental rehabilitation procedure under general anesthesia was completed in a single visit. Following the treatment, the quality of life was evaluated after one week, 6 months and 12 months post-operatively. The quality of life measures was based on two parameters: physical as well as social measures. Both the parameters were evaluated by a questionnaire given to the parents on the recall visit one week post-operatively. Those children, who failed to come for the recall visit, were excluded from the study.

Following parameters were evaluated in the questionnaire.

- Physical quality of life: Dental pain-free; Eats better; Sleeps more; Better overall health.
- Social quality of life: Looks better; Smiles more; Better in school; More social.

Yes, No or Don't know responses were recorded for each parameter and compared between the two group.

Post-operative dental anxiety was evaluated using CFSS-DS scale. It is a 15-point scale which evaluates the patient on 15 parameters giving score from 15-75. Children having CFSS-DS score greater than 38 were considered as anxious. CFSS-DS score were compared between the two groups.¹⁴

The data collected was entered in the spreadsheet and the data was analyzed using SPSS software. Chi-square test was used to compare the outcomes between the two groups for physical and social quality of life measures. Wilcoxon-signed ranked test was used to compare CFSS-DS scores between the two groups. The values were considered significant when $p < 0.05$.

RESULTS

70 children aged 3-5 years included in the study were equally divided to receive either of the intervention. 65.86% and 51.42% of children managed using general anesthesia and nitrous oxide-oxygen sedation were females. Mean age of the patient treated under general anesthesia was 3.4 years and under nitrous oxide-oxygen sedation was 4.51 years.

Based on chi-square test, there was no significant difference between the physical quality of life measures between the two groups after 1 week, 6 months and 12 months post-operatively ($P > 0.05$) (**Table 1**) (**Table 2**) (**Table 3**). Based on chi-square test, there was no significant difference between the two groups for the outcome of social quality of life measures between the two groups after 1 week, 6 months and 12 months post-operatively. ($P > 0.05$) (**Table 4**) (**Table 5**) (**Table 6**).

Table 1: Parent's perception of physical quality of life measures after 1 week post-operatively

Parameters	Treatment under General anesthesia (N=35)			Treatment under Nitrous-oxide oxygen sedation (N=35)			p-value
	Yes (%)	No (%)	Don't know (%)	Yes (%)	No (%)	Don't know (%)	
Dental pain-free	29(82.85)	3(8.57)	3(8.57)	28(80)	3(8.57)	4(11.42)	>0.05
Eats better	32(91.42)	1(3.3)	2(5.7)	31(88.57)	3(8.57)	1(3.3)	
Sleeps more	31(88.57)	4(11.42)	0(0)	29(82.85)	6(17.14)	0(0)	
Better overall health	27(77.14)	7(20)	1(3.3)	24(68.57)	9(25.71)	2(5.7)	

Table 2: Parent's perception of physical quality of life measures after 6 months post-operatively

Parameters	Treatment under General anesthesia (N=35)			Treatment under Nitrous-oxide oxygen sedation (N=35)			p-value
	Yes (%)	No (%)	Don't know (%)	Yes (%)	No (%)	Don't know (%)	
Dental pain-free	28(80.00)	5(14.28)	2(5.71)	31(88.57)	3(8.57)	1(2.85)	>0.05
Eats better	30(85.71)	3(8.57)	2(5.71)	32(91.42)	3(8.57)	0(0)	
Sleeps more	30(85.71)	5(14.28)	0(0)	29(82.85)	6(17.14)	0(0)	
Better overall health	27(77.14)	8(22.85)	0(0)	23(65.71)	10(28.57)	2(5.71)	

Table 3: Parent's perception of physical quality of life measures after 12 months post-operatively

Parameters	Treatment under General anesthesia (N=35)			Treatment under Nitrous-oxide oxygen sedation (N=35)			p-value
	Yes (%)	No (%)	Don't know (%)	Yes (%)	No (%)	Don't know (%)	
Dental pain-free	29(82.85)	4(11.42)	2(5.71)	28(80)	4(11.42)	3(8.57)	>0.05
Eats better	33(94.28)	2(5.71)	0(0)	31(88.57)	4(11.42)	0(0)	
Sleeps more	31(88.57)	4(11.42)	0(0)	29(82.85)	6(17.14)	0(0)	
Better overall health	32(91.42)	3(8.57)	0(3.3)	29(82.85)	3(8.57)	3(8.57)	

Table 4: Parent's perception of social quality of life measures after 1 week post-operatively

Parameters	Treatment under General anesthesia (N=35)			Treatment under Nitrous-oxide oxygen sedation (N=35)			p-value
	Yes (%)	No (%)	Don't know (%)	Yes (%)	No (%)	Don't know (%)	
Looks better	31(88.57)	2(5.7)	2(5.7)	31(88.57)	3(8.57)	1(3.3)	>0.05
Smiles more	33(94.28)	1(3.3)	1(3.3)	33(94.28)	0(0)	2(5.7)	
Better in school	33(94.28)	0(0)	2(5.7)	33(94.28)	2(5.7)	0(0)	
More social	29(82.85)	2(5.5)	4(12.5)	28(80)	3(8.57)	4(12.5)	

Table 5: Parent's perception of social quality of life measures after 6 months post-operatively

Parameters	Treatment under General anesthesia (N=35)			Treatment under Nitrous-oxide oxygen sedation (N=35)			p-value
	Yes (%)	No (%)	Don't know (%)	Yes (%)	No (%)	Don't know (%)	
Looks better	32(91.42)	1(2.85)	2(5.71)	33(94.28)	1(2.85)	1(2.85)	>0.05
Smiles more	34(97.14)	1(2.85)	0(0)	33(94.28)	0(0)	2(5.71)	
Better in school	34(97.14)	1(2.85)	0(0)	33(94.28)	2(5.71)	0(0)	
More social	33(94.28)	2(5.71)	0(0)	31(88.57)	3(8.57)	1(2.85)	

Table 6: Parent's perception of social quality of life measures after 12 months post-operatively

Parameters	Treatment under General anesthesia (N=35)			Treatment under Nitrous-oxide oxygen sedation (N=35)			p-value
	Yes (%)	No (%)	Don't know (%)	Yes (%)	No (%)	Don't know (%)	
Looks better	32(91.42)	2(5.71)	1(2.85)	31(88.57)	3(8.57)	1(2.85)	>0.05
Smiles more	33(94.28)	2(5.71)	0(0)	32(91.42)	3(8.57)	0(0)	
Better in school	34(94.28)	1(2.85)	0(0)	32(91.42)	3(8.57)	0(0)	
More social	30(85.71)	3(8.57)	2(5.71)	28(80)	3(8.57)	4(11.42)	

When comparing CFSS-DS score between the two groups 71.42% of children treated under general anesthesia had scores >38, indicating increased post-operative anxiety. On the other hand, all 100% of patient treated under nitrous-oxide oxygen sedation had scores <38, indicating decreased post-operative anxiety. The mean CFSS-DS score for children treated under general anesthesia was 39.514 ± 4.408 and for children treated under nitrous-oxide oxygen sedation was 25 ± 4.595 . Comparing results with Wilcoxon-signed ranked test it was found children treated under nitrous-oxide oxygen sedation showed statistically significant less post-operative anxiety as compared to children treated under general anesthesia ($P < 0.00001$) (**Figure 1**).

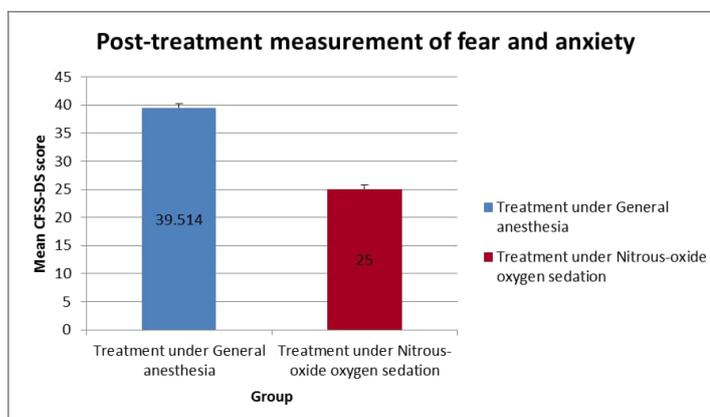


Figure 1: Post-treatment measurement of fear and anxiety

DISCUSSION

Behavior management is an important aspect of treating pediatric patients. When conventional non-pharmacological behavior management techniques are ineffective, it becomes imperative to use pharmacological methods of managing children.⁴ The use of general anesthesia and nitrous oxide-oxygen sedation is employed to provide high quality of dental treatment in pre-cooperative and fearful children.¹⁵ With the increasing awareness of parents towards the dental treatment, more parents are opting for pharmacological methods for multiple dental procedures. The post-operative success of the healthcare treatments is not only based on the absence of physical symptoms but also on the social interaction.⁸ In addition, the post-operative fear of the child also plays role in behavior shaping for positive attitude towards dental treatment.¹⁶ With this objective, the present study compares the quality of life and post-operative dental fear between dental treatment under general anesthesia and nitrous oxide-oxygen sedation.

The present study uses the questionnaire to evaluate the effect on the physical and social quality of life measures. The post-operative fear is compared using CFSS-DS scale. These methods are employed for evaluation between the two groups, since they measure the subjective as well as the objective quality of life.

The study shows 82.85% of children treated under general anesthesia to be pain free post-operatively as compared to 80% of children treated under nitrous oxide sedation to be pain free. However, only 77.14% of children treated under general anesthesia and 68.57% of children treated under nitrous oxide sedation reported to have better overall health. These findings were results in spite of better ability of children to eat and sleep post-operatively. This signifies the inability of the parents to establish a relation between the oral as well as the general health of the children. These findings were consistent with other studies by Acs et al^[17] and White et al⁸ who reported 84% of children were pain free post-operatively but only 65% and 60% children respectively were reported to have better overall health. These studies evaluated the physical quality of life measures post-operatively after treatment under general anesthesia alone.

It also compares the physical quality of life post-operative between treatment under general anesthesia and nitrous oxide sedation. The present study however, reports no significant difference between the physical quality of life measures. This fact signifies that all unco-operative children need not be subjected to treatment under general anesthesia. Based on the children's co-operative dental treatment can as efficiently carried out under nitrous oxide sedation as under general anesthesia. No other study has evaluated the post-operative quality of life between treatment under general anesthesia and nitrous oxide sedation. However, a study by Eidelman et al¹⁸ has reported better quality of restoration with treatment under general anesthesia as compared to under conscious sedation. These finding was inconsistent with the present study, this study did not evaluate the post-operative quality of life.

The present study also evaluates the social quality of life measures after treatment under general anesthesia and nitrous oxide sedation. In both the groups, after 1 week post-operatively 88.57% of parents reported that children looked better, 94.28% reported the children smiles more and 94.28% reported their children were better in school post-operatively. 82.85% of children treated under general anesthesia were more social as compared to 80% of children treated

under nitrous oxide sedation. These findings were in co-relation with previous study by White et al.⁸ However, lower percentages of improvement in social parameters were reported by Low et al.¹⁹ This can be because their survey did not include children under school programme. No study has compared the social quality of life post-operatively between treatment under general anesthesia and nitrous oxide sedation. This is the first study comparing physical and social quality of life measures between nitrous oxide sedation and general anesthesia after 6 months and 12 months post-operatively. There was an improvement in the physical as well as social quality of life measure after 6 months and 12 months, however, the present study did not show a statistically significant difference between the two groups.

It also compares fear and anxiety after treatment under general anesthesia and nitrous oxide sedation using CFSS-DS scale. The present study shows decreased post-operative anxiety and fear after treatment with nitrous oxide sedation as compared to general anesthesia. This can be attributed to the fact that treatment under nitrous oxide sedation was completed in multiple appointments which conditions the fearful child to cope with the dental treatment. On the other hand, no conditioning is possible in treatment under general anesthesia due to the loss of consciousness of child during treatment.²⁰ Other studies by Kupietzky et al²¹ and Fuhrer et al²² did not report any difference in the post-operative anxiety between treatment under general anesthesia and conscious sedation. The post-operative fear and anxiety for both these studies were evaluated after long term follow up post treatment.

The study is limited to the subjective evaluation of quality of life. Objective evaluation of quality of life can show a better idea of its impact post-operatively with treatment under general anesthesia as well as nitrous oxide sedation.

CONCLUSION

The present study shows better physical and social quality of life measures after treatment under general anesthesia as well as nitrous oxide sedation. However, there was no significant improvement in the quality of life between treatment under general anesthesia and nitrous oxide sedation. The present study show decreased dental fear and anxiety with treatment under nitrous oxide sedation as compared to treatment under general anesthesia.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

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