

Parental anxiety associated with children undergoing dental treatment



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Abstract

Aim Over the past two decades, improvements in both the safety of anaesthetic agents and the techniques of operative dentistry have resulted in the popularity of “day-case anaesthesia”. The aim of this study was to evaluate the stress felt by parents of children undergoing dental treatment. The study also aimed to compare the stress felt by parents of children undergoing chairside treatment to the stress felt by parents of children who received their treatment under general anaesthesia.

Materials and methods Study Design: Stress among parents was assessed subjectively using the Modified Dental Anxiety Stress (MDAS) questionnaire and objectively using a pulse oximeter to record the heart rate. The sample comprised of 60 parents of children aged between 4 and 7 years who were divided into three groups. Group A comprised of 20 sets of parents of children who underwent complete dental treatment without any pharmacological behaviour management. Group B comprised of 20 sets of parents of children who were treated at the dental chair with N₂O used as pharmacological behaviour management. Group C comprised of 20 sets of parents of children who underwent dental rehabilitation under general anaesthesia. Objective signs were recorded preoperatively, during the procedure and post-operatively.

Results Dental treatment is a stressful experience for a parent. The introduction of a pharmacological method of behaviour management seems to significantly increase the stress felt by the parent.

Conclusions A significant increase in heart rate was observed among parents whose children were under treatment.

Introduction

The anxiety that a parent feels when his or her child undergoes surgery under general anaesthesia has been documented in paediatric anesthesiology literature [Akinci et al., 2008; Jolliffe, 1997]. Stress among parents prior to surgery has been shown to have a direct impact on the post-anaesthetic recovery of the child [Arai et al., 2008]. While in the past decade a number of attempts, such as clown therapy and allowing the parent into the operation room until the induction of anaesthesia, have been made in order to reduce the stress and anxiety in children going into surgery [Kain et al., 2003; Karl et al., 1990; Vagnoli et al., 2005], not many steps have been taken to lower parental anxiety during the surgery of their child [Agostini et al., 2014].

Over the past two decades, improvements in both the safety of anaesthetic agents and the techniques of operative dentistry have resulted in the popularity of “day-case anaesthesia” [Amanor-Boadu, 2002]. As a result, parents do not have to deal with the process of admitting their child in the hospital, consequently, they stay at the hospital for a shorter period, which allows them to better cope with the stress of the operation [Amanor-Boadu, 2002; Jolliffe, 1997; Mariano et al., 2006]. Dental rehabilitation under general anaesthesia is an elective surgery and little is known about the stress experienced by the parents prior to and during the procedure. Furthermore, there are virtually no previous studies on parents of patients undergoing dental rehabilitation [Agostini et al., 2014; Arai et al., 2008; Mariano et al., 2006].

The Dental Anxiety Stress (DAS) questionnaire is perhaps one of the most commonly used and validated questionnaires for the recording of stress felt by parents. The heart rate, as measured by a pulse oximeter, is a useful tool for the measurement of acute stress and changes that are being felt by the individual [Pani et al., 2014], and has been previously used to monitor anxiety in mothers of children undergoing surgery [Arai et al., 2008].

Given the scarcity of studies on the topic, there is a need for a study to assess the differences between parental anxiety during dental rehabilitation of their children undergoing dental treatment in different settings.

KEY WORDS Behaviour management; Dental treatment; General anaesthesia; Heart rate; MDAS questionnaire; Parental anxiety.

The aim of this study is to evaluate the anxiety felt by parents of children undergoing dental treatment using the heart rate and the Modified Dental Anxiety Scale (MDAS) questionnaire. Moreover, the study aims to compare the anxiety of parents whose children undergo chairside treatment with or without the use of nitrous oxide to the anxiety felt by parents whose children are submitted to treatment under general anaesthesia. The Dental Anxiety Stress (DAS) questionnaire is perhaps one of the most commonly used and validated questionnaires for the recording of stress felt by parents. The heart rate, as measured by a pulse oximeter, is a useful tool to measure the acute stress and changes that are being felt by the individual [Pani et al., 2014] and has been previously used to monitor anxiety in mothers of children undergoing surgery [Arai et al., 2008].

Materials and methods

Research and ethical approval

This study was registered and ethical approval obtained from the research centre of Riyadh Colleges of Dentistry and Pharmacy (registration number FPGRP/43435006/120). Parents were asked to sign the informed consent form before participation.

Sample selection

A sample of parents was divided into three groups. Group A comprised of 20 sets of parents of medically fit children aged between 4 to 7 years, who had been scheduled for chairside dental rehabilitation without the use of nitrous oxide. Group B comprised of 20 sets of parents of medically fit children aged between 4 to 7 years, who had been scheduled for chairside dental rehabilitation with the use of nitrous oxide (behaviour management). Group C comprised of 20 sets of parents of medically fit children aged between 4 to 7 years of age, who had been referred for dental rehabilitation under general anaesthesia (Fig. 1).

Inclusion criteria

Parents of medically fit children aged between 4–7 years and parents of children who had never before been submitted to general anaesthesia and required dental drilling treatment.

Exclusion criteria

Parents of medically compromised children and parents of children with a history of surgery and hospitalisation.

Sample power calculation

A sample power calculation was done using the G-Power Sample power calculator (Universitat-Kiel, Germany). The sample comprised of the parents (both mother and father) of children undergoing dental rehabilitation under general anaesthesia. The minimum sample required a sample power of 95% with $\alpha < 0.05$ is 20 per group.

Qualitative measurement

Parents were given an Arabic version of the Modified Dental Anxiety Scale (MDAS) questionnaire half an hour prior to the appointment and the surgery.

Quantitative measurement

As a predictor of the immediate stress, a pulse oximeter was used to monitor the heart rate and the oxygen saturation

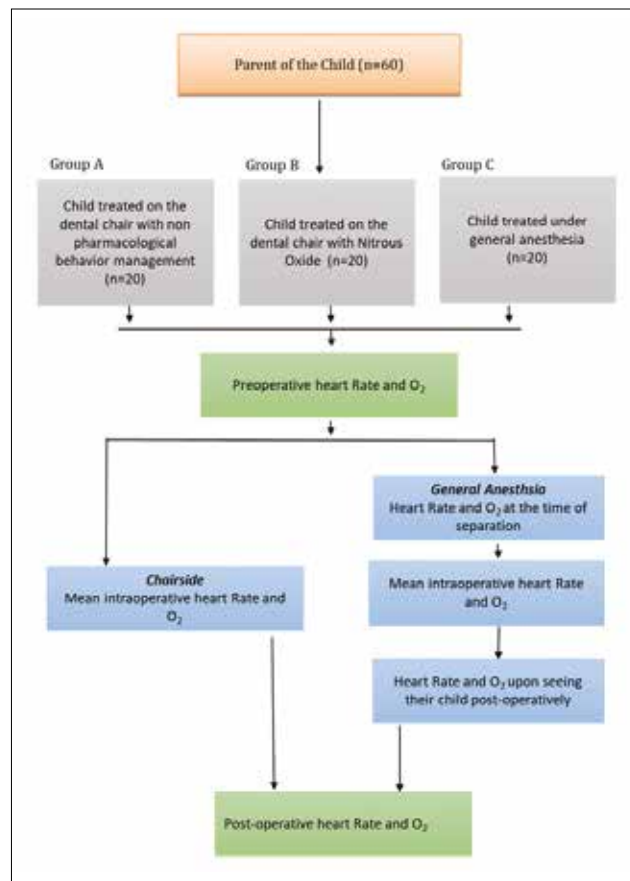


FIG. 1 Flow of sample protocol.

of the parents. In groups A and B the following readings were used.

- Heart rate and O_2 saturation before the procedure.
- Mean heart rate and O_2 saturation during the procedure.
- Heart rate and O_2 saturation ten minutes after completion of the procedure.

In Group C the following readings were used.

- Heart rate and O_2 saturation before the procedure.
- Heart rate and O_2 saturation at the time of separation from the child prior to surgery.
- Mean heart rate and O_2 saturation during the procedure.
- Heart rate and oxygen saturation immediately upon seeing their child after the surgery.
- Heart rate and O_2 saturation ten minutes after the completion of the procedure.

Administration of questionnaire and data collection

The demographic data of the family was collected by administering a questionnaire to the father and the mother. The questionnaire contained questions regarding the parents' age and education level. The questionnaire also served as a means of obtaining informed consent.

Arabic version of the modified dental anxiety questionnaire was provided to the parents for their anxiety level assessment.

Statistical analysis

All statistical analyses were done using the SPSS ver.22 data processing software.

- a) Descriptive statistics were performed for the demographic data.
- b) The significance of difference in heart rate, oxygen saturation and the dental fear between different groups at each measurement was compared using the one-way ANOVA.
- c) The Scheffe's post hoc test was used to compare the significance of difference within each group.
- d) ANOVA was used to study the variations in heart rate and oxygen saturation at the different times of repeated measurements.

Results

The sample comprised of an almost equal number of female (n=29) and male (n=31) children, however, most females were accompanied by their mothers while most of the males were accompanied by their fathers. The mean age of the children was 5.32 ±1.2 years with no significant difference between the ages of the males and the females (t=0.799, p=0.865).

An equal number of fathers (n=30) and mothers (n=30) participated in the study. The parents were evenly distributed in groups (Table 1).

Heart rate and location of dental treatment

The heart rate was observed across groups and was noted that the heart rate tended to be the lowest pre-operatively (baseline), then increased during the procedure and reduced ten minutes post-operatively. The pattern of the rise was the same among the three study groups.

The significance of difference in heart rate between the different groups at each measurement was compared using the one-way ANOVA. Significant differences between groups were observed at each interval with the lowest heart rate being seen in the parents whose children were treated in the dental chair whereas the highest heart rate being seen in the parents whose children were treated under general anaesthesia.

The heart rate of the parents was monitored at different intervals during the general anaesthesia procedure (Fig. 2).

ANOVA was used to study the variations in the heart rate of the measurements at the different time points during the procedure. It was observed that the heart rate was highest intraoperatively and slowly returned towards the baseline in the post-operative period. It was observed that there were significant differences in the heart rates across different intervals, with the post-operative heart rate still being significantly higher than the baseline.

The Scheffe's post hoc test showed that when the heart rate was measured pre-operatively, parents of children who were treated without sedation or general anaesthesia had significantly lower pre-operative heart rates. There was no significant difference in the pre-operative heart rate of parents whose children were treated under sedation or those who were treated under general anaesthesia. Similar findings were observed for the intra-operative and post-operative heart rates. Neither the gender of the child nor the relationship of the parent had any significant relationship to the heart rate of the parent.

Oxygen saturation and type of dental procedure

Oxygen saturation among the groups did not vary much

| | Chairside | Chairside + N2O | General Anaesthesia |
|--------|-----------|-----------------|---------------------|
| Father | 10 | 11 | 9 |
| Mother | 10 | 9 | 11 |

TABLE 1 Distribution of the parents among the different groups.

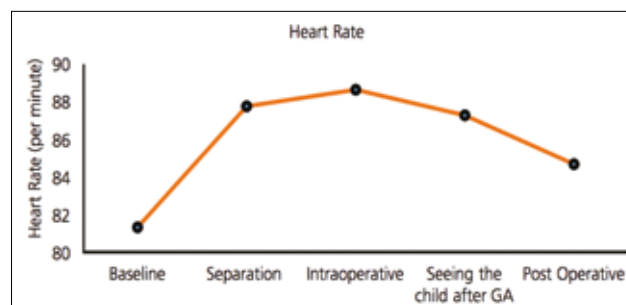


FIG. 2 Changes in the heart rate of parents while their child was undergoing treatment under general anaesthesia.

| | | Significance |
|-----------------|----------------|--------------|
| Pre-operative | Between Groups | 0.066 |
| | Within Groups | |
| | Total | |
| Intra-operative | Between Groups | 0.377 |
| | Within Groups | |
| | Total | |
| Post-operative | Between Groups | 0.000 |
| | Within Groups | |
| | Total | |

TABLE 2 Significance of difference in the oxygen saturation among groups.

across time periods (Table 2). The one-way ANOVA showed a significant difference only in the post-operative oxygen saturation of parents.

The Scheffe's post hoc test showed that parents of children who were treated under general anaesthesia had significantly higher post-operative oxygen saturation when compared to the two other groups. Neither the gender of the child nor the relationship of the parent had any significant effect on the oxygen saturation of the parent during the different dental procedures.

Reported anxiety among groups

When the fear of parents was recorded using the MDAS questionnaire, no significant differences were observed among the parents of the three groups in terms of general fear, dental fear or overall fear.

Although mothers consistently reported being more fearful than fathers in all three categories, there was no significant difference between them (Table 3).

Discussion

While the fear that a child feels in the dental clinic has been well documented, little is known about the fear and anxiety experienced by parents when their child undergo dental treatment. The anxiety of the parent can have direct and indirect effects [Abrahamsson et al., 2001; Abrahamsson et al., 2002; Al-Eheideb and Herman, 2003; Benoit Allen et al., 2015]. The direct effect is the transmission of their anxiety to their children. There is ample evidence to support the fact that the anxiety of the parent is transmitted to the child, and that fear of dental procedures in the parent often results in a fear in the child as well [Al-Eheideb and Herman, 2003; Doerr et al., 1998; Johansson et al., 1993; Kaczurkin and Foa, 2015].

Recent researches suggested that the fear and anxiety of the parent could also affect how the child receives dental care [Goettems et al., 2012; Keeton et al., 2015; Mills et al., 2015; Stenebrand et al., 2013]. Dental care under general anaesthesia is a process by which the child is treated under general anaesthesia and all the restorative and surgical work needed is completed in a single visit. However, the stress that parents bear while their children are undergoing dental treatment under general anaesthesia has received little attention in the literature. The purpose of this study was to subjectively and objectively study the influence of dental treatment of the child on the stress experienced by the parents.

The traditional methods for evaluation of stress are subjective in nature. The dental anxiety stress (DAS) questionnaire was originally developed in 1969 as a tool to quantify dental fear (Corah, 1969). This study used an Arabic version of the Modified Dental Anxiety Stress (MDAS) questionnaire which has been previously validated [Bahammam and Hassan, 2014]. However, the fact that there were no significant differences among the parents of the three groups in terms of general fear, dental fear or overall fear indicates that a subjective tool may not accurately record fear. These findings are similar to those of a previous study that found that the DAS was not a useful tool to discriminate among the types of fear [Locker et al., 2001].

The objective measurement of dental anxiety has been researched extensively. The subjective nature of fear has often made its accurate measurement difficult [Guinot Jimeno et al., 2011]. Monitoring of heart rate has been shown to offer a valid measure of dental anxiety in children and is sensitive to changes in anxiety during the course of treatment [Furlan et al., 2012; Guinot Jimeno et al., 2011]. The physiological component of fear prepares the individual for action. It is characterised by an increase in muscular tension, tachycardia, hyperventilation and an increase in the person's sensibility towards external agents, such as sensitivity to pain which is of significance in the field of dentistry [Caceres and Burns, 1997]. Recently the use of portable pulse oximeter that measures the heart rate and oxygen saturation has found increasing use in research on paediatric dental behaviour [Guinot Jimeno et al., 2011]. The significance of difference in heart rate between the different groups at each interval of measurement was compared using the one-way ANOVA. Significant differences between groups were observed at each interval, with the lowest heart rate being seen in the parents of children who were treated in the dental chair while the highest heart rate being seen in the parents of children who were treated under general anaesthesia. This is in line with a Japanese study that showed that maternal heart rate could be correlated to the stress of the mother as well as the behaviour of the child [Arai et al., 2008].

| | Relationship | Mean | Std. Deviation | Significance |
|--------------|--------------|---------|----------------|--------------|
| General Fear | Father | 15.2000 | 1.87054 | 0.361 |
| | Mother | 15.6500 | 1.69249 | |
| Dental Fear | Father | 29.1000 | 7.17042 | 0.321 |
| | Mother | 31.1500 | 8.9182 | |
| Overall Fear | Male | 44.3000 | 20.221 | 0.099 |
| | Female | 46.8000 | 21.223 | |

* Calculated using the independent t test

TABLE 3 Effect of gender of the parent on reported parental stress.

These findings are important because treatment under general anaesthesia is often sought by parents who are unable to see the distress of their child in the dental chair [Quinonez et al., 1997]. It is often assumed that having a child undergo treatment under general anaesthesia would be less stressful for the parent when compared to watching the child undergo chairside treatment [Crawford, 1990; Arnup et al., 2002; Savanheimo et al., 2005]. The results of our study showed a significantly higher heart rate in parents whose children underwent pharmacological behaviour management. This finding is significant as it suggests that there was no significant difference in heart rate between parents who could watch their children being treated (sedation) and those who had to wait outside an operation theatre (general anaesthesia). These results seem to suggest that the use of pharmacological behaviour management techniques may increase the stress levels of parents.

Gender is one of the most commonly reported factors in the extant literature that is associated with differences in dental fear [Pierce and Kirkpatrick, 1992]. It has been shown that men tend to score lower on tests of dental anxiety than women as it is not culturally acceptable for males to show fear. Although the results of our study showed that fathers scored lower on the MDAS than mothers, there was no significant difference between them. This was a finding that was corroborated by heart rate and oxygen saturation measurements. This finding seems to suggest that in the present sample there was no difference between the anxiety of the fathers to that of the mothers.

Modern day digital pulse oximeter has been shown to have an accuracy that is comparable to that of pulse oximeter used in hospitals [Pupim et al., 2013]. When the oxygen saturation among the groups was compared it was observed that it did not vary much across time periods. Although increased oxygen saturation could be an indicator of hyperventilation seen in panic attacks [Pupim et al., 2013; Rantavuori et al., 2004; Shaw et al., 1996], the results observed suggest that while the stress of observing their child undergo dental treatment is sufficient to cause anxiety and increase heart rate it is unlikely to cause a panic attack that would be evidenced by increased oxygen saturation.

The different phases of dental treatment may elicit different responses from the parents. These responses may differ from when they are allowed to observe their child in the dental chair to when they are asked to wait outside an operation theatre [Mills et al., 2015]. The results of this study showed that there was a significant increase in the heart rate of parents during

the procedure regardless of whether they were with the child or separated from him/her. This seems to suggest that the stress of dental treatment on the parent is manifested regardless of whether they observe the child or not. The fact that watching their child being sedated caused the same amount of stress as having the child undergo general anaesthesia is in line with the findings of earlier studies that have shown that sedation and general anaesthesia are both worrying experiences for the parents [Bryan, 2002; Crawford, 1990; Holroyd and Roberts, 2000; Kupietzky, 2004].

The results of this study seem to suggest that the use of a pharmacological method of behaviour management such as sedation or general anaesthesia increases the stress felt by the parent. This stress does not seem to be influenced by whether the parent is inside the operatory room or outside.

Although all efforts were made to standardise the variables in this study, the results must be viewed in the light of certain limitations.

- 1) The sample size was adequate to demonstrate an association, but not large enough to conduct a detailed regression analysis on the influence of variables such as the education or the income of the parent or the order of birth of the child.
- 2) The study only focused on acute anxiety as manifested by the heart rate and did not take into consideration the possible confounding effects of long-term stress.

Conclusion

It could be concluded that dental treatment is a stressful experience for a parent. The introduction of a pharmacological method of behaviour management seems to significantly increase the stress felt by the parent. Moreover, the presence or absence of a parent from the operatory room seems to have no significant impact on parental stress.

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