

# ANTHROPOMETRIC MEASUREMENTS OF DIETARY PATTERN AND HYPERTENSION

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## ABSTRACT:

The most prevalent form of chronic illness and the key contributor to an increased risk of cardiovascular disease is hypertension. During the process of developing hypertension, prehypertension has been shown to have a tight relationship to a number of risk factors for cardiovascular disease. The purpose of this research was to investigate whether or not there is a connection between food trends and hypertension in the province of Jiangsu. In particular, we gathered information through food frequency questionnaires, anthropometric measures, and sickness self-reports from participants in the Jiangsu Province of China in 2007 and then followed up with them in 2014. This took place in 2014. In the end, there were a combined total of 1762 male and female participants from which to draw conclusions. Through the use of factor analysis, we were able to identify four distinct eating patterns. Next, we calculated the pattern-specific factor scores, and finally, we sorted the scores into quartiles, increasing from Q1 to Q4. Participants in Q4 of the snack eating pattern were shown to be at a higher risk of having high diastolic blood pressure as compared to those in Q1 of the study. In addition, those who followed the thrifty eating pattern and fell into categories Q2–Q4 were shown to have a positive correlation with abnormal blood pressure. After correcting for other potential confounding factors, the results that were reported in the thrifty eating pattern no longer held true for high systolic blood pressure. We discovered that eating certain foods was linked to both hypertension and prehypertension in certain people. Both prehypertension and hypertension can be caused by an unhealthy intake of salt and alcohol, which are both considered risk factors. Added sugar and saturated fatty acids are both risk factors for hypertension, which may provide suggestions for the residents of China to change their dietary habits in order to prevent prehypertension and hypertension.

**Key words:** *Anthropometric measurements; Blood tests; Dietary habits; High blood pressure; cardiovascular disease*

## INTRODUCTION

The era of time known as adolescence is characterised by rapid cognitive and physical development. Height gain that occurs at a more rapid rate than usual during the transition from childhood to adolescence is an indication of the normal physical changes that occur throughout this time. Girls often reach their peak height two years earlier than males do, on average, as a result of their faster overall growth. Even among teenagers of the same chronological age, there is a wide range of rates of development in terms of both height and the amount of weight gained. Anthropometric measurements are used to monitor adolescent

growth during regular periodic health examinations. The results obtained are important for the prevention of a number of chronic diseases such as cardiovascular diseases (CVD), obesity or malnutrition, and/or a diet that is nutritionally deficient. Anthropometric measurements are used to monitor adolescent growth during regular periodic health examinations. One of the most common patterns of behaviour that can have a detrimental effect on health is dissatisfaction with one's body and weight, as well as skipping meals and snacking instead of eating meals. On the other hand, it is common knowledge that a nutritious diet is of paramount significance not only for attaining a decent level of health but also for preserving that level of health over time. It is quite concerning that the incidence of overweight and obesity among children and adolescents in the European area of the World Health Organization is so high. Since the year 2002, several Eastern European nations have been reporting an upward trend in the percentage of youngsters who are overweight. The tendency to carry excess weight into adulthood is increased when a person is overweight throughout their teenage years. As a result, education targeted specifically on adolescents is required to address appropriate food habits, regular health care, the management of body weight, and the necessity of frequent medical checkups. Anthropometric measurements and indicators calculated on their basis, such as body mass index (BMI), waist-to-hip ratio (WHR), and waist-to-height ratio (WHtR), are included in the assessment of weight status in children and adolescents because these measurements have been shown to correlate strongly with risk factors for cardiovascular disease. The waist-to-height ratio (WHtR) is an indicator that displays a link between the rate of increase in waist circumference (WC) and body height. This relationship shifts as one ages.

It is a straightforward indicator that, when used in clinical screening, may be used to estimate the risk factors for cardiovascular disease (CVD), and it appears to be even more trustworthy than WC and BMI. There is mounting evidence to suggest that children and adolescents who have high blood pressure (BP) are far more prevalent than was previously believed. The relatively high frequency of elevated blood pressure in children is a major cause for worry with regard to the general health of populations all over the world. It is important to monitor the phenomena not just epidemiologically but also clinically since there are cases in which high blood pressure in adolescence might progress into hypertension in adulthood. This highlights the need of monitoring the phenomenon. There is a correlation between hypertension in childhood and adolescence and an increased risk of death from a stroke in middle age. This study calls for more follow-up research to be conducted on a larger scale and over a longer period of time in order to validate the hypothesis and investigate the long-term consequences of hypertension in adolescents.

It is well known that being overweight or obese is one of the most significant risk factors for high blood pressure in young people (children and adolescents), ranking among the top 10. Even though hypertension has been documented in children and adolescents, there are still a lot of information gaps about how to identify and treat high blood pressure in adolescents in the most effective way. The blood pressure levels of children and adolescents have been the subject of earlier research, and other variables that lead to high blood pressure levels should be evaluated further. There hasn't been a lot of research done utilising data on the population of children and adolescents who have high blood pressure in connection to sexuality. As a result, it is absolutely necessary to formulate therapeutic guidelines that are supported by data.

In light of the information presented above, the purpose of the study was to evaluate gender differences in Croatian adolescent boys' and girls' anthropometric measures, dietary habits, serum lipid levels, and glucose levels in relation to high blood pressure (BP).

Participants were high school students from Croatia who were chosen to take part in the study based on their responses to an initial survey on teenage interest in bettering their food habits. Parents of kids who expressed interest in participating in the study provided their informed consent, which was also acquired from school administrators, the Ethics Committee of the University of Zagreb School of Medicine, and the Ministry of Science, Education, and Sports. The ages of the participants ranged from 14 to 17, and there were both male and female participants (girls and boys). The number of survey participants was 260 (68.2%) teenage girls and 121 (31.8%) boys, and anthropometric data was gathered (without missing values) from 246 girls and 111 boys. The gender distribution of the participants was as follows: 260 (68.2%) females and 121 (31.8%).

### **Blood collection and biochemical measurements**

After fasting for 12 hours, blood samples were drawn using the usual venipuncture technique by personnel who were thoroughly trained in blood drawing. After being divided into newly labelled vials and centrifuged according to a predetermined methodology, the blood was then sent to the Clinical Department of Laboratory Diagnostics at Dubrava University Hospital to be processed. Before the analysis, the serum was kept frozen at a temperature of -20 degrees Celsius.

Serum glucose levels were determined using the hexokinase method, serum total cholesterol (TC) levels were determined using the CHOD-PAP method, serum triglyceride levels were determined using the GPO-PAP method, and serum high-density lipoprotein cholesterol (HDL-c) levels were determined using automated homogeneous assays performed on a Beckman Coulter AU 680 analyzer (Beckman, Minneapolis, USA) using reagent kits Both of the intra-assay quality controls found that the coefficient of variation for all blood values fell below the 5% threshold.

### **OBJECTIVES**

1. To study anthropometric measurements.
2. To study hypertension.
3. To study the Dietary Patterns and the Characteristics of the Individuals in Each Dietary Pattern
4. To study the factors of dietary patterns identified by factor analysis in the participants.

### **METHODS**

Participants were high school students from Croatia who were chosen to take part in the study based on their responses to an initial survey on teenage interest in bettering their food habits. Parents of kids who expressed interest in participating in the study provided their informed consent, which was also acquired from school administrators, the Ethics Committee of the University of Zagreb School of Medicine, and the Ministry of Science, Education, and Sports. The ages of the participants ranged from 14 to 17, and there were both male and female participants (girls and boys). The number of survey participants was 260 (68.2%) teenage girls and 121 (31.8%) boys, and anthropometric data was gathered (without missing values) from 246 girls and 111 boys. The gender distribution of the participants was as follows: 260 (68.2%) females and 121 (31.8%).

### **Questionnaire**

Dietary Habits of the Adolescents and Nutrition-Related Lifestyle were the two categories that were covered in the survey, which was titled Questionnaire on Nutritional Status, Health Condition, and Dietary Habits of Adolescents and had the following two groups of questions: In the first round of questions, participants were asked about their gender, age, grade level in high school, town (or other place of residence), gender, and school. After this, there were eight questions pertaining to the eating routines of the teenagers, which were as follows: Breakfast, lunch, and supper are the three primary meals that I consume on a daily basis; I bring one of the following items to school with me to eat for breakfast: leafy dough, a variety of white bread flakes, biscuits, or snacks; When I'm parched, my beverage of choice is water; I snack on fresh seasonal fruit and vegetables; and I drink water when I'm thirsty. Pate (chicken and liver), meat salami, and sausages are the kind of meat items that I consume the most frequently. I also consume white fish and fatty fish (anchovy, sardine, tuna). The second section of the questionnaire consisted of four questions pertaining to the nutritional lifestyle, and they were as follows: I make time every day to get in some exercise, smoke cigarettes, and consume alcohol, and I also make sure to give myself enough of downtime. The Likert scale, with its five degrees, was utilised throughout the entirety of the questionnaire. The scale ranged from never (1) to always (5). (5). The students finished the questionnaire within the allotted time of 45 minutes, but the majority of them finished it in less time than that.

The questionnaires' levels of reliability and construct validity were found to be adequate in our research. These metric properties of the two entirely new measuring instruments (Nutrition-Related Lifestyle and Dietary Habits of Adolescents) provide evidence for the notion that the implementation of these instruments should be deemed advantageous in the future.

### **Anthropometry**

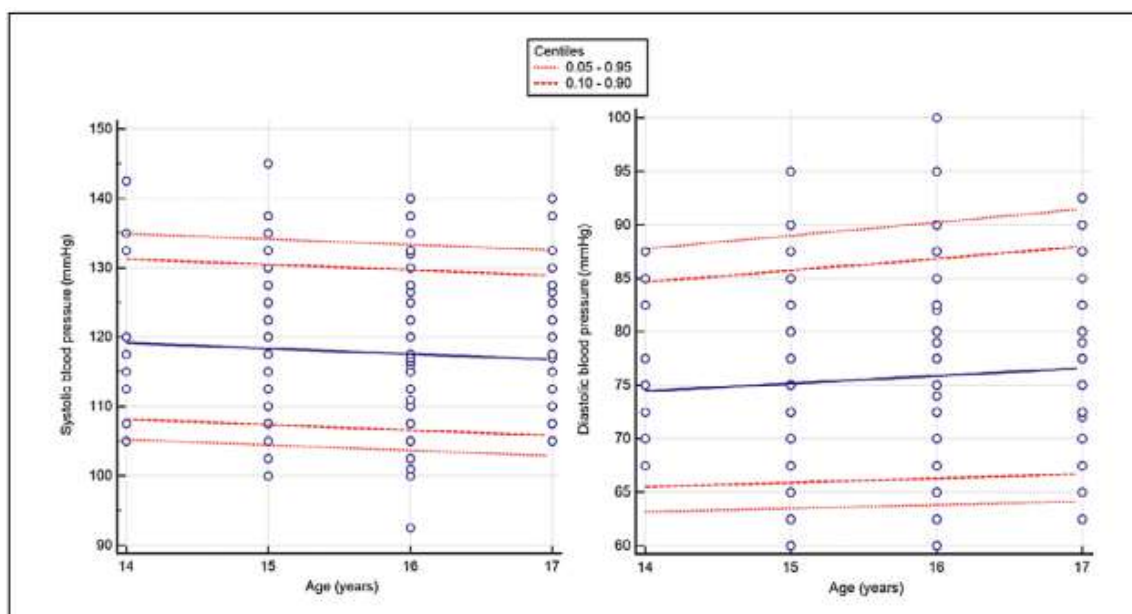
Anthropometric measurements were carried out in accordance with the procedures that are standard 12. All of the subjects in the research were measured by the same trained professionals using the identical apparatus, which was used for all of the participants.

The anthropometer (Siber Hegner, Switzerland) was used to measure height to the closest millimetre, and a self-zeroing digital scale (precise 0.1 kg; Beurer, Germany) was used to measure body weight. Both devices were calibrated before to each measurement. The individual's height and weight were determined when they were wearing light clothing and without their shoes. The height was measured in centimetres, and the reading was accurate to two decimal places. The formula for determining BMI is weight in kilogrammes divided by height in metres squared ( $\text{kg}/\text{m}^2$ ). 13. WC was measured with a measuring tape to the closest 0.1 cm at the high point of the iliac crest when the individual was in the standing posture during minimum respiration 14. The formula that was used to determine WHtR is as follows: waist circumference (cm)/height (cm). A measuring tape was used to determine the individual's hip circumference (HC) at the location in the buttocks that had the largest circumference. The waist-to-hip ratio was determined using the following formula: waist circumference (cm) / hip circumference (cm) 15. Using specialised callipers, the millimeter-scale measurement of skinfold thickness was obtained (Harpenden, Baty International, UK). The subcutaneous fat layer may be determined using a technique known as the skinfold thickness method. This technique involves measuring the thickness of the skin by pinching it at many predetermined locations around the body. When the arm is resting by the side of the body, a mark is made on the skin anteriorly to measure the skinfold of the biceps and posteriorly to measure the skinfold of the triceps.

### **Statistical analysis**

Tables and figures are used to display the data. The Kolmogorov-Smirnov test was performed to examine the normality of the distribution of continuous variables, and non-parametric tests were used to the data in the subsequent studies. Quantitative data were reported as medians and interquartile ranges, whereas categorical variables were expressed as frequencies and the associated percentages of those frequencies (25th to 75th percentile). In addition to the mean blood pressure for each gender, we also displayed the age-related reference intervals for SBP and DBP, along with the 5th, 10th, 90th, and 95th percentiles. The methodologies that are outlined serve as the basis for the methodology behind the reference interval for age. The measurements were translated logarithmically as a result of the fact that the distribution of the measurements revealed skewness at various ages. A weighted polynomial regression<sup>21</sup> was utilised to model the altered data based on the subject's age. This regression model calculates the mean of the measures after they have been modified as a function of the subject's age.

The test was applied in order to investigate the variations in dietary routines that exist between the BP groups consisting of teenage girls and boys in a distinct manner. Analyses of variations in anthropometric and laboratory data were performed using the Mann-Whitney U test in order to compare high (90th percentile) and normal blood pressure groups of teenage girls and boys.

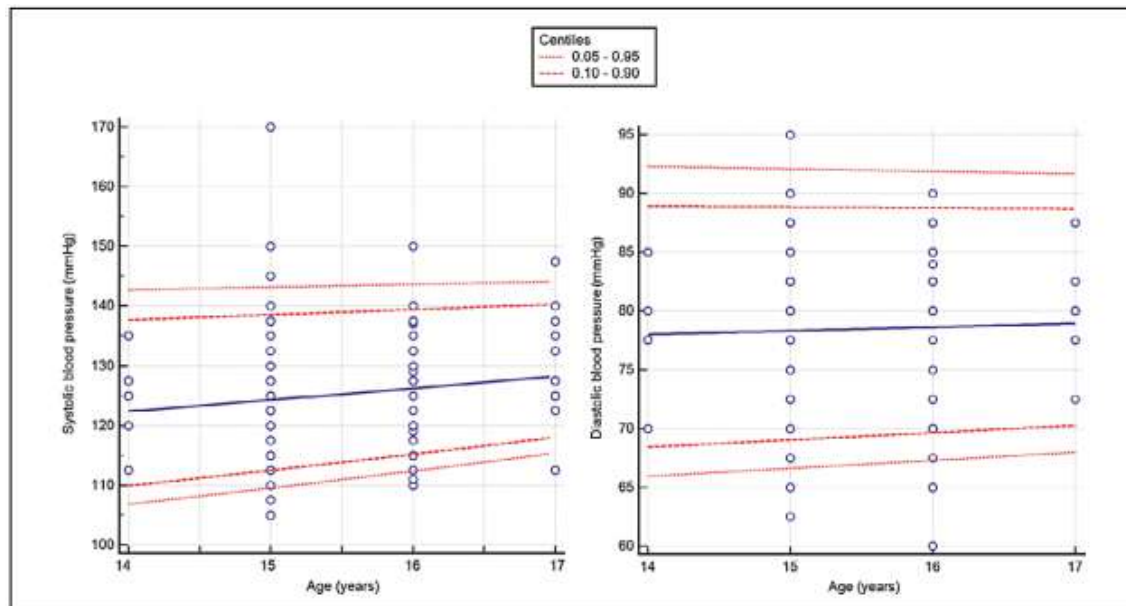


**Fig. 1. Systolic and diastolic blood pressure reference intervals in adolescent girls according to age**

## Results

The research was conducted on 246 teenage females and 111 teenage boys, and it involved 260 teenage girls (representing 68.2% of the total) and 121 teenage boys (representing 31.8% of the total). The lowest age for both males and females was 14 years old, while the highest age was 17 years old. The mean age, as measured by the standard deviation, was 15.8 years for girls and 15.5 years for boys. The reference intervals for SBP and DBP in adolescent girls and boys, broken down by age, are depicted in Figures 1 and 2, respectively. With increasing age, there was a tendency for girls' SBP to decline while their DBP increased. In contrast, there was an upward increase in both SBP and DBP among adolescents who were male.

Table 1 displays the anthropometric and laboratory value disparities that exist between the high blood pressure (90th percentile) and normal blood pressure (BP) groups of teenage girls. Girls who had high blood pressure (>135/87.5 mm Hg) had a significantly higher body mass index ( $p = 0.020$ ), waist circumference ( $p = 0.002$ ), waist-to-hip ratio ( $p = 0.016$ ), waist-to-hip ratio ( $p = 0.043$ ), high cholesterol ( $p = 0.015$ ), and total cholesterol ( $p = 0.021$ ) levels than those who did not have high blood pressure.



**Fig. 2. Age-specific systolic and diastolic blood pressure reference intervals for teenage boys.**

Teenage males who had high blood pressure had a substantially higher body mass index ( $p = 0.045$ ), waist circumference ( $p = 0.004$ ), waist to hip ratio ( $p = 0.022$ ), and WHtR ( $p = 0.017$ ). (Table 2).

Table 3 illustrates the correlation between unhealthy eating patterns and high blood pressure in young women. Girls who had high blood pressure were much more likely to consume leafy dough, various types of white bread flakes, biscuits, and snacks at school breakfast ( $p = 0.008$ ). On the other hand, they were significantly less likely to consume white fish ( $p = 0.021$ ) and oily fish ( $p = 0.026$ ).

The incidence of eating meat items such as pate (chicken, liver), meat salami, and sausages was considerably greater among boys who had high blood pressure ( $p = 0.015$ ).

## CONCLUSION

The eating habits of European adolescents served as the major focus of our investigation because of the potential influence that these habits may have on blood pressure, hyperglycemia and lipidemic profiles, and inflammatory levels. Our research was conducted throughout Europe. The patterns that were discovered revealed connections with indices such as the body mass index (BMI) and biomarkers such as cholesterol and C-reactive protein (CRP). The relationships that were highlighted in this study display a great deal of interest and enhance the necessity for additional research on the pivotal role of diet in the essential-for-development period of adolescence, as a modifying factor for cardiometabolic risk factor-related disorders such as obesity, hypertension, and type 2 diabetes. The relationships that were highlighted in this study display a great deal of interest and enhance the necessity for additional research on the pivotal role of diet in the essential.

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