*ejpmr, 2024, 11(9), 66-70*

SJIF Impact Factor 7.065

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Research Article

ISSN 2394-3211

EJPMR

# PREVALENCE OF SYSTEMIC HYPERTENSION IN OUTPATIENT CHILDREN AT TISHREEN UNIVERSITY HOSPITAL

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**Article Received on 11/07/2024** **Article Revised on 01/08/2024** **Article Accepted on 21/08/2024**

## ABSTRACT

**Background:** High blood pressure is a significant global health concern, gaining increasing importance due to its numerous complications. Hypertension in childhood may be a predictive factor for its development in adulthood. Early identification and management of high blood pressure in children are crucial for preventing cardiovascular complications that often arise in early adulthood. **Objective:** determine the prevalence of high blood pressure among children attending the general pediatric clinic at Tishreen University Hospital. It will also investigate the correlation between high blood pressure in children and both obesity and a family history of high blood pressure. **Materials and Methods:** In a descriptive, cross-sectional study conducted at Tishreen University Hospital, the prevalence of high blood pressure among children attending the general pediatric clinic was investigated from September 2022 to September 2023. The study involved measuring arterial blood pressure and categorizing it based on the American Academy of Pediatrics guidelines, which included Normal Pressure, Elevated Pressure, Stage 1 Hypertension, and Stage 2 Hypertension. Additionally, height and weight measurements were taken to calculate body mass index (BMI). The study aimed to determine the prevalence of high blood pressure and explore the relationship between high blood pressure, obesity, and a family history of hypertension. Statistical analysis utilized IBM SPSS Statistics (Version 25) to analyze the data and draw meaningful conclusions. **Results:** Over the study period, 1,200 children aged 5 to 15 visited the general pediatric clinic. The majority (93.4%) were classified as having normal weight based on their BMI, while a smaller proportion (6.6%) were categorized as obese. A family history of hypertension was identified in 4.4% of the children. Following arterial blood pressure measurements, 93% of children had normal blood pressure, 3.1% had elevated blood pressure, 3.7% had Stage 1 hypertension, and 0.2% had Stage 2 hypertension. The prevalence of abnormal arterial pressure was 7%, leading to referrals for follow-up and further investigations to manage high blood pressure levels. The statistical analysis revealed significant associations between elevated arterial blood pressure, body mass index, and a family history of hypertension. Specifically, a higher percentage of obese children exhibited abnormal arterial blood pressure, and there were significant differences related to a family history of hypertension and abnormal arterial pressure. **Conclusion:** High blood pressure in children is a growing public health concern with increasing prevalence. Early detection and treatment are crucial to prevent the development of serious complications later in life.

**KEYWORDS:** Prevalence, Systemic Hypertension, Children.

## INTRODUCTION

High Blood Pressure is a major long-term health condition and is the leading cause of premature death among adults throughout the world, including both developed, developing, and lesser-developed countries.[1] Interest in childhood hypertension (HTN) has increased since the 2004 publication of the "Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents" (Fourth Report).[2] Therefore, elevated blood pressure levels during childhood and adolescence are a recognized predictor of adulthood BP, leading to increased CVD disease in adults.[3,4]

The prevalence of pediatric High Blood Pressure has increased in recent decades.[5,6] Between 3% and 5% of children and adolescents have hypertension and 10% and 14% have elevated BP levels ("prehypertension"). In a global meta-analysis, the pooled prevalence of hypertension was 4.0% and prehypertension was 9.7%. Hypertension prevalence increased from 1.3% (1990–1999) to 6.0% (2010–2014).[7]

The cause of increasing pediatric hypertension is multifactorial.[8] Several risk factors are associated with HTN, with obesity being a major. The association between obesity and raised BP is further demonstrated by the fact that an overweight child is three times more

likely to develop HTN than a child with a BMI in the normal range.[9] Along with obesity, high sodium intake, strong family history, increased fructose intake, and uric acid levels, male sex and ethnicity are some of the other established risk factors for the development of HTN in a child.[9]

Identifying High Blood Pressure can thus be challenging as patients may present with non-specific symptoms that may be difficult to distinguish from other common illnesses.[10] Therefore, this study aimed to determine the prevalence of high blood pressure among children and investigate the correlation between high blood pressure in children and both obesity and a family history of high blood pressure.

## PATIENTS AND METHODS

### Study population

Following the approval from the local research ethics committee, a descriptive, cross-sectional study to investigate the prevalence of high blood pressure among children attending the general pediatric clinic at Tishreen University Hospital. Data was collected between September 2022 and September 2023.

In the absence of previous assessments, the maximum prevalence of High Blood Pressure in children was estimated at 50% based on expert opinions. This led to a required total sample size of 1068 children, calculated using the Cochran formula:

$$N0=z^2pq/e^2$$

This calculation was performed with a 95% confidence interval (CI), α=5%, β=20%, and a power of 80%, where z=1.96 and e=3%.

The study ultimately included 1200 children, considering potential sample attrition. All children aged five years and above who consecutively visited the general pediatric clinic at Tishreen University Hospital were included. After obtaining informed consent from their parents or guardians, detailed medical histories, including family history, were collected. Height and weight were measured, and BMI was calculated. BMI was then categorized according to CDC growth charts[11], as follows:

- Underweight: BMI < 5 %.
- Normal weight: BMI ≥ 5 % and < 85 %.
- Overweight: BMI ≥ 85% and < 95 %.
- Obese: BMI ≥ 95 %.
- Severely obese: BMI > 99 %.

Arterial blood pressure (BP) was measured in all participants using a standardized protocol. After a minimum 5-minute rest period in a seated position with feet flat on the floor and arms at heart level, BP was measured using a mercury sphygmomanometer. The cuff was positioned on the upper arm, covering approximately two-thirds of its length and completely encircling its circumference. BP was measured three times on both arms, and the average of the last two readings was recorded. This procedure was repeated on three consecutive visits.

Following the recommendations of the American Academy of Pediatrics (AAP)[12], BP values were categorized as follows:

- Normal BP: Systolic and diastolic pressures below 90% for age, sex, and height.
- Elevated BP: Systolic or diastolic pressure between 90% and 95% for age, sex, and height.
- Hypertension: Systolic or diastolic pressure at or above 95% for age, sex, and height on three consecutive visits.

### Statistical analysis

The statistical analysis was conducted utilizing IBM SPSS version 20. The descriptive statistics included means, standard deviations (SD), medians, frequencies, and percentages. To assess the differences between paired groups, the Friedman test was employed. All tests held significance at type I error rate of 5% ($p<0.05$), with β=20%, and 80% power for this study.

## RESULTS

Over the study period, 1,200 children aged 5 to 15 visited the general pediatric clinic. A majority (93.4%, n=1,121) were classified as having normal weight based on their body mass index (BMI). A smaller proportion (6.6%, n=79) were categorized as obese. Furthermore, a family history of hypertension was identified in 4.4% (n=53) of the children through a review of their medical history. After measuring arterial blood pressure, it was found that 1,116 children, representing 93%, had normal blood pressure. Additionally, 38 children, representing 3.1%, had elevated blood pressure, while 44 children, representing 3.7%, had Stage 1 hypertension, and two children, representing 0.2%, had Stage 2 hypertension (Table 1).

**Table 1: Children Clinical characteristics of the study population.**

| BMI | Number | Percentile % |
|---|---|---|
| Normal | 1121 | 93.4% |
| Obesity | 79 | 6.6% |
| Family history of hypertension | Number | Percentile % |
| Exist | 53 | 4.4% |
| Not exist | 1147 | 95.6% |
| BP | Number | Percentile % |
| Normal | 1116 | 93% |
| Elevated | 38 | 3.1% |
| Stage 1 | 44 | 3.7% |
| Stage 2 | 2 | 0.2% |

The prevalence of abnormal arterial pressure in the studied research sample was 7%, as observed in the previous (table 1). These individuals were subsequently

referred for follow-up and further investigations to assess and manage their high blood pressure status.

To determine the relationship between elevated arterial blood pressure in children, body mass index, and a family history of hypertension, we calculated the statistical significance as follows (Table 2):

**Table 2: The correlation between abnormal blood pressure, body mass index, and the presence of a family history of high blood pressure of the study population.**

| BMI | BP | | | | P-value |
|---|---|---|---|---|---|
| | Normal | | Abnormal | | |
| | N | % | N | % | |
| Normal | 1050 | 94.1% | 71 | 84.5% | 0.003 |
| Obesity | 66 | 5.9% | 13 | 15.5% | |
| Family history of hypertension | Normal BP | | Abnormal BP | | P-value |
| | N | % | N | % | |
| Exist | 20 | 1.8% | 33 | 39.3% | 0.0001 |
| Not exist | 1096 | 98.2% | 51 | 60.7% | |

**Based on the information provided in table 2**

It is apparent from the aggregated data that statistically significant discrepancies are observed between abnormal arterial blood pressure and body mass index. Notably, a greater proportion of children classified as obese display abnormal arterial blood pressure in contrast to children categorized as having normal weight. Furthermore, the data underscores statistically significant distinctions related to abnormal arterial blood pressure and the presence of a familial background of high arterial blood pressure. The statistics demonstrate a higher percentage of children exhibiting abnormal arterial blood pressure in cases where a family history of high arterial pressure exists.

## DISCUSSION

The escalating global health concern of hypertension, also known as high blood pressure, poses significant challenges to public health worldwide due to its strong association with cardiovascular complications. Recognizing hypertension in childhood as a potential precursor to adult hypertension underscores the critical importance of early detection and intervention for pediatric populations.

Early identification and management of high blood pressure in children play a pivotal role in healthcare for several reasons. Firstly, timely detection enables healthcare providers to implement suitable interventions to regulate blood pressure levels and potentially avert the progression of hypertension into adulthood. Effective management in childhood can significantly reduce the risk of cardiovascular complications, such as heart disease and stroke, which commonly arise in early adulthood.

Moreover, addressing hypertension early in childhood through identification and management strategies can help mitigate the long-term health risks linked to sustained high blood pressure. Intervening in a child's health early on allows healthcare providers to introduce lifestyle modifications, administer medical treatments, and offer guidance on maintaining a healthy blood pressure profile throughout the individual's life span.

In our study, significant associations between arterial hypertension, body mass index (BMI), and family history of hypertension were observed through statistical analyses using IBM SPSS Statistics. Notably, obese children exhibited a heightened risk of abnormal arterial hypertension, and notable disparities were identified concerning family history of hypertension and abnormal blood pressure levels, albeit with family history obtained solely through parental reports without documented confirmation.

In discussing this study in the context of existing literature, it is necessary to explore how these findings correlate with or diverge from other significant research in the field of High Blood Pressure in Children and Adolescents. The first study was conducted by Nirav Buch et al (2011). aimed to determine the prevalence of hypertension among school-going children in Surat City, Western India, and identify associated risk factors. The findings of this research provided insights into the prevalence of hypertension among school children in Surat City, shedding light on the early emergence of this health concern in adolescent populations. The study's results regarding the prevalence of hypertension and associated risk factors are valuable for public health initiatives aimed at early detection and management of hypertension in young individuals.[13]

The second study was by Ogechukwu F Amadi et al (2019). investigates the prevalence of hypertension in children and explores the possibility of an increasing trend in its occurrence. The authors highlight a tendency in the developing world to underestimate the significance of primary hypertension in children's health, despite clear associations between various factors and hypertension incidence in adults. The study findings may prompt interventions focused on early detection, prevention, and management of hypertension in children to reduce the

negative health implications related to elevated blood pressure levels.[14]

Furthermore, The study conducted by Ranya A Ghamri et al (2019), at King Abdulaziz University Hospital in Jeddah, Saudi Arabia, aimed to investigate high blood pressure in children attending the pediatric clinic. The study highlighted the global importance of high blood pressure as a significant health issue, particularly in the context of mortality rates in Saudi Arabia and its association with heart disease, a leading cause of global deaths.The study was a cross-sectional investigation involving children aged 6-15 years seen at the pediatric clinics. By examining the prevalence of high blood pressure and the related risk factors in pediatric clinic attendees, the research aimed to contribute to the understanding of hypertension in children and support strategies for its prevention and management in this demographic.[15]

**Declaration**

**Ethical approval and consent to participate**

Ethical approval to study was obtained from the Scientific Research Ethics Committee at Tishreen University on 15/9/2022 in accordance with the Declaration of Helsinki.

**Consent for publication**

Not applicable.

**Availability of Data and Materials**

All the data generated or analyzed during this study are included in this published article. The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

**Competing interests**

None.

**Funding**

None.

**Author Contribution**

Ibraheem Jraikoos, collected the data, checked the quality of the data collection, analyzed and interpreted the data, designed and coordinated the study, undertook and checked the quality assessment, produced the first draft of the manuscript, wrote and edited the manuscript and approved the final manuscript before submission.

Ahmad Chreitah and Sulieman Sulieman were the supervisors of the project; undertook and checked to the quality assessment, checked the quality of the collected data; analyzed and interpreted the data; checked the quality assessment; edited the manuscript and approved the final manuscript before submission.

**CONCLUSION**

This study's results contribute valuable insights into the prevalence and associations of high blood pressure in children attending a general pediatric clinic. The findings underscore the importance of early detection, especially in the context of obesity and familial predispositions, to mitigate the long-term health risks associated with untreated hypertension in childhood.

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