SVOA Dentistry
ISSN:2753-9172

ScienceVolks Open Access

Research Article

Evaluation of Blood Pressure Variation in a Pediatric Dentistry Clinic

Adriene Mara Souza Lopes Silva[1]*, Celso Monteiro da Silva[1], João Marcelo Ferreira de Medeiros[2], Andreia Da Silva Neves[3], Pedro Luiz de Carvalho[4], Caleb Shitsuka[5] and Irineu Gregnanin Pedron[5]

[1]*Professor, Department of Pediatric Dentistry, School of Dentistry, Universidade de Taubaté, Taubaté, Brazil.*

[2]*Professor, Department of Endodontics, School of Dentistry, Universidade Brasil, São Paulo, SP, Brazil.*

[3]*Undergraduated student, Universidade Brasil, São Paulo, SP, Brazil.*

[4]*Professor, School of Dentistry, Universidade Federal do Pará, Belém, Brazil.*

[5]*Professor, Department of Pediatric Dentistry and Cariology, School of Dentistry, Universidade Brasil and Faculdades Metropolitanas Unidas, São Paulo, Brazil.*

[6]*Professor, Department of Periodontology, Implantology, Stomatology, Integrated Clinic and Therapeutics, School of Dentistry, Universidade Brasil, São Paulo, Brazil.*

***Corresponding Author:** Adriene Mara Souza Lopes Silva, Department of Pediatric Dentistry, School of Dentistry, Universidade de Taubaté, Taubaté, Brazil.*

***Received:** October 04, 2021 **Published:** October 15, 2021*

Abstract:

This study evaluated variations in blood pressure in 24 children during dental treatment. The age ranged from 4 to 12 years, of which 13 were girls and 11 were boys. Blood pressure measurements were performed by a digital sphygmomanometer on the arm. Measurements were performed with the child relaxing in silence in a dental chair, with back support, uncrossed legs, and with the right arm supported at the heart level. The cuff was placed securely two to three centimeters above the cubital fossa, centralizing the rubber sleeve over the brachial artery. In two sessions, three measurements were taken: once before treatment, again during treatment, and the last one at the conclusion. Measurement values, procedure, and treatment time were noted. The results showed that there was no statistically significant change between measurements of systolic and diastolic blood pressure at different times. In conclusion, dental treatment can be considered safe for the population studied regarding changes in blood pressure.

***Keywords:** Dental Anxiety; Child; Blood Pressure; Pediatric Dentistry.*

Introduction

Pediatric dental treatment aims at the oral health care of children, through preventive and curative procedures on deciduous and permanent teeth. The psychological condition of the child is of fundamental importance for cooperation during dental care. Stressful situations, fear, anxiety or previous negative experiences may be causal factors for behavioral problems in the dental environment[1-4]. Several changes such as crying, sweating, trembling, irritability, tachycardia, and blood pressure variations can occur[2-4].

Even during childhood, blood pressure assessment is important, being a risk factor for cardiovascular and renal diseases[3,5-10]. Blood pressure variations assessed in the same patient may be determined by genetic or behavioral factors, even in the dental environment. Therefore, checking blood pressure should be part of the clinical examination of the child patient prior to dental care, as well as during and after, if necessary[7-9]. From this perspective, the purpose of this study was to evaluate the variations in blood pressure in children during dental treatment, correlating them to the time and type of procedure.

Materials and Methods

The work was done after evaluation and approval of the research project by the Committee on Ethics in Research of the University of Taubaté (CEP/UNITAU Nº. 623/10).

Patients were attended at the Pediatric Dentistry Clinic (School of Dentistry, University of Taubaté), in the period between March and June 2011. Parents and guardians were invited to participate in the research, after signing the Informed Consent Form and accepting the child for the blood pressure measurement, provided that the cuff size was adequate for the measurement, according to the recommendations of manufacturer.

Blood pressure measurements

Blood pressure was measured by a trained researcher using a pediatric digital sphygmomanometer (HEM742INT™, Omron, Matsusaka, Japan).

In two sessions, three measurements were taken: one before treatment, one during treatment, and one at the conclusion.

The measurements were done in the chair of the dental surgeon with the child relaxed, with his back well supported, legs uncrossed, right arm resting at heart height, and instructed to remain calm. The right arm was chosen for the blood pressure measurements because it was the only arm used for the reference charts. The cuff was securely positioned two to three centimeters above the cubital fossa with the rubber sleeve centered on the brachial artery. The width of the rubber cuff should correspond to 40% of the arm circumference, and its length should involve 80 to 100% of the arm[11].

The values obtained in the measurements (systolic pressure - SP, and diastolic pressure - DP), the type of procedure, and the treatment time were noted in the patient record.

The data obtained were presented in tables, and the differences in value between the three experimental times were analyzed. These data then underwent statistical analysis in the GMC statistical program. The normality test was applied and the normal distribution of the sample was observed, followed by the Analysis of Variance to compare the initial, during, and final systolic and diastolic blood pressure measurements in the two sessions. After doing the statistical analysis, the F values calculated in the Analysis of Variance were compared with statistical reference tables. The Median Test was applied with a significance level of 5% to compare the running time of the different procedures between the patients who did not present pressure alterations and those who did.

Results

Twenty-four children were evaluated, 13 girls and 11 boys, aged 4 to 12 years. About 66.6% of the measurements were normal, below the 90th percentile for age and gender, being in accordance with the VI Brazilian Guidelines of Hypertension[11]. About 33.3% of the measurements showed changes at some point during treatment (initial, during or final). The original data of blood pressure measurements and procedure time are presented in Table 1.

Of the changes in blood pressure observed, 25% showed the sistolic and/or diastolic measurements between 90th and the 95th percentile (pre-hypertensive) and 8.3% above the 95th percentile (hypertensive), 25% of which were sistolic changes, 4.1% diastolic changes, and 4.1% sistolic and diastolic. Of those patients who presented altered pressure measurements, two occurred in both sessions of treatment, five only in the first session, and only one in the second session.

Figure 1 presents the distribution of the procedures performed on the patients during treatment, according to the blood pressure changes, in which were done a clinical exam, tooth brushing orientation, endodontic treament, exodontia, psychological preparation, and sealant.

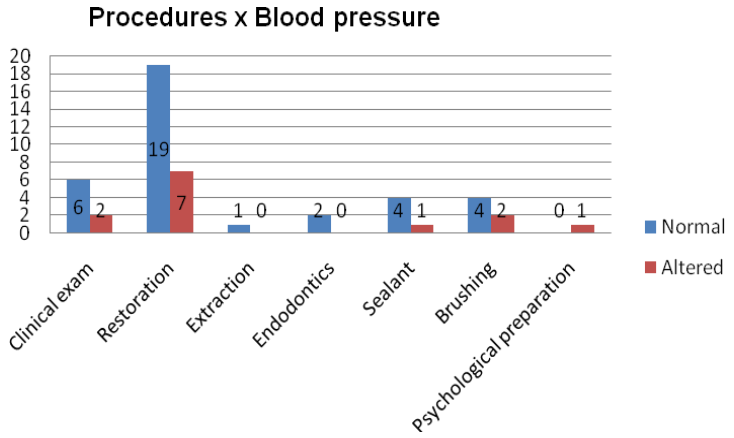

Figure 1: *Distribution of procedures performed on the patients during treatment according to the alterations in blood*

Table 1: Original measurements for blood pressure in the population studied.

N	G	A	1st Session - BP mmHg				2nd Session - BP mmHg			
			Initial	During	Final	T min.	Initial	During	Final	T min.
1	M	11	110/65	104/59	110/59	30	105/56	109/60	115/62	40
2	F	12	115/73	114/70	102/68	40	120/64	106/70	127*/93*	55
3	M	8	103/54	113*/59	105/53	20	105/59	100/62	100/62	20
4	F	9	101/60	107/62	111/63	60	98/55	102/57	102/65	50
5	M	9	103/70	107/62	106/62	50	96/58	103/59	103/64	45
6	M	6	98/56	94/54	94/54	10	97/56	93/61	85/52	35
7	M	6	101/49	93/62	96/64	50	97/61	101/62	101/60	45
8	M	7	107/53	116*/53	109/54	30	96/50	111/53	99/71	34
9	M	9	106/51	104/52	101/55	35	111/55	116/62	106/61	65
10	M	9	108/61	100/61	99/59	32	106/53	101/64	86/56	75
11	F	11	102/57	107/60	95/61	60	109/73	102/58	97/53	60
12	M	9	109/71	120*/71	106/65	55	118*/70	117*/63	107/56	30
13	F	9	101/58	106/61	104/52	35	108/58	98/59	100/61	37
14	F	8	114*/64	110/62	114*/61	37	126*/63	130*/72	130*/65	45
15	F	9	91/53	92/57	89/59	50	97/41	95/57	110/54	25
16	F	5	84/50	80/51	84/53	40	85/53	83/54	86/47	15
17	F	9	106/55	107/59	117*/56	60	108/52	111/60	102/67	80
18	F	9	101/62	106/60	103/59	40	113/69	112/67	102/67	15
19	M	9	108/75*	108/70	110*/66	40	93/56	87/56	93/57	27
20	F	6	96/67	97/64	96/66	30	95/61	95/63	106/70	20
21	M	8	104/63	97/58	101/57	35	85/52	91/59	91/56	70
22	F	4	93/54	83/51	81/51	40	86/51	86/60	93/46	22
23	F	8	123*/73	111/69	111/67	45	111/62	106/58	101/65	30
24	F	9	105/71	112/70	108/68	40	109/63	109/68	117/68	75

Table 2: Average measurements of systolic and diastolic blood pressure at different times.

	Times Sessions	Initial	During	Final
Systolic Pressure	First session	102.96	102.80	102.00
	Second session	102.38	102.53	102.26
Diastolic Pressure	First session	60.23	59.85	59.15
	Second session	57.69	60.11	60.80

$c^2 = 0.0034$ (not significant) ($p>0,05$)

Statistical Analysis

Table 2 shows the average samples calculated and compared. After the statistical analysis, the F values calculated in the Variance Analysis were compared with the statistical reference tables by which it was possible to see the absence of statistical significance between the sistolic and diastolic pressure changes at the different times and also between sessions. Comparing the running time for the various procedures, which ranged from 10 to 80 minutes, there was no statistical difference between the patients who did not show any pressure changes with those patients who did (Median Test with significance level of 5%; value of $c^2 = 0.0034$; $p>0,05$).

Discussion

Hypertension is one of the major public health problems. Blood pressure checking should be routine in the practice of clinical dentistry, and the dental surgeon should contribute to the diagnosis and primary prevention of hypertension, promoting adequate means for the surveillance of this systemic alteration[7,8,11-14]. Appropriate methods and equipment should be used[11]. Particularly in the care of the pediatric patient, the cuff should be specifically selected to the arm of a child[6,11,15,16], as was used in the present study.

As observed in this study, the variation in blood pressure in the same individual may be determined by genetic, environmental or behavioral factors, such as the "white coat effect"[9,12]. Among the children evaluated, 66.6% had normal blood pressure, i.e., below the 90th percentile for age and gender, and 33.3% had changes at some point during treatment, 50% girls and 50% boys (Table 2).

In the present study, we found blood pressure measurements that we considered borderline in 25% of patients and 8.3% of stage I hypertensives, differing from the findings of Hsien et al.[7] (2012), who found 5.7% of their patients hypertensive and 8.6% prehypertensive. In the work of Freitas et al.[17] (2012), 16.3% were considered borderline (prehypertensive) and 6% hypertensive. However, these findings were not sufficient for the diagnosis of hypertension in patients, because according to the VI Brazilian Hypertension Guidelines of 2010, several factors and different measurements should be considered for this purpose[11]. Statistical analysis showed no significant difference between the values of changes in systolic and diastolic pressures during treatment or between sessions. Goulart et al.[18] (2012) also found no changes in systolic or diastolic pressures during dental treatment. However, the patients evaluated were adults.

The procedures performed were clinical examination, oral hygiene orientation, restorations, exodontics, psychological conditioning consultation, and sealant (Figure 1). The altered blood pressure measurements occurred more frequently during the performance of restorations, which were the most numerous.

Comparing the treatment time, which ranged from 10 to 80 minutes, there was no statistically significant difference between patients who did not present pressure alterations and those who did.

In the adult patient, if the systolic pressure exceeds 180 mmHg or the diastolic pressure exceeds 110 mmHg, the patient should be referred to a physician immediately. No dental treatment should be performed, as there are risks[4,19]. Pediatric patients above the 99th percentile, according to age and gender, may be considered severe hypertensive, and thus, should not receive any dental treatment[5]. In the present study, we did not find measurements above the 99th percentile for the age and height percentiles. Similarly, for the diagnosis of hypertension in children, numerous measurements are necessary, because it is expected that blood pressure levels reduce according to the psycho-emotional conditioning of the child facing the anxiety of dental treatment[15].

Overweight is the main factor leading to increased blood pressure in children[9,10,13,14,17,20-26]. From this perspective, information to educators and family members about the importance of changing habits, prevention and treatment of childhood obesity is fundamental. Similarly, hypertensive parents are more likely to have hypertensive children, constituting another risk fator[24].

Anesthetic and pharmacological management in obese children is a challenge. With the increasing prevalence of childhood obesity, children with obesity have more complex comorbidities and, when undergoing anesthetic and pharmacologic procedures, the impact of pathophysiologic changes is more dangerous. Optimal and safe anesthetic management in an obese child requires careful pre-procedural assessment and meticulous perioperative management tailored to associated comorbidities, with increased awareness of potential perioperative complications. There remains a need for better guidelines for risk stratification, medication dosing, and postoperative disposition in this patient population[25,26].

Based on the results, we can consider dental treatment safe for the studied population regarding pressure alterations. However, other studies should be conducted, considering different procedures and other conditions of the children, such as obesity, age range, heredity, since these are important factors related to hypertension.

Conclusion

Dental treatment can be considered safe for the population studied as far as changes in blood pressure are concerned, for there were no statistically significant alterations among the measurements of systolic and diastolic blood pressures at the different testing times, between sessions, and time of treatment.

References

1. Novaes TF, Matos R, Raggio DP, Braga MM, Mendes FM. Children's discomfort in assessments using different methods for approximal caries detection. Braz Oral Res 2012;26(2):93-9.
2. Samra-Quintero PA, Bernardoni-Socorro C, Borjas AM, Fuenmayor NR, Estévez J, Arteaga-Vizcaíno M. Changes in blood pressure in children undergoing psychological treatment before dental procedures. Acta Odontol Latinoam 2006;19(1):9-12.
3. Neves CAF, Couto GBL, Botelho KVG, Vasconcelos MMVB, Soares RPF, Cavalcanti JB, Silva GMP. Evaluation of the blood pressure of children and adolescents attending at the odontopediatric clinic. Odontol Clín Científ 2007;6 (2):163-167.
4. Ferraz EG, Carvalho CM, Jesuino AA, Provedel L, Sarmento VA. Evaluation of arterial pressure variation during the dental surgical procedure. Rev Odontol UNESP 2007;36(3):223-9.
5. Lotufo AS, Lotufo MA. Sinais vitais no paciente odontopediátrico e avaliação de hemograma. In: Correa MSNP. Odontopediatria na Primeira Infância. 3. ed. São Paulo: Santos, 2009, p. 845-850.
6. Silva MAM, Rivera IR, Souza MGB, Carvalho ACC. Blood Pressure Measurement in Children and Adolescents: Guidelines of High Blood Pressure Recommendations and Current Clinical Practice. Arq Bras Cardiol 2007;88(4):491-95.
7. Hsien HC, Carvalhães JTA, Braga JA. Blood pressure in children with sickle cell disease. Rev Paul Pediatr 2012;30 (1):87-92.
8. Koch VH, Colli A, Saito MI, Ruffo P, Cardoso R, Ignes EC, Okay Y, Mion Jr D. Ambulatory Blood Pressure Monitoring in Normal Adolescents. Arq Bras Cardiol 1997;69(1):41-6.
9. Rosa AA, Ribeiro JP. High blood pressure in children and adolescents: Determinant factors. J Pediatr (Rio J) 1999;75 (2):75-82.
10. Silva MCP, Ramos CHB, Costa RF. Estado nutricional e níveis pressóricos de escolares adolescentes da cidade de Cubatão - SP, Brasil. Rev Bras Crescimento Desenvolv Hum 2008;18(3):288-297.
11. Sociedade Brasileira de Cardiologia / Sociedade Brasileira de Hipertensão / Sociedade Brasileira de Nefrologia. VI Diretrizes Brasileiras de Hipertensão. Arq Bras Cardiol 2010;95(1 supl.1):1-51.
12. Goonasekera CDA, Dillon MJ. Measurement and interpretation of blood pressure. Arch Dis Child 2000;82(4):261-65.
13. Barreira AK, Couto GBL, Vasconcelos MMVB, Vianna RBC. Hipertensão arterial na infância. J Bras Odontopediatr Odontol Bebê 2003;6(30):131-136.
14. Monego ET, Jardim PCBV. Determinants of risk of cardiovascular diseases in schoolchildren Arq Bras Cardiol 2006;87(1):37-45.
15. Salgado CM, Carvalhaes JTA. Hipertensão arterial na infância. J Pediatr (Rio J) 2003;79(supl.1):S115-S124.
16. Pickering TG, Hall JE, Appel LJ, Falkner BE, Graves J, Hill MN, Jones DW, Kurtz T, Sheps SG, Roccella EJ. Recommendations for blood pressure measurement in humans and experimental animals: part 1: blood pressure measurement in humans: a statement for professionals from the Subcommittee of Professional and Public Education of America Heart Association Council on High Blood Pressure Research. Circulation 2005;111(5):697-716.
17. Freitas D, Rodrigues CS, Yagui CM, Carvalho RST, Marchi-Alves LM. Risk factors for hypertension among middle school students. Acta Paul Enferm 2012;25(3):430-434.
18. Goulart JCF, Pinheiro MD, Rodrigues RV, Santos FSA, Martins AT, Scannavino FLF. Influence of anxiety on blood pressure and heart rate during dental treatment. Rev Odonto Cienc 2012;27(1):31-35.
19. Santos TS, Acevedo CR, Melo MCR, Dourado E. Abordagem atual sobre hipertensão arterial sistêmica no atendimento Odontológico. Odontol Clín Científ 2009;8(2):105-109.
20. Lima EM. Assessment of risk factors associated with elevated blood pressure in children and adolescents. J Pediatr (Rio J) 2004;80(1):3-4.
21. Moura AA, Silva MAM, Ferraz MRMT, Rivera IR. Prevalence of high blood pressure in children and adolescents from the city of Maceió, Brazil. J Pediatr (Rio J) 2004;80(1):35-40.
22. Oliveira AMA, Oliveira AC, Almeida MS, Almeida FS, Ferreira JBC, Silva CEP, Adan LF. Fatores ambientais e antropometricos associados a hipertensão arterial na infância. Arq Bras Endocrionol 2004;48(6):849-854.
23. Rodrigues AN, Moyses MR, Bissoli NS, Pires JGP, Abreu GR. Cardiovascular risk factors in a population of Brazilian schoolchildren. Braz J Med Biol Res 2006;39(12):1637-42.
24. Kuschnir MCC, Mendonça GASAS. Risk factors associated with arterial hypertension in adolescents. J Pediatr (Rio J) 2007;83(4):335-42.
25. Chidambaran V, Tewari A, Mahmoud M. Anesthetic and pharmacologic considerations in perioperative care of obese children J Clin Anesth 2018;45:39-50.

26. Marjanovic V, Budic I, Golubovic M, Breschan C. Perioperative respiratory adverse events during ambulatory anesthesia in obese children. Ir J Med Sci 2021; (Online ahead of print).

Citation: Silva AMSL, da Silva CM, de Medeiros JMF, Neves ADS, de Carvalho PL, Shitsuka C, Pedron IG. "Evaluation of Blood Pressure Variation in a Pediatric Dentistry Clinic". SVOA Dentistry 2:6 (2021) Pages 298-303.