

Original Research

Effect of Local Anesthesia on Anxiety, Blood Pressure and Pulse Rate in 6-10 Years Old Children during Dental Treatment- An In Vivo Study

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ABSTRACT:

Background: Anxiety is a special variety of fear, experienced in anticipation of threatening stimuli. It has been documented that the response of a child improves with the number of visits. The present study is yet another effort to find the efficacy of Local Anaesthesia (LA) on anxiety and vital signs in children. Aim of the study was to evaluate the effect of LA on anxiety, Blood Pressure (BP) and pulse rate in 6-10 year old children during dental treatment. **Methods:** A sample of 22 children of 6-10 years were randomly selected and evaluated for the signs and symptoms of functional alterations of the stomatognathic system. The BP and pulse rate of the patients were checked in different periods of the dental treatment. Each time along with measuring the BP and pulse rate, Lebarons face scale was shown to the patients and anxiety level was recorded according to the scores of anxiety. **Results:** The results indicate that dental treatment does appear to influence BP and pulse rate readings in healthy children. The anxiety measurements increased significantly ($p < .01$) with increased BP and pulse rate during LA procedure. **Conclusion:** The anticipated high-stress (Anxiety) affected Blood pressure and pulse rate measurements during dental appointments.

Key words: Vital signs; Behavioral measures; Dental anxiety, Lebarons scale

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INTRODUCTION:

Fear, anxiety, stress and pain associated with dental treatment are emotions intrinsically linked to the unpleasant experiences that affect a great part of the population. Anxiety is a vague and an emotional state experienced by the child patient that makes it difficult for the dental treatment, associating to multifactorial aetiology can be manifested in different ways¹. Inevitably, assessing dental anxiety in children is more complex than assessing anxiety in adults. Therefore, the assessment measure should be child-centred, quick and easy to use as well as reliable and valid.

Despite advances in local anaesthesia and treatment techniques, child dental anxiety still poses a significant problem for the child, parent(s) and dentist. The effects of this anxiety can persist into adulthood, which can often lead to avoiding the dentist and the subsequent worsening of oral health. It is necessary,

to identify and quantify this anxiety, in order to implement and monitor the effect of treatment interventions².

A variety of measures have been developed to elicit self-reports of pain and anxiety from children, including the Poker Chip Tool, visual analogue scales, pain thermometers, and color scales. In recent years considerable attention has been devoted to 'faces scales' which shows a series of faces, typically hand-drawn, with the faces graded in increasing intensity between pain or anxiety. Faces scales, unlike other self-report measures, are thought to be easily understood by children in that they do not require the child to translate their pain or anxiety experience into a numerical value. However, there has been minimal effort to empirically validate the relative merits of different faces scales³.

According to LeBaron S and Zeltzer L⁴, correlations between ratings of pain and anxiety indicated that

there was consistently more agreement on ratings of anxiety than of pain. Patient self-reports and observer ratings provided supportive evidence that children and adolescents did not differ significantly in their experience of anxiety at any time during the medical procedure.

Measurements of psychophysiological responses in children during dental procedures have demonstrated a general pattern of sympathetic arousal with increased secretion of catecholamines, increased heart rate, and decreased galvanic skin resistance⁵. Therefore, this factor must be considered to avoid mistakes in observation of blood pressure and its consequences on diagnosis and/or treatment on the patient. García-Donaire JA and co-workers suggested the use of automated office BP (AOBP) devices against routinely used office devices (sphygmomanometer) which could diminish white coat effect over the patient⁶.

The present study is an effort to find the levels of anxiety in children during local anaesthesia administration. This helps in gradation of behaviour according to the level of anxiety. It may help in proper selection of behaviour modulation techniques and apply the same on children. So there is a need to perform the study to know whether there is direct association of anxiety on blood pressure and pulse rate in children.

MATERIALS AND METHODS

The study was conducted in the Department of Pedodontics and preventive dentistry, K. M. Shah Dental College and Hospital, Vadodara. The ethical approval No.SVCS/DENT/14439 was taken from ethics committee of the institute. Twenty two children of age 6-10 years requiring local anesthesia for treatment purpose, who were supposed to be exposed to local anaesthesia for the first time and whose parents gave informed written consent for the local anaesthesia administration procedure were randomly selected. Children who were allergic to local anesthesia, those with any past medical history, those who experienced local anesthesia administration earlier, who required special child care and all local and systemic conditions wherein local anesthesia was contraindicated were excluded from the study.

The conduction of physical, extra and intra oral examinations, for the evaluation of the hypertension was done by the same examiner. The blood pressure and pulse rate of the patients were recorded at 3 intervals:

1. In the play area: first measurement, with the patient still in the play area. [Fig 1].
2. Before anaesthesia: before the treatment, with the patient sitting in the dental chair. [Fig 2].
3. After anesthesia: after the injection of the local anesthetic, with the objective of establishing the relation between the

anesthetic procedure and the variation of BP and pulse rate. [Fig 3].

Before starting the procedure of local anesthesia administration, the child was informed about the procedure and written consent was taken from parents. Local anesthesia administration was done by the principal investigator throughout the study for standardization purpose, only after the blood pressure and pulse rate is normal. The blood pressure, pulse rate and anxiety scale recordings were registered by the trained nurse who is taught to record the readings from the digital blood pressure unit, pulse oximeter and Lebarons face scale[Fig 4].

The Lebarons anxiety scale⁴ which was used for the study to assess both pain and anxiety. Five hand-drawn faces ranging from neutral to sad; & the same scale is used to assess both pain and anxiety. The ordered faces are scored from 0 to 4.

The descriptive statistical tests was computed using excel statistical operations. Inferential statistics was done using SPSS version 17.0. Statistical tests applied were; Independent Sample T-test, Paired Sample T-test.

RESULTS

In the study 22 Children's were participated after the consent from parents, in which 11 were males and 11 were female participants.

Figure 5 shows the blood pressure, anxiety and pulse rate of patient in the play area. The average systolic blood pressure of male patient was 99.55 and that of female was 105.

The average diastolic blood pressure of male patient was 66.09 and that of females was 65.70. The average pulse rate of male patient was 95.82 and that of female was 103.50.

The Lebarons score for males is 1 and that of females is 1.10.

Figure 6 shows the blood pressure, anxiety and pulse rate of patient on dental chair before administration of L.A. The average systolic blood pressure of male patient was 101.36 and that of females was 104.30.

The average diastolic blood pressure of male patient was 71.64 and that of females was 69.90. The average pulse rate of male patient was 106.82 and that of females was 102.20.

The LeBarons score for males is 3.18 and that of females is 2.40.

Figure 7 shows the blood pressure, anxiety and pulse rate of patient on dental chair after administration of L.A. The average systolic blood pressure of male patient was 107.27 and that of females was 105.70.

The average diastolic blood pressure of male patient was 76.9 and that of females was 71.60. The average pulse rate of male patient was 113.73 and that of females was 111.40.

The LeBarons score for males is 3.82 and that of females is 2.80.



FIGURE 1: Measuring patients blood pressure, anxiety and pulse rate in the play area



FIGURE 2: Measuring patients blood pressure, anxiety and pulse rate on dental chair before administration of L.A



FIGURE 3: Measuring patients blood pressure, anxiety and pulse rate on dental chair after administration of L.A

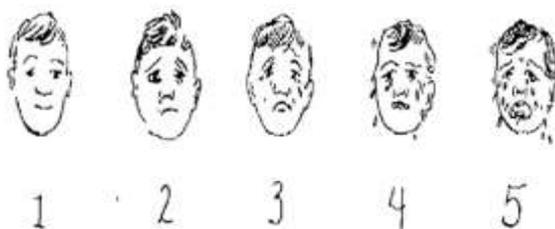


FIGURE 4: Five hand-drawn faces ranging from neutral to sad; & the same scale is used to assess both pain and anxiety

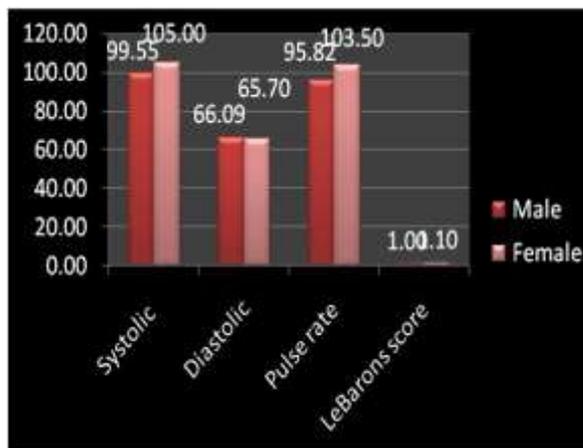


FIGURE 5: Graph showing patients blood pressure, anxiety and pulse rate in the play area

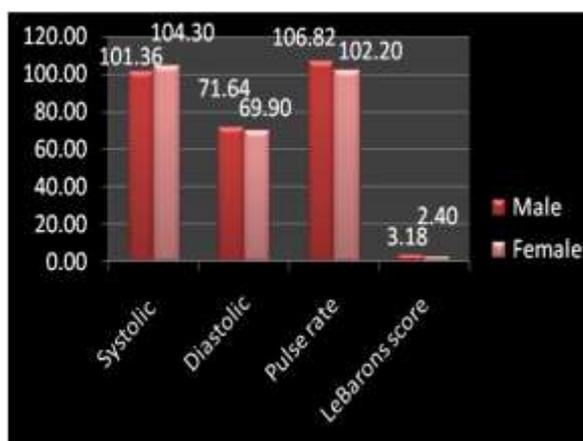


FIGURE 6: Graph showing patients' blood pressure, anxiety and pulse rate on dental chair before administration of L.A

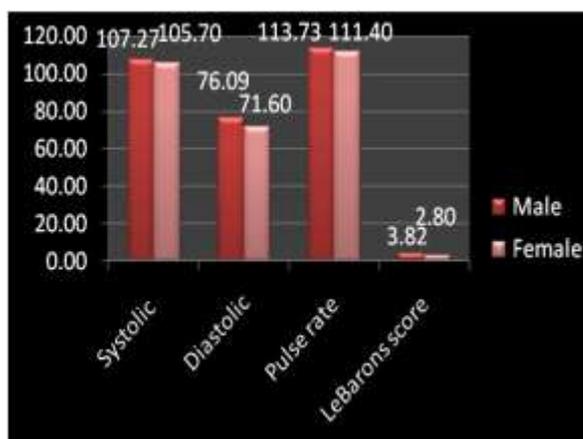


FIGURE 7: Graph showing patients' blood pressure, anxiety and pulse rate on dental chair after administration of L.A

DISCUSSION

Dental anxiety (DA) is a multi-system response to a believed threat or danger. It is an individual, subjective experience which varies among people. This is seen in both children and adults, with child anxiety often manifesting as inappropriate or

disruptive behavior⁷. Unfortunately, many general dental practitioners are not willing to provide care for preschool children who display disruptive behavior, especially even though simple treatment is required⁸. In addition, the use of dental anxiety measures (DAMs) by dentists is lower, but the measurement of dental anxiety in children is important not just for delivery of high quality clinical care but also for research. The level of anxiety before treatment and the factors responsible for it will allow the dentist to identify the anxious child in order to provide better anxiety management and a more positive experience⁹. Child dental anxiety is a common and potentially distressing problem both for the child and the dental practitioner. Ideally, a scale should be used to measure the dental anxiety. A scale should be short in length to maximize response from the children and minimize time for administration, includes items which are most relevant to the child dental experience, easily hold the attention of the child which is simple to score and interpret. Buchanan H and Niven N¹⁰ proposed the Facial Image Scale (FIS) as a suitable measure for assessing children's state dental anxiety. LeBaron and Zeltzer (1984)⁴ developed a scale for Six to 10-year-old children. Five hand-drawn faces ranging from neutral to sad; same scale used to assess both pain and anxiety; no data provided on how faces were developed to the child. The ordered faces are scored from 0 to 4. Reliability and validity of the LeBarons scale was based on moderate correlations between patient and observer rating of pain using the scale.

In a study by Wright et al¹¹ on 5-9 years old, girls had more dental anxiety than boys. Based on an overall level of fear of dentistry, Kleinknecht et al reported that girls rated themselves more fearful than boys. They also found that the greatest mean difference by gender of the participants appeared in response to the fear of needle and drill¹². Moyer, Taylor and Peterson et al reported that male behavior was found to be superior to female behavior in older children, especially during the injection and operative phases of appointments¹³. The above results were in accordance with the present study where the girls had more anxiety in comparison with the boys.

The results of this study clearly showed a significant change in the systolic pressure and heart rate in all the situations in the dental operatory area. The most anxiety provoking situation was found to be the time before and after the L.A. procedure. In comparison the physiological variables between boys and girls no significant difference was found during any of the observation periods. The results of the physiological parameters measured are in accordance with the study of McCarthy, Laufer, Myers and Messer who concluded that heart rate and blood pressure acted as a reliable indicator of stress and anxiety^{14,15,16,17}. But a contradictory study done by Rosenbery and Katcher denounced heart rate as an indicator of stress¹⁸. They found the heart rate to vary due to the physical

movement of the individual during dental treatment. Another study, which contradicted our findings, was by Beck and Weaver who in their study showed that the anticipation of high stress dental appointment did not affect blood pressure, but altered the heart rate¹⁹.

Chaves et al²⁰ concluded that there were no significant changes between anxiety and BP for both genders. Conceição et al.²¹, did not find statistically significant differences in BP and HR of anxious and non-anxious patients. Such data corroborate the results found in this study, because none of the parameters evaluated (systolic, diastolic BP or HR) showed statistically significant differences, when compared to initial BP with the other measures within the four anxiety levels. It should be noted that the HR and BP are commonly used as dependent variables in behavioral studies and serve as parameters for the evaluation of anxiety level²². There is a positive correlation in the present study which is significant between systolic blood pressure and Lebarons score in play area, and pulse rate and Lebarons score, after administration of local anaesthesia.

In study by Rayen R and co-workers²³, the physiological recordings were high at the time of local anesthesia administration whereas in our study the readings were high before the extraction procedure showing a significant correlation between the two studies. The reason for higher values at first visit could also be because of the use of a sophisticated looking apparatus which could create anxiety and act as a confounding factor to the obtained values.

The difference in the systolic blood pressure before and after administration of local anaesthesia is significant with p value 0.028. The difference in the diastolic blood pressure before and after administration of local anaesthesia is significant with p value 0.008 which is highly significant. The difference in the pulse rate before and after administration of local anaesthesia is significant with p value 0.010 which is significant. In the study by Rayen and co-workers²³, they have checked anxiety before and after cavity preparation and extraction whereas in the present study anxiety before and after administration of local anaesthesia.

According to Andrade²⁴, the use of anesthetics with vasoconstrictor promotes pain control and avoids the anxiety. On the other hand, Palma et al.²⁵ when studying the variation of BP by using local anesthetics without vasoconstrictor found that it proved to be more superficial and less lasting, generating pain and anxiety in the patients, thus producing a significant increase in BP in normotensive patients. In the present study correlation between the blood pressure and anxiety with local anaesthesia is significant.

CONCLUSION

In the play area systolic, diastolic blood pressure and pulse rate is increased in girls. Before administration of the local anesthesia, the diastolic blood pressure, pulse rate and anxiety was increased in boys in

comparison to the girls, where as the systolic blood pressure is decreased in girls. After administration of local anesthesia, the systolic blood pressure, diastolic blood pressure, pulse rate and anxiety were increased in boys than the girls.

There was a significant correlation in blood pressure and pulse rate with dental anxiety in play area and also after administration of local anesthesia.

REFERENCES

- Jean Carlos Fernandes Goulart, Matheus Dias Pinheiro, Rodrigo Ventura Rodrigues, Fabiano de Sant'Ana dos Santos, Alex Tadeu Martins, FábioLuiz Ferreira Scannavino. Influence of anxiety on blood pressure and heart rate during dental treatment. *Rev Odonto Cienc* 2012;27(1):31-35
- Buchanan H. Assessing dental anxiety in children: the Revised Smiley Faces Program. *Child Care Health Dev.* 2010 Jul;36(4):534-8.
- Chambers CT, Giesbrecht K, Craig KD, Bennett SM, Huntsman E. A comparison of faces scales for the measurement of pediatric pain: children's and parents' ratings. *Pain.* 1999 Oct;83(1):25-35.
- LeBaron S, Zeltzer L. Assessment of acute pain and anxiety in children and adolescents by self-reports, observer reports, and a behaviour checklist. *J Consult Clin Psychol* 1984;52:729-738.
- Rosenberg HM, Katcher AH. Heart rate and physical activity of children during dental treatment. *J Dent Res* 1976;55(4):648-651.
- García-Donaire JA, Dalfó Baqué A, Sanclemente Ansó C, Urdiales Castillo D, Martínez Debén F, Ortega López N, Pizarro Núñez JL, Martín Oterino JÁ, García-Norro Herreros J, Mediavilla García JD, Vara González LA, Prieto Díaz MÁ, Vila Coll MA, Gómez Fernández P, Rossique Delmas P, Gascón Becerril R, Pérez Álvarez R, Delgado Zamora R, de Vega Santos T, Cerezo Olmos C, Segura de La Morena J, Ruilope LM. Measurement of blood pressure in consultation and automated measurement (BPTru®) to evaluate the white coat effect. *Med Clin (Barc).* 2012 May 19;138(14):597-601.
- Nolly H, Romero M, Nolly A, Osso P, Reinoso O, Nolly M. Home blood pressure measurement: validation of the Braun BP 2550 (UG) monitor according to the ESH International. *Protocol. Blood Press Monit.* 2004 Feb;9(1):53-8.
- Mostofsky D I, Forgione A G, Giddon D B. *Behavioural dentistry.* USA: Wiley-Blackwell, 2006.
- Dailey Y, Humphris G, Lennon M. The use of dental anxiety questionnaires: a survey of a group of UK dental practitioners. *Br Dent J* 2001; 190: 450-453.
- Buchanan H, Niven N. Validation of a Facial Image Scale to assess child dental anxiety. *Int J Paediatr Dent.* 2002; 12 (1): 47-52.
- Wright FA, Lucas JO, McMurray NE. Dental anxiety in five-to-nine-year-old children. *J Pedod.* 1980 Winter;4(2):99-115.
- Kleinknecht RA, Klepac RK, Alexander LD. Origins and characteristics of fear of dentistry. *J Am Dent Assoc.* 1973 Apr;86(4):842-8.
- Taylor MH, Moyer IN, Peterson DS. Effect of appointment time, age, and gender on children's behavior in a dental setting. *ASDC J Dent Child.* 1983 Mar-Apr;50(2):106-10.
- McCarthy FM: A clinical study of blood pressure responses to epinephrine containing local anaesthetic solutions. *J Dent Res* 1957;36:132-141.
- Laufer Rosenzweig D, Kurt A, Chosack A. Explanations as a means of reducing fear of dental procedures in children. *The Alpha survey Omegan* 1964;57: 130-133.
- Myers DR, Kramer WS, Sullivan RE. A study of the heart action of the child dental patient. *ASDC J Dent Child.* 1972 Mar-Apr;39(2):99-106.
- Messer JG. Stress in dental patients undergoing routine procedures. *J Dent Res.* 1977 Apr;56(4):362-7.
- Rosenberg HM and Katcher AH: Heart rate and physical activity of children during dental treatment. *J Dent Res* 1976;55: 648-650.
- Beck FM, Weaver JM: Blood pressure heart rate responses to anticipated high stress dental treatment. *J Dent Res* 1981;60: 26-29.
- Chaves MA, Loffredo LCM, Valsecki-Júnior A, Chavez OM, Campos JADB. Estudo epidemiológico da ansiedade dos pacientes ao tratamento odontológico. *Rev Odontol UNESP* 2006; 35:236-8.
- Conceição DB, Schonhorst L, Conceição MJ, Oliveira Filho GR. Pressão arterial e a frequência cardíaca não são bons parâmetros para a avaliação do nível de ansiedade pré-operatória. *Rev Bras Anestesiol* 2004;54:769-73.
- Moerman N, van Dam FS, Muller MJ, Oosting H. The Amsterdam preoperative anxiety and information scale. *Anesth Analg* 1996;82:445-51.
- Rayen R, Muthu MS, Chandrasekhar Rao R, Sivakumar N. Evaluation of physiological and behavioral measures in relation to dental anxiety during sequential dental visits in children. *Indian J Dent Res.* 2006 Jan-Mar;17(1):27-34.
- Andrade ED. Cuidados com o uso de medicamentos em diabéticos, hipertensos e cardiopatas. In: *Anais do 15º Conclave Odontológico Internacional de Campinas; 2003 Mar-Apr; Campinas; 2003.* p. 104.
- Palma FR, Lins LHS, Branco FP, Wygladala LG. Verificação da variação da pressão arterial pelo uso de anestésicos locais com vaso constritor. *Rev Odonto Cienc* 2005;20:35-9.