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# The Blood Pressure of Children in the Dental Situation

Busabakorn Vattasingh
*Loyola University Chicago*

# THE BLOOD PRESSURE OF CHILDREN IN THE DENTAL SITUATION

by

Busabakorn Vattasingh D.D.S.

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## DEDICATION

I dedicate this thesis to my beloved parents; Mr. Preecha Vattasingh and Mrs. Poonsub Vattasingh, for giving me the opportunity to advance my education.

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Esplanade IV, Suite 108
3001 Red Hill Ave.
Costa Mesa, Calif. 92626

## AUTOBIOGRAPHY

Busabakorn Vattasingh was born in Thailand on February 2, 1950. After receiving her BSc. degree from Mahidol University in 1970, she entered dentistry and received the degree of Doctor of Dental Surgery in 1974 from Chulalongkorn University, School of Dentistry, Bangkok, Thailand. She has been accepted into the postgraduate program in Pedodontics at Loyola University, School of Dentistry and has been working for a Master of Science degree in Oral Biology.

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# CHAPTER I

## INTRODUCTION

In the past several years, the health sciences have become increasingly aware of the need for the early recognition of hypotension or hypertension. Many health agencies have considered various means to evaluate blood pressure disease as it effects the population. Medical science has not fully recognized that each age may have its own influence on the progress and end result of the disease.

Recently, organized dentistry has encouraged dentists to consider the inclusion of blood pressure measurement as part of their dental procedure. At the present time, there is little dental research evaluating blood pressure in children. On the contrary, in the medical literature, the American Heart Association has recognized that blood pressure measurements in children should be considered as an important part of physical examinations. Medical literature shows that hypertension or hypotension in young children can lead to many systemic conditions in adolescence.

It appears, at present, that most practicing dentists are not knowledgeable or motivated to take routine blood pressure measurements in children. Because of the foregoing, it is the author's contention that the dentist needs more and better training in blood pressure techniques and evaluation.

The purpose of this study is to evaluate the blood pressure of children who come for dental treatment. Comparisons will be made of normal blood pressure as recorded in the medical literature and to blood pressure changes within the subjects; that is: before, during, and after dental procedures. Part of this study will be to evaluate the effect of the dental environment and dental procedures on blood pressure in children.

## CHAPTER II

## REVIEW OF THE LITERATURE

### A. Introductory review

There have been no previous publications of surveys or studies of blood pressure in children who come for dental treatment. There is controversy concerning routine blood pressure measurements in children, whether by a physician or dentist, as a primary health service.

Hypertension is a term commonly used to denote an abnormal elevation of blood pressure in the arterial circulatory system. When the pulmonary circulation is affected, it is called pulmonary hypertension.

Since systolic blood pressure tends to fluctuate more under the influence of emotion and other factors, the diastolic pressure is considered to be of much greater diagnostic significance.

Systemic hypertension can be further divided into systolic hypertension and diastolic hypertension.

Systolic hypertension is characterized by elevation of systolic pressure without a proportional increase in diastolic pressure. It is caused by an increase in stroke output of the left ventricle, or by the loss of elasticity of the great vessels, or both. This type of hypertension is found in aortic regurgitation, complete heart block, patent ductus arteriosus, thyrotoxicosis, severe anemia, arteriovenous fistula, and arteriosclerosis of the aorta.

Diastolic hypertension is characterized by an elevation of the diastolic blood pressure and, usually, the systolic blood pressure as well. In most instances, it is caused by constriction of the arterioles.

Until 1950, studies related to hypertension in children were infrequent and, with a few notable exceptions, of little value today. (Graham, Hines, Gage 1945) More recent studies have evaluated children with recognized hypertension (Loggie 1959, Londe 1971) or epidemiologic in nature. (Zinner 1971, Buck 1973)

The definition of hypertension in children is still debatable. Some prefer to define hypertensive children and adolescents as those having arterial pressures above the 95th percentile as determined in asymptomatic contemporaries during pediatric office examinations. (Londe 1968) Some have used values of 130-140 mmHg systolic and 85-90 mmHg diastolic as upper limits of normal in children under 10 years of age. (Haggerty 1956)

B. Literature review

Compared to studies in adults, there have been few studies to establish norms for hypertension in children. There is, moreover, a tendency to consider the same standards of measurement in children as adults. Loggie (1973) stated that it is well known that hypertension may produce no symptoms until the diastolic pressure has been sustained at a high level for a relative long period. This means that mild to moderately hypertensive youngsters may be labeled as "normal" if their blood pressure is not routinely checked, and may eventually be identi-

fied as hypertensive only in the accelerated phase of their disease.

It is not necessary to read blood pressure to the nearest millimeter to decide whether it is normal, elevated, or in a suspicious range requiring repeated measurements. The blood pressure, whether normal or elevated, is not constant but varies within the day; relative to meals, activities, and emotions. The apprehension associated with an examination in a physician's office, or upon admission to a hospital, characteristically makes the child tense, and consequently, the blood pressure will be higher than basal.

Kooh, Rance, and Arbus (1974) stated that a patient's blood pressure should be as much a part of his vital statistics as age, height, and weight. Measurement of blood pressure should be a routine part of the primary health care of every child by the family physician, or if one is not available, by the local health care unit. The blood pressure should be measured routinely at health examinations of 2 or 3 year old children, at preschool examinations, and at every health examination thereafter. Blood pressure should be taken of all hospitalized patients.

Frequently, little attention is paid to blood pressure readings in the upper range of normal in infants and children who have no signs and symptoms of hypertension. (Kooh, Rance, Arbus 1974) A significant factor that must be considered is the difficulty in assessing the child's normal blood pressure if he is apprehensive. Another factor to be considered is that the physician or the dentist may be uncertain as to how high the blood pressure must rise to be considered abnormal.

Blood pressure readings of 1 and 2 standard deviations above the mean value for an age group can be considered abnormal, but values 2 standard deviation above the mean (or lie above the 95th percentile), should be considered abnormally high. A simple rule is: "Beware of a diastolic pressure over 80 mmHg in a child under 8 years old, and over 90 mmHg in a child over 8 years old." (Rance 1974)

Single high readings of systolic pressure may be due to nervous tension at the time of examination and may suggest labile hypertension. Persistently high systolic readings with a large pulse pressure should suggest hyperthyroidism or cardiovascular conditions. (Rance, Kooh 1974)

Masland and his colleagues (1956) recorded the blood pressure of 1,795 randomly selected outpatients between 12-21 years of age. They found that 1.4-11.0% had a systolic pressure that equaled or exceeded 140 mmHg, and a diastolic pressure that equaled or exceeded 90 mmHg or more. In a similar study, Londe (1971) reported 2.3% of 1,473 children, age 4-15 years, had blood pressure persistently greater than the 95th percentile for their age. This low incidence of hypertension in childhood may be contrasted with the higher incidence found in the adult studies.

Data collected from 1967-1972 by the National Health Examination Surveys of the Public Health Service showed that 9% of white adults and 22% of black adults of the U.S. population, age 18-79, had hypertensive disease. This was based on the World Health Organization's criteria of a diastolic pressure of 90 mmHg or greater.

Londe (1964) investigated 46 pediatric patients under age 15 who were diagnosed as hypertensive. He observed elevated blood pressure of the patients for 3 years. Although parental hypertension was more common among these children than among normotensives, more than half the children did not have hypertensive parents. He defined the hypertensive child as one with a systolic and/or diastolic pressure persistently above the 90th percentile of all patients in his pediatric practice. A later follow up of all these children showed that 65% still had elevation of the systolic or diastolic pressure, or both.

Buck (1964-1965) similarly provided suggestive evidence that if elevated blood pressure is recorded at age 5, it is likely to be above average at the age of 11-12. In his study, 33 children of the total group of 569 had an elevated systolic and diastolic pressures at age 5. Twenty-eight of the children were followed until the age of 11-12 years, at which time they all had blood pressure beyond 1 standard deviation of the mean of their peer group. When compared with control children of the same sex from the same class in school, their blood pressure (systolic and diastolic) was significantly elevated.

Buck, therefore, suggested that hypertension may be detectable as early as the fifth year of life, with greater certainty in the females than males. His study implies that a relatively high blood pressure at age 5 predisposes the child to higher blood pressure throughout childhood.

In 1968, in his private office, Londe evaluated 60 boys and 60 girls at age 3, whom he said appeared to be normal. He sought a cor-

relation between blood pressure, weight, and height in children. He demonstrated statistically significant correlation ($p<0.05$) between systolic pressure and weight but not between systolic pressure and height in both boys and girls. The diastolic pressure appeared unrelated to either weight or height. The prevalence of obesity in children and the prevalence of parental hypertension were significantly higher in hypertensive children than normotensive ones.

During the past 13 years, the hypertensive unit of the Royal Air Force Hospital, in Cosford, investigated more than 1,400 hypertensive patients, 161 of these were under 30 years of age. They suggested that hypertension among young people should be considered under two headings:

1. A small group with the complication of hypertension, usually the result of an underlying disease, most often renal.

2. A larger group of young hypertensive patients who appeared healthy and whose disorder is discovered only when blood pressure is routinely taken.

Garfunkel (1971) was concerned mainly with the type of patient exemplified by the second group, those severe hypertensive cases which were missed by not routinely taking blood pressure. He suggested that a large element of this responsibility would be discharged by the regular systemic search for, and subsequently careful follow up of, those mildly hypertensive children who will in middle life compose a large portion of the hypertensive population.

A contrary philosophy presented in an editorial by Martin Ware

and Swinscow (1973) of the British Medical Journal, seemed to imply that the blood pressure should not be measured routinely in children and adolescents since medical science at present does not know how to treat borderline hypertensive patients. However, Loggie (1973) disagreed with the concept. He stated, "It seemed to be illogical and hardly promotes progress in an area which had been too long neglected. It is neither time consuming nor expensive to measure blood pressure in patients, age 2-20 years, during a routine examination. It is well known that hypertension may produce no symptoms until diastolic pressure has been sustained at a high level for a relatively long period."

## CHAPTER III

## METHODS AND MATERIALS

### A. Selection of subjects

The blood pressures of one hundred and fifty children, coming for dental treatment to the Pedodontic Department, Loyola University Dental School, were evaluated. The age range of the patients was 4-11 years. This age range was divided into the following 3 age groups.

| | | | |
|---|---|---|---|
| Group I. | 4-6 years | 25 males | 25 females |
| Group II. | 6-8 years | 25 males | 25 females |
| Group III. | 9-11 years | 25 males | 25 females |

No black children were used as subjects in this study, since the literature reports that blacks have a tendency toward high blood pressure and labile hypertension.

The subjects received the following dental treatment; local anesthetics (2% Xylocaine HCL solution 1:100,000 epinephrine), and cavity preparations utilizing high-speed technique at 300,000 r.p.m. None of the dental visits was the first appointment for the subject. The parents approved and signed consent forms before the study commensed.

### B. Instrumentation

An Infrasonde Electronic Blood Pressure Monitor, Model 3000* and pediatric cuffs (9cm. size) were used in this study. An electronic



*Marion Scientific Corporation, Costa Mesa, Calif.

transducer on the cuff, which transmits and receives ultrasonic waves, was placed over the brachial artery. The arm cuff was inflated to a pressure higher than the expected systolic pressure, then slowly deflated until the systolic pressure is reached. The movement of the arterial wall causes a change in frequency and converts to a sound. As the pressure continues to fall to the diastolic pressure, the sound becomes muffled because there is less movement of the arterial wall as the blood flow becomes continuous.

C. Procedure

The blood pressure was recorded at three different times, before, during and after the dental procedure. The patients were lying in supine positions, so that the arm was at heart level, the left arm was cuffed to avoid interference with the working dentists. There were three stages in which the blood pressure was taken:

Stage I Before treatment, after the dental student seated the patient in the dental chair, and let him relax approximately ten minutes.

Stage II The recording of blood pressure for this stage was made during the dental procedure of cavity preparation. A high speed handpiece 300,000 r.p.m. was utilized in the procedure. Every subject had received a local anesthetic prior to the operative procedure. The researcher also did measure the blood pressure of some subjects at the time of local anesthetic administration. These blood pressure values were not considered in this study as a result of the study of Londe (1968), and Kooh, Rance, Balfe, Arbus (1974). They stated that blood pressure should not be taken while the patients are crying or moving

because the values might be erroneously interpreted.

Stage III After the dental treatment was completed, the blood pressure was taken immediately.

# CHAPTER IV

## EXPERIMENTAL RESULTS

The blood pressure of twenty-five children, before, during, and after dental treatments, males and females of each age group are presented in table I, II, and III.

Table IV, V, and VI show statistical results, which are readily apparent as follows:

1. Both systolic and diastolic blood pressure increased in all age groups of subjects during the dental procedures. Paired "t" comparison showed a statistically significant correlation ($p<0.01$) when comparing the before measurements and during dental measurements.

2. Systolic blood pressure readings of one standard deviation above the mean value, during the dental treatment, presented a statistically significant increase in all age groups, of both sexes.

3. Paired "t" comparison evidenced no significant change in both systolic and diastolic blood pressure, between the before dental treatment readings and after dental treatment readings. (With the exception of male 4-6 years old, female 6-8 years old at $.05>p>.01$)

TABLE I (Systolic and Diastolic Blood Pressure of Children Age 4-6 Years in the Dental Situation)

| Age (4-6) Male | | | Age (4-6) Female | | |
|---|---|---|---|---|---|
| Before | During | After | Before | During | After |
| 100/50 | 98/52 | 92/52 | 106/60 | 110/62 | 92/64 |
| 110/50 | 140/50 | 98/56 | 102/60 | 98/44 | 102/58 |
| 82/48 | 130/68 | 80/50 | 110/70 | 120/80 | 120/60 |
| 90/50 | 100/65 | 84/48 | 100/62 | 90/60 | 96/60 |
| 108/68 | 120/78 | 102/68 | 98/50 | 120/62 | 94/58 |
| 80/40 | 90/40 | 86/40 | 92/50 | 100/50 | 102/62 |
| 102/44 | 108/50 | 102/50 | 82/42 | 84/46 | 80/40 |
| 94/50 | 100/60 | 96/54 | 94/52 | 110/70 | 106/62 |
| 102/54 | 120/60 | 100/60 | 86/50 | 90/56 | 92/62 |
| 84/50 | 98/56 | 90/58 | 88/60 | 120/78 | 78/46 |
| 80/40 | 92/48 | 78/40 | 92/50 | 98/62 | 90/56 |
| 102/60 | 126/70 | 104/52 | 84/52 | 120/70 | 90/46 |
| 100/42 | 122/62 | 100/52 | 86/40 | 98/50 | 90/46 |
| 90/40 | 120/44 | 96/50 | 90/50 | 120/50 | 90/50 |
| 80/46 | 98/50 | 84/46 | 96/48 | 110/64 | 98/52 |
| 100/60 | 126/58 | 106/58 | 94/46 | 130/60 | 110/56 |
| 98/60 | 104/60 | 100/60 | 90/50 | 90/70 | 86/48 |
| 108/38 | 98/40 | 110/38 | 92/50 | 106/58 | 94/52 |
| 80/38 | 90/40 | 80/40 | 92/48 | 102/50 | 90/50 |
| 82/40 | 90/40 | 80/40 | 90/40 | 100/52 | 106/62 |
| 82/40 | 86/40 | 82/40 | 90/48 | 90/54 | 88/60 |
| 88/50 | 100/50 | 82/50 | 104/48 | 110/70 | 100/60 |
| 98/44 | 120/42 | 92/40 | 80/48 | 92/50 | 98/50 |
| 92/42 | 118/44 | 88/44 | 94/44 | 102/50 | 94/46 |
| 98/46 | 98/62 | 88/42 | 88/50 | 120/80 | 86/46 |
| 90/60 | 118/70 | 100/50 | | | |

TABLE II (Systolic and Diastolic Blood Pressure of Children Age 6-8 Years in the Dental Situation)

| Age (6-8) Male | | | Age (6-8) Female | | |
|---|---|---|---|---|---|
| Before | During | After | Before | During | After |
| 120/68 | 135/70 | 124/72 | 90/54 | 135/54 | 100/46 |
| 110/70 | 120/60 | 98/58 | 110/60 | 116/58 | 112/58 |
| 120/50 | 140/50 | 118/70 | 98/42 | 100/50 | 98/52 |
| 90/60 | 100/70 | 90/50 | 90/50 | 90/54 | 86/50 |
| 105/68 | 130/50 | 90/50 | 96/46 | 118/84 | 80/64 |
| 102/64 | 110/72 | 100/62 | 106/62 | 110/70 | 98/68 |
| 98/52 | 120/70 | 92/54 | 72/42 | 98/58 | 70/52 |
| 98/52 | 110/62 | 96/58 | 98/48 | 110/60 | 94/48 |
| 94/52 | 100/60 | 100/52 | 106/52 | 116/60 | 104/54 |
| 108/68 | 108/68 | 98/62 | 88/48 | 100/52 | 86/48 |
| 100/44 | 118/60 | 98/50 | 102/52 | 106/64 | 98/62 |
| 98/52 | 102/70 | 90/48 | 94/46 | 102/58 | 92/48 |
| 104/50 | 130/80 | 110/50 | 120/70 | 136/72 | 100/70 |
| 80/42 | 90/50 | 84/46 | 90/48 | 100/60 | 90/50 |
| 98/60 | 100/60 | 104/54 | 86/50 | 90/52 | 84/50 |
| 100/54 | 120/60 | 98/50 | 96/58 | 94/62 | 100/64 |
| 98/50 | 108/58 | 108/48 | 80/38 | 110/48 | 78/38 |
| 100/64 | 100/70 | 90/64 | 78/38 | 88/40 | 70/36 |
| 82/42 | 88/50 | 80/44 | 78/50 | 88/60 | 90/50 |
| 88/50 | 90/50 | 86/50 | 96/60 | 100/70 | 90/50 |
| 96/44 | 96/46 | 98/46 | 128/58 | 140/70 | 110/54 |
| 92/46 | 110/70 | 94/48 | 110/58 | 108/58 | 106/50 |
| 96/58 | 108/60 | 98/58 | 88/50 | 100/52 | 90/54 |
| 80/40 | 90/46 | 84/40 | 94/58 | 120/60 | 100/60 |
| 114/40 | 120/40 | 112/40 | 98/60 | 118/60 | 96/50 |

TABLE III (Systolic and Diastolic Blood Pressure of Children Age 9-11 Years in the Dental Situation)

| Age (9-11) Male | | | Age (9-11) Female | | |
|---|---|---|---|---|---|
| Before | During | After | Before | During | After |
| 100/50 | 112/52 | 106/60 | 114/64 | 140/85 | 118/58 |
| 108/58 | 118/70 | 114/68 | 90/50 | 94/52 | 98/54 |
| 114/42 | 116/62 | 120/58 | 115/50 | 122/50 | 115/54 |
| 100/60 | 110/65 | 100/62 | 98/48 | 110/68 | 102/46 |
| 110/76 | 120/80 | 116/68 | 118/52 | 136/70 | 122/64 |
| 104/60 | 120/70 | 118/64 | 98/44 | 108/52 | 102/64 |
| 110/60 | 115/70 | 104/60 | 92/48 | 142/80 | 90/48 |
| 120/80 | 128/82 | 118/64 | 106/58 | 130/60 | 108/52 |
| 112/64 | 112/72 | 96/64 | 98/58 | 112/62 | 104/50 |
| 108/60 | 120/62 | 100/60 | 96/50 | 110/68 | 90/50 |
| 118/64 | 132/68 | 114/68 | 98/52 | 112/60 | 86/62 |
| 94/44 | 116/50 | 98/50 | 90/50 | 98/58 | 98/56 |
| 100/50 | 114/56 | 98/50 | 98/48 | 110/50 | 96/48 |
| 116/64 | 120/58 | 110/60 | 88/48 | 110/62 | 112/60 |
| 108/66 | 110/66 | 98/62 | 118/82 | 130/78 | 116/80 |
| 98/52 | 108/60 | 92/52 | 100/50 | 110/60 | 90/48 |
| 90/42 | 98/60 | 98/50 | 102/60 | 116/70 | 108/60 |
| 98/50 | 130/60 | 98/50 | 100/50 | 120/68 | 110/50 |
| 118/54 | 128/58 | 116/54 | 98/52 | 108/52 | 98/54 |
| 96/50 | 110/70 | 88/50 | 110/64 | 130/64 | 100/64 |
| 124/80 | 130/70 | 118/60 | 90/38 | 90/40 | 88/38 |
| 98/60 | 100/70 | 96/60 | 100/64 | 120/60 | 112/60 |
| 90/46 | 94/52 | 86/50 | 98/40 | 108/52 | 102/62 |
| 100/60 | 114/58 | 98/60 | 110/50 | 120/58 | 104/60 |
| 98/60 | 110/50 | 100/50 | 98/48 | 100/50 | 100/52 |

TABLE IV

Blood Pressure Comparison by Paired "t" Design and Mean Systolic and Diastolic Blood Pressure for Age Group 4-6 Years

| | MALE (N=25) | | FEMALE (N=25) | |
|---|---|---|---|---|
| | SYSTOLIC | DIASTOLIC | SYSTOLIC | DIASTOLIC |
| BEFORE | 93.92 ± 17.20# | 48.4 ± 8.16 | 92.4 ± 7.79 | 50.72 ± 5.3 |
| DURING | 108.8 ± 14.73 | 54.36 ± 10.97 | 105.2 ± 12.58 | 59.92 ± 10.65 |
| AFTER | 92.72 ± 19.18 | 49.52 ± 4.45 | 94.88 ± 9.36 | 54.08 ± 6.92 |

PAIRED "t" COMPARISON

| | MALE | | FEMALE | |
|---|---|---|---|---|
| | SYSTOLIC | DIASTOLIC | SYSTOLIC | DIASTOLIC |
| BEFORE-DURING VALUE | 6.286** | 4.76** | 4.784** | 4.96** |
| BEFORE-AFTER VALUE | -2.67* | 1.142 | 1.3 | 1.709 |

# mean ± 1 standard deviation

* $p < .05$ (statistically significant at $p = .05$)

** $p < .01$

TABLE V

Blood Pressure Comparison by Paired "t" Design and Means Systolic and Diastolic Blood Pressure for Age Group 6-8 Years

| | MALE (N=25) | | FEMALE (N=25) | |
|---|---|---|---|---|
| | SYSTOLIC | DIASTOLIC | SYSTOLIC | DIASTOLIC |
| BEFORE | 98.84 ± 10.59# | 53.6 ± 9.47 | 96.0 ± 13.79 | 52.18 ± 10.354 |
| DURING | 109.72 ± 14.64 | 60.08 ± 10.22 | 107.05 ± 17.45 | 59.55 ± 9.66 |
| AFTER | 87.52 ± 24.51 | 52.96 ± 8.31 | 92.55 ± 13.305 | 52.82 ± 8.61 |

PAIRED "t" COMPARISON

| | MALE | | FEMALE | |
|---|---|---|---|---|
| | SYSTOLIC | DIASTOLIC | SYSTOLIC | DIASTOLIC |
| BEFORE-DURING VALUE | 6.93** | 3.2** | 4.6** | 5.89** |
| BEFORE-AFTER VALUE | -0.992 | -0.46 | -2.56* | 0.55 |

# mean ± 1 standard deviation

* $p < 0.05$

** $p < 0.01$

TABLE VI

Blood Pressure Comparison by Paired "t" Design and Means Systolic and Diastolic Blood Pressure for Age Group 9-11 Years

| | MALE (N=25) | | FEMALE (N=25) | |
|---|---|---|---|---|
| | SYSTOLIC | DIASTOLIC | SYSTOLIC | DIASTOLIC |
| BEFORE | 105.83 ± 11.69# | 58.78 ± 10.42 | 100.81 ± 9.34 | 66.0 ± 9.07 |
| DURING | 115.26 ± 9.64 | 64.48 ± 8.398 | 116.0 ± 14.17 | 62.33 ± 11.06 |
| AFTER | 104.43 ± 12.95 | 58.43 ± 6.38 | 102.43 ± 10.56 | 55.24 ± 8.89 |

PAIRED "t" COMPARISON

| | MALE | | FEMALE | |
|---|---|---|---|---|
| | SYSTOLIC | DIASTOLIC | SYSTOLIC | DIASTOLIC |
| BEFORE-DURING VALUE | 6.573** | 4.28** | 7.013** | 4.98** |
| BEFORE-AFTER VALUE | 0.119 | 0.742 | 1.63 | 1.415 |

# = mean ± 1 standard deviation

* $p < 0.05$

** $p < 0.01$

# CHAPTER V

## DISCUSSION

The results presented in this study show a statistically significant increase in blood pressure during dental treatment. This is possibly due to stress, either physiologic or psychologic, in the patients. The administration of a concentration of epinephrine 1:100,000 in local anesthetic has been stated to have no significant effect on blood pressure. (American Medical Association and American Dental Association Conference, 1964)

The decrease in the blood pressure following dental procedures probably is attributable to the relaxation of the patient as he realizes that the dental treatment is completed.

The initial blood pressures of some subjects measured in the dental chair prior to the dental treatment were slightly higher than that reported in the literatures as the normal blood pressures for children of this age (i.e. when compared to the several surveys reported in the medical literature). Several possible explanations are suggested to explain the results:

1. The patients may have been apprehensive about the impending dental treatment. Since the blood pressure dropped to values closer to the reported normal values after treatment was completed, we can conclude that this initial high blood pressure value was possibly due to anxiety.

2. The comparison of blood pressure values between the before and after treatment readings may offer an insight to the hypertension question. If the blood pressure still remains high after treatment when compared to before treatment, we might logically suspect the possibility of a high blood pressure tendency in that patient. The patient might have hereditary high blood pressure or an acquired systemic hypertension.

3. 5.33 per cent of the subjects showed a very high initial blood pressure, both systolic and diastolic, on the criteria of 1 standard deviation above the mean. (Londe 1968) The researcher did advise the parents of these particular children to take them to a physician for a more complete physical examination. These subjects had the elevation of blood pressure values during the dental treatment higher than the others in the study. Nevertheless, they did not evidence pathologic values. The evaluation of blood pressure in the dental office only becomes valuable if the standards of normality that we use are accurate, that we use them correctly, and if we refer to our medical colleagues for more complete evaluation. These studies, presenting 5.33 per cent high blood pressure, correlated very closely with the range established by previous studies in the medical literature i.e. Masland 1956, Londe 1968, 1971, and Hull 1973.

As a consequence of this study, the researcher believes that both medicine and dentistry should recognize that children and adolescents need to be clinically evaluated routinely. Those patients who demon-

strate early hypertension should be treated early to prevent the sequelae of hypertensive diseases.

# CHAPTER VI

## SUMMARY AND CONCLUSIONS

The study was done on children of age groups 4-6 years, 6-8 years, and 9-11 years, with males and females separated into three groups of twenty-five each. The random sample of 25 was selected from clinical patients in the Pedodontic Department, Loyola University School of Dentistry. The blood pressure was measured at three different times; before, during, and after the dental treatment.

The results of the data show a statistically significant increase in blood pressure during the dental treatment when compared to the initial blood pressure value, as well as the value obtained after treatment.

This study demonstrated the children's reaction before, as well as during and after the dental treatment. Since 5.33% of the subjects showed abnormally high initial blood pressures both systolic and diastolic, therefore this study also showed the importance of the detection of hypertensive patients, who can be referred to a physician for a more comprehensive physical examination and evaluation. Hopefully the physician can then initiate treatment procedures for the hypertensive tendency.

More importantly to dentistry, this study perhaps shows that it is practical and feasible to measure blood pressure in children in a

dental office. Moreover a dental profession may be of service in detection of unexpected hypertension in children.

It is hoped that future studies can elaborate more fully the need of more specific elements of the dental visit on hypertension.

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APPROVAL SHEET

The thesis submitted by Dr. Busabakorn Vattasingh has been read and approved by members of the Department of Oral Biology.

The final copies have been examined by the co-directors of the thesis and the signatures which appear below verify the fact that any necessary changes have been incorporated, and that the thesis is now given final approval with reference to content, form, and mechanical accuracy.

Thé thesis is therefore accepted in partial fulfillment of the requirements for the degree of Master of Science.

1/4/77
Date

Dr. Wayne E. Mutis DDS, MS.
Signature of advisor

1-3-77
Date

Mark K. DDS MS
Signature of Co-advisor

1-4-77
Date

Douglas C. Bowman
Signature of Co-advisor

1-4-77
Date

Eugene F. Kramer DDS, MS
Signature of Co-advisor