

## REVIEW

**Recommendations for the prevention of hypertension in children and adolescents: systematic scoping review****Recomendaciones para la prevención de la hipertensión arterial en niños y adolescentes: revisión sistemática de alcance****Recomendações para a prevenção da hipertensão arterial em crianças e adolescentes: revisão sistemática de escopo**Velia Margarita Cárdenas-Villarreal <sup>1</sup> <https://orcid.org/0000-0001-9315-3193>Nora Hernández-Martínez <sup>2</sup> <https://orcid.org/0000-0002-8713-6255>Milton Carlos Guevara-Valtier <sup>3</sup> <https://orcid.org/0000-0001-7291-3931>Norma Edith Cruz-Chávez <sup>4\*</sup> <https://orcid.org/0000-0002-8532-5415>

1. PhD in Culture of Nursing Care. School of Nursing. Universidad Autónoma de Nuevo León, Monterrey, Nuevo León, México.
2. PhD in Nursing Sciences. School of Nursing. Universidad Autónoma de Nuevo León, Monterrey, Nuevo León, México.
3. PhD in Education. School of Nursing. Universidad Autónoma de Nuevo León, Monterrey, Nuevo León, México.
4. PhD in Nursing Sciences. School of Nursing. Universidad Autónoma de Nuevo León, Monterrey, Nuevo León, México.

\*Corresponding author: [norma.cruzch@uanl.edu.mx](mailto:norma.cruzch@uanl.edu.mx)**Received:** 08/02/2022**Accepted:** 05/07/2023

### Abstract

**Introduction:** Childhood is the ideal time to apply primary measures against arterial hypertension. In this stage it is vital to maintain blood pressure in a normal range to contribute to a healthier young adulthood. Nursing plays an important role in this activity. **Objective:** To synthesize the main evidence-based recommendations on identification, detection and prevention of hypertension in children and adolescents, as indicated by international health agencies at the primary care level. **Methodology:** Systematic scoping reviews of clinical practice guidelines, systematic reviews and meta-analyses of studies not older than 5 years were used, in Spanish and English, with searches in PubMed, TRIP, and Epistemonikos databases. A total of 106 studies were found using the Boolean operators AND, OR, and NOT; of these, only 10 complied with the methodological quality of the Critical Appraisal Skills Programme and Clinical Practice Guideline Evaluation instruments. A qualitative analysis of the main recommendations according to the level of evidence was used. **Results:** The main recommendations were to identify risk factors for hypertension, measure blood pressure at least once a year after the age of 3 years, reduce childhood obesity, have an optimal low-sodium diet, eliminate barriers and improve the intention for physical activity and healthy sleep during childhood. **Conclusions:** The new recommendations for the prevention of childhood hypertension are aimed at making nurses more efficient in identifying risk factors for hypertension, monitoring weight and blood pressure values, and promoting healthy lifestyles such as nutrition, physical activity, sleep, and non-pharmacological strategies.

**Keywords:** Hypertension; Prehypertension; Blood pressure; Child; Disease prevention; Adolescent (DeCs).

### Resumen

**Introducción:** La infancia es un período óptimo para aplicar la prevención primordial de la hipertensión arterial en esta etapa es vital mantener la presión arterial en un rango normal y contribuir a una adultez joven más saludable, enfermería juega un rol importante en esta actividad. **Objetivo:** Sintetizar las principales recomendaciones basadas en evidencia sobre identificación, detección y prevención de hipertensión arterial en niños y adolescentes que señalan los organismos internacionales de salud a nivel de atención primaria. **Metodología:** Revisión sistemática de alcance de guías de práctica clínica, revisiones sistemáticas y metaanálisis no mayor a 5 años, en español e inglés, en bases de datos: PubMed, TRIP, Epistemonikos. Se identifican 106 estudios utilizando operadores booleanos AND, OR, NOT, solo 10 cumplieron con calidad metodológica de los Instrumentos Critical Appraisal Skills Programme y Evaluación Guía de Práctica Clínica. El análisis fue cualitativo de principales recomendaciones según nivel de evidencia. **Resultados:** Las principales recomendaciones fueron identificación de factores de riesgo de hipertensión arterial, medición de presión arterial a partir de los 3 años, mínimo una vez al año, disminuir la obesidad infantil, dieta óptima baja en sodio, eliminar barreras y mejorar la intención para actividad física y sueño saludable durante la niñez. **Conclusiones:** Las nuevas recomendaciones de prevención hipertensión arterial infantil están dirigidas a que el personal de enfermería sea más eficiente en identificar factores de riesgo de hipertensión arterial, monitorear el peso y valores de presión arterial, promover estilos de vida saludables como nutrición, actividad física y sueño y estrategias no farmacológicas.

**Palabras clave:** Hipertensión; Prehipertensión; Presión arterial; Niño; Prevención de enfermedades; Adolescente (DeCs).



### Abstrato

**Introdução:** A infância é o momento ideal para aplicar medidas primárias contra a hipertensão arterial. Nessa fase, é fundamental manter a pressão arterial em uma faixa normal para contribuir para uma vida adulta jovem mais saudável. A enfermagem desempenha um papel importante nessa atividade. **Objetivo:** sintetizar as principais recomendações baseadas em evidências sobre a identificação, detecção e prevenção da hipertensão arterial em crianças e adolescentes, conforme delineado por organizações internacionais de saúde em nível de atenção primária. **Metodologia:** revisão sistemática do escopo das diretrizes de prática clínica, revisões sistemáticas e meta-análises com não mais de 5 anos, em espanhol e inglês, em três bancos de dados: PubMed, TRIP, Epistemonikos. Foi identificado um total de 106 estudos utilizando AND, OR, NOT operadores, dos quais apenas 10 corresponderam à qualidade metodológica dos instrumentos ACORDO e CASPe e instrumento Programa de Habilidades de Avaliação Crítica avaliação das diretrizes de prática clínica. A análise foi qualitativa das principais recomendações de acordo com o nível de evidência. **Resultados:** As principais recomendações foram a identificação de fatores de risco para hipertensão, medição da pressão arterial a partir da idade mínima de 3 anos uma vez por ano, diminuição da obesidade infantil, dieta ótima com baixo teor de sódio, remoção de barreiras e melhoria da intenção de atividade física e sono saudável durante a infância. **Conclusões:** As novas recomendações de prevenção visam tornar os enfermeiros mais eficientes na identificação de fatores de risco para hipertensão arterial, monitorando peso, pressão arterial e valores de peso, promovendo estilos de vida saudáveis (nutrição, atividade física e sono) e estratégias não-farmacológicas.

**Palavras-chave:** Hipertensão; Pré-hipertensão; Pressão arterial; Criança; Prevenção de doenças; Adolescente (DeCs).

### Introduction

Hypertension (HT) in childhood is a multifactorial condition characterized by persistent elevation of systolic and diastolic blood pressure above the 95th percentile on three or more consecutive occasions, and is a risk factor for disability and premature death, which can be present in children and adolescents at a very young age <sup>(1)</sup>. A worldwide prevalence of hypertension in children and adolescents is estimated at 1-5% and high blood pressure (BP) at 16.3% <sup>(2)</sup>. In Mexico, a prevalence of hypertension of 3 % and 10 % of elevated blood pressure has been reported <sup>(3)</sup>. The aforementioned prevalence of hypertension may be directly related to the increase in childhood obesity, especially in the last 20 years <sup>(2)</sup>.



The current interest of researchers and clinicians in the subject of hypertension in children and adolescents is due to evidence showing that elevated blood pressure is much more prevalent than previously assumed <sup>(1,2)</sup>. Furthermore, studies have shown that altered blood pressure at these ages leads to hypertension in adulthood, as well as changes in target organs such as cognitive impairment, left ventricular hypertrophy and subclinical markers of cardiovascular disease, for example, increased carotid intima-media thickness and metabolic syndrome at a very early age <sup>(4)</sup>. Therefore, it is important to emphasize the monitoring of this phenomenon not only at the clinical epidemiological level, considering prevention as a primary tool.

Primary prevention is defined as the prevention of the risk factor that causes a disease. For the condition of hypertension, it would be the prevention of abnormal elevations in blood pressure among normotensive individuals <sup>(5)</sup>. Therefore, primary prevention precedes primary care, in which the standard of care for established hypertension in children, as well as in adults, is treatment to lower blood pressure, regardless of the cause. Successful prevention could not only lead to low rates of hypertension, but also improve the quality of life, reduce healthcare costs, keep people active and healthy, and increase life expectancy.

In order to implement effective and efficient strategies for the primary prevention of childhood hypertension, it is necessary to have the best evidence from research, professional clinical experience, circumstances, and patient values. The best evidence is the empirical knowledge generated from the synthesis of quality studies through clinical practice guidelines (CPGs) and systematic reviews (SR) on how to address a clinical problem and use it for health care decision making in the clinical practice <sup>(6)</sup>.

Health surveys in Canada and the United States have shown that nurses located at the primary care level are the most trusted to carry out hypertension prevention, and the general population knows



that they act in the best interest of the public and trusts them to improve their health <sup>(7)</sup>. Therefore, if these health professionals take into account the best evidence to justify their daily actions, they can position themselves at the center of the implementation of health behavior management strategies to prevent and manage the prevalence of prehypertension and other comorbidities in childhood <sup>(8)</sup>.

In Mexico, there are no specific clinical practice guidelines on hypertension in children and adolescents, and health professionals use international recommendations for the management and control of hypertension in this population. Considering that high blood pressure is a concern in the pediatric population due to the magnitude and consequences it can cause, it is important to know the main current evidence-based recommendations on identification (set of symptoms or characteristics that make it possible to identify children and adolescents with hypertension), detection (methods or techniques for classifying individuals with some level of hypertension) and prevention (measures for reducing risk factors, measures for halting the progression and reducing the consequences of the onset of the disease or its effects) of hypertension in children and adolescents, so that nurses have the best evidence available for making decisions in their daily professional practice.

Based on the above, the aim of these systematic reviews was to synthesize the evidence-based recommendations on the identification, detection and prevention of hypertension in children and adolescents that international health agencies point out at the primary care level to support care and/or interventions in this often underappreciated problem. For which the research question was formulated: What are the evidence-based recommendations made by international agencies for the identification, detection and prevention of hypertension in children and adolescents at the primary health care level?



## **Methodology**

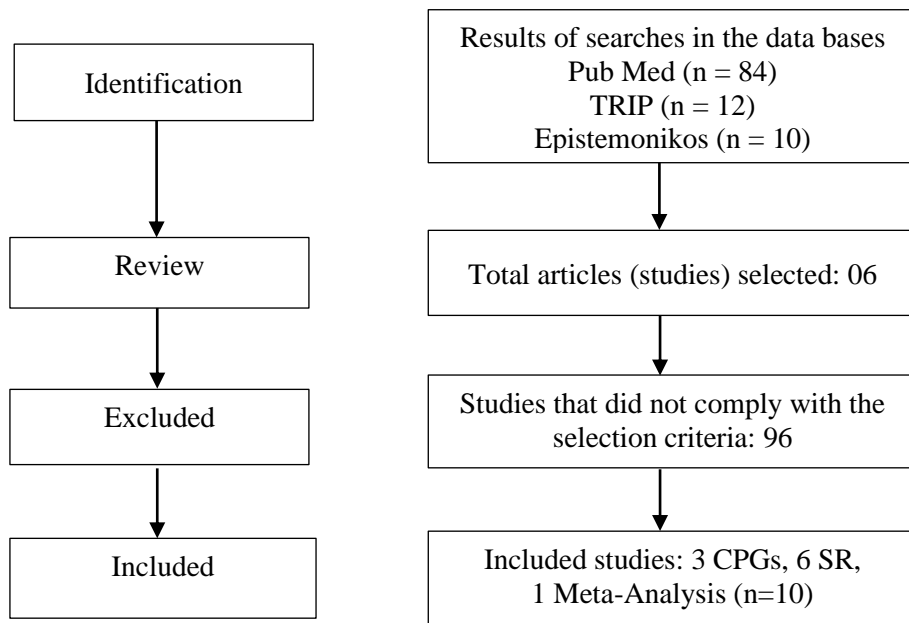
Systematic scoping reviews <sup>(9)</sup> were performed based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist, the method allows identifying literature on a topic, evaluating its extension, scope and nature of its different study designs, which improves the results without compromising its reliability, in addition to identifying research gaps. The question asked considered Population (P), Intervention (I) and Outcomes (O), according to PIO type format. The Population (P) consists of children and adolescents between the ages of 0 and 18 years. For the Intervention (I), recommendations on identification, detection and prevention were taken into account. For the Outcomes (O), recommendations to reduce the risk of hypertension and high blood pressure at the primary care level were considered. Articles classified as meta-analyses, systematic reviews and clinical practice guidelines were selected. The selection period of the published articles was between 2016 and 2021. The languages selected were Spanish and English. Primary studies where pregnant adolescents were mentioned, population older than the established age, children with any underlying clinical condition that implied being treated in a specialized clinic were excluded.

Regarding the search strategy, first, a search for the keywords used in the clinical question was performed using the Health Sciences Descriptors (DeCS) and Medical Subject Headings (MeSH) search engines for articles in Spanish and English using the terms: Hypertension, prehypertension, blood pressure, persistent elevated blood pressure, identification, prevention, control, therapy, diet, children, adolescents, systematic review, clinical practice guidelines, with the AND, OR, and NOT



Boolean operators, with different combinations. Searches were performed in the TRIP MEDLINE (through PubMed) and Epistemonikos databases. For the selection of the articles, two independent reviewers analyzed the articles obtained, considering the inclusion and exclusion criteria. A total of 106 articles (studies) were evaluated, of which 96 did not meet the established criteria, ending with 10 articles, which were validated by a third researcher to avoid selection bias. Once the articles had been selected, the methodological quality was assessed by means of the Critical Appraisal Skills Programme (CASPe)<sup>(10)</sup> for systematic reviews or meta-analyses<sup>(11)</sup> and the Instrument for the Evaluation of Clinical Practice Guidelines (AGREE II)<sup>(12)</sup>, all of which were rated with a high score (Figure 1). Subsequently, the qualitative and quantitative analysis was performed, reviewing in each article the aspects included in the recommendations (identification, detection and prevention) with their level of evidence.

Figure 1: Diagram of search and selection of literature published between 2016 and 2021.



Source: Own development.



## Results

All the articles (studies) were in English. We found that 30% were Clinical Practice Guidelines (CPGs) related to blood pressure in children and adolescents from Europe <sup>(1)</sup>, Canada <sup>(8)</sup>, and the United States <sup>(13)</sup>, 50% were Systematic Reviews (SR) <sup>(14-18)</sup>, 10% were meta-analyses <sup>(2)</sup>, and the rest were reviews of expert recommendations <sup>(19)</sup>. The sample size of the studies ranged from 55,000 to 137,000 children and adolescents. The types of recommendations (identification, detection, and prevention) were consistent in most of the papers. Recommendations related to identification <sup>(1, 2, 8, 13, 15, 17, 18, 19)</sup> focused on the assessment of risk factors especially those focused on family history of hypertension, diabetes and obesity, sedentary lifestyle, race, and sex. Regarding screening, only 20% of the studies did not cite recommendations in this area <sup>(14, 15)</sup>, the rest of the articles (80%) focused on recommending blood pressure measurement in children over 3 years of age at least once a year. In addition, they detail the importance of applying standardized procedures and validated blood pressure devices for blood pressure measurement and performing ambulatory blood pressure monitoring (ABPM). Regarding prevention, the recommendations focused on teaching strategies by health personnel involving parents to promote healthy lifestyles, nutrition, physical activity and healthy weight <sup>(1, 2, 8, 13, 18, 19)</sup>, promoting the Dietary Approaches to Stop Hypertension (DASH) diet, which consists of a diet low in sodium and high in fruits, vegetables, whole grains, low-fat dairy and lean protein <sup>(14, 16, 19)</sup>, and promoting healthy sleep habits <sup>(1, 13)</sup>. All the documents analyzed were of high quality (Table 1).





Table 1. Analysis of the selected articles, 2016-2021, (n=10).

Author	Identification	Screening	Prevention	Type and Quality Level
Lurbe, et al. (2016) <sup>(1)</sup>	<p>Assessment of risk factors:</p> <ul style="list-style-type: none"> <li>-Masked hypertension<sup>(a)</sup>.</li> <li>-Diabetes mellitus type 2 (DM2)<sup>(i)</sup>.</li> <li>-Obesity or repaired coarctation of the aorta (CoA)<sup>(k)</sup>.</li> </ul>	<p>Blood pressure assessment<sup>(b)</sup>:</p> <ul style="list-style-type: none"> <li>-Measure three times with 3 minutes between measurements and use the average of the last two.</li> <li>-Use auscultatory method and phase I and V (disappearance).</li> <li>-Validate the oscillometric model.</li> <li>-Measure blood pressure<sup>(b)</sup> when the individual has risk factors.</li> <li>-Use ambulatory blood pressure monitoring (ABPM)<sup>(c)</sup> for the diagnosis and treatment of hypertension<sup>(a)</sup>:</li> </ul>	<ul style="list-style-type: none"> <li>-Engage parents in the process of changing lifestyles. -Set realistic goals.</li> <li>- Maintain a healthy weight.</li> <li>-Implement behavioral changes when high blood pressure<sup>(b)</sup> values are present.</li> <li>- Engage in moderate-to-vigorous-intensity physical activity for 60 minutes daily.0</li> <li>- Have age-appropriate sleep habits.</li> <li>-Avoid more than 2 hours of sedentary activities per day.</li> <li>-Avoid excessive consumption of sugar, soft drinks, saturated fats and salt.</li> <li>-Encourage the consumption of fruits, vegetables and cereal-based food products.</li> </ul>	SR <sup>(h)</sup> , High Quality
Song, et al. (2019) <sup>(2)</sup>	<p>Assessment of risk factors</p> <ul style="list-style-type: none"> <li>-History of hypertension (a):</li> <li>-High body mass index (BMI) (f).</li> <li>-Low physical activity.</li> <li>-Ethnicity and sex (male).</li> </ul>	<p>Blood pressure assessment (b):</p> <ul style="list-style-type: none"> <li>-Measure annually from age 3 years onward on three separate occasions.</li> <li>-Compare the measurement according to age, sex and height.</li> <li>-Use oscillometric devices for detection and auscultatory devices for diagnosis.</li> <li>- Follow up the patient if blood pressure (b) is elevated or has risk factors.</li> </ul>	<ul style="list-style-type: none"> <li>-Promote adequate diets and increased physical activity.</li> <li>- Asymptomatic children should attend preventive check-ups from the age of 3 years.</li> </ul>	SR/Meta-analysis <sup>(j)(l)</sup> High Quality
Flynn, et al. (2017) <sup>(13)</sup>	<p>Assessment of risk factors:</p> <ul style="list-style-type: none"> <li>-Family history of hypertension<sup>(a)</sup> and overweight or obesity.</li> <li>-Overweight and obesity</li> <li>-Diet high in sodium</li> <li>-Sedentary time.</li> </ul>	<p>Blood pressure assessment<sup>(b)</sup>:</p> <ul style="list-style-type: none"> <li>-Measure annually in children and adolescents aged 3 years or older.</li> <li>-Use oscillometric devices.</li> <li>-Use ABPM<sup>(c)</sup> to confirm hypertension<sup>(a)</sup>.</li> <li>-Make diagnosis with three confirmed blood pressure</li> </ul>	<p>General population:</p> <ul style="list-style-type: none"> <li>-Promote proper nutrition and weight.</li> </ul> <p>Follow-up of individuals with risk factors.</p> <p>High blood pressure<sup>(b)</sup> interventions:</p>	CPG <sup>(g)</sup> , High Quality



	<ul style="list-style-type: none"> <li>-Taking medications that increase blood pressure <sup>(b)</sup>.</li> <li>-Renal disease, obstruction or CoA, or DM2.</li> </ul>	<p>measurements <sup>(b)</sup> using auscultatory method devices.</p> <p>Complementary testing:</p> <ul style="list-style-type: none"> <li>-Urine analysis, blood chemistry panel: electrolytes, blood urea nitrogen and creatinine, lipid profile.</li> <li>-Hemoglobin A1c</li> </ul>	<ul style="list-style-type: none"> <li>-Dietary Approaches to Stop Hypertension (DASH) type diet <sup>(d)</sup>.</li> <li>-Avoid high sodium foods</li> <li>-60 minutes per day of moderate to vigorous physical activity</li> <li>- Adequate sleep habits</li> <li>- Avoid smoking.</li> </ul>	
Rabi, et al. (2020) <sup>(18)</sup>	<p>Assessment of risk factors:</p> <ul style="list-style-type: none"> <li>-Family history of DM2 and chronic kidney disease.</li> <li>-Low consumption of fresh fruit and vegetables.</li> <li>-Sedentary lifestyle.</li> <li>-Overweight and obesity.</li> </ul>	<p>Blood pressure assessment <sup>(b)</sup>:</p> <ul style="list-style-type: none"> <li>-Measure annually from the age of 3 years.</li> <li>-Measure with aneroid sphygmomanometer or oscillometric device.</li> <li>-Use ABPM <sup>(c)</sup> when there are high blood pressure values <sup>(b)</sup>.</li> <li>-Assess and diagnose with percentile based on age, sex, height, and level of blood pressure elevation <sup>(b)</sup>, perform three measurements.</li> </ul> <p>Complementary tests:</p> <ul style="list-style-type: none"> <li>-Blood chemistry (sodium, potassium, chloride, total CO2 <sup>(b)</sup>) and creatinine, urinalysis, non-HDL cholesterol <sup>(e)</sup>.</li> </ul>	<ul style="list-style-type: none"> <li>-Have a comprehensive approach to dietary education and an increase in physical activity.</li> <li>-Achieve a healthy body weight (BMI <sup>(f)</sup> &lt;85th percentile) for the non-hypertensive individuals to prevent hypertension.</li> </ul>	SR <sup>(h)</sup> , High Quality
Dionne, et al. (2017) <sup>(8)</sup>	<p>Assessment of risk factors:</p> <ul style="list-style-type: none"> <li>-Obesity</li> <li>-Consumption of medications that increase blood pressure <sup>(b)</sup>.</li> <li>-Renal disease, obstruction or CoA, or DM2.</li> </ul>	<p>Blood pressure assessment <sup>(b)</sup>:</p> <ul style="list-style-type: none"> <li>-Measure annually from the age of 3 years.</li> <li>-Measure pressure with an aneroid sphygmomanometer or oscillometric device.</li> <li>-Use percentile tables based on age, sex, and height on at least 3 different occasions.</li> <li>-Use ABPM <sup>(c)</sup> to classify blood pressure <sup>(b)</sup>.</li> <li>-Use only ABPM <sup>(c)</sup> devices that have been validated.</li> </ul> <p>Complementary testing:</p>	<ul style="list-style-type: none"> <li>-Achieve a healthy body weight (BMI <sup>(f)</sup> &lt;85th percentile).</li> <li>-Have a comprehensive approach to dietary education and an increase in physical activity.</li> </ul>	CPG <sup>(g)</sup> , High Quality



<p>Gartlehner , et al. (2020) (16)</p>	<p>-Blood chemistry (sodium, potassium, chloride, total CO<sub>2</sub><sup>(1)</sup> and creatinine). -Urinalysis. Blood pressure assessment<sup>(b)</sup>: -Measure blood pressure three times<sup>(b)</sup> with 3 minutes between measurements and use the average of the last two measurements. -Use auscultatory method and phase I and V (disappearance). -Measure blood pressure<sup>(b)</sup> when risk factors are present. -Use ABPM<sup>(c)</sup> for the diagnosis and treatment of hypertension<sup>(a)</sup>. -Six measurements on the right arm (three with Hawksley random zero sphygmomanometers and three with standard mercury sphygmomanometers without removing the cuff) in a sitting position with 5 minutes rest for 4 visits one week apart.</p>	<p>-Follow a DASH-type diet (d): -Include 8 servings per day of vegetables and fruits, 3 servings per day of low-fat dairy. -Low sodium diet was not effective. -Educational programs aimed at diet and exercise modifications for children and their parents. -Combined resistance and aerobic exercises for 12 weeks.</p>	<p>SR<sup>(h)</sup>, High Quality</p>	
<p>Fobian, et al. (2018) (15)</p>	<p>Assessment of risk factors: -Sleep deprivation. -Quality of sleep, Short/long periods of sleep.</p>		<p>SR<sup>(h)</sup>, High Quality</p>	
<p>US Preventive Services Task Force. (2020) (19)</p>	<p>Assessment of risk factors: -Family history of hypertension<sup>(a)</sup>. - High BMI<sup>(f)</sup>. -Low birth weight. -Male sex. Race, African-American, Hispanic or Latino ethnicity.</p>	<p>Blood pressure assessment<sup>(b)</sup>: -Routine measurement starting at 3 years of age. -Measure by auscultation of the right upper arm with an appropriately sized cuff at 3 different visits. -Diagnosis should be confirmed by ABPM<sup>(c)</sup>.</p>	<p>-Increase in physical activity. -Use of DASH diet<sup>(d)</sup>.</p>	<p>SR<sup>(h)</sup>, High Quality</p>



Bricarello, et al. (2018) (14)			-Maintain a DASH <sup>(d)</sup> diet: Diet of vegetables, fruits, nuts, seeds and legumes, whole grains, lean meats, low calcium intake, and sugar-sweetened beverages. -Practice physical activity.	SR <sup>(h)</sup> , High Quality
Hamoen, et al. (2019). (17)	Assessment of risk factors: -Family history of hypertension (a). -Overweight, lipid disorders.	Blood pressure assessment <sup>(b)</sup> : -The diagnosis should be confirmed on at least 3 occasions to avoid false positives	-Improve nutrition and increase physical activity.	SR <sup>(h)</sup> , High Quality

Note: <sup>a</sup> Hypertension, <sup>b</sup> blood pressure (BP), <sup>c</sup> ambulatory blood pressure monitoring (ABPM), <sup>d</sup> dietary approaches to stop hypertension (DASH), <sup>e</sup> high-density lipoprotein (HDL), <sup>f</sup> body mass index (BMI), <sup>g</sup> clinical practice guideline (CPG), <sup>h</sup> systematic review (SR), <sup>i</sup> systematic review and meta-analysis (SR/MA), <sup>j</sup> diabetes mellitus 2 (DM2), <sup>k</sup> coarctation of the aorta (CoA), <sup>l</sup> carbon dioxide (CO2).

Source: Own development.

In order to classify the recommendations identified according to the quality of the evidence, the criteria indicated by the American Academy of Pediatrics (AAP) <sup>(20)</sup> were considered; these criteria are shown in Figure 2.

Figure 2: Matrix of recommendation ratings according to the American Academy of Pediatrics (AAP), 2016-2021 <sup>(20)</sup>

Quality of the evidence	Predominant benefit or damage	Balanced benefit or damage
Level A: Intervention: Well-designed and conducted trials, meta-analyses on applicable populations. Diagnostic: Independent gold standard trials on applicable populations.	Strong recommendation	Recommended with reservations (Based on balance)
Level B: Trials of diagnostic studies with minor limitations, consistent results from multiple observational studies.	Moderate recommendation	
Level C: Single or few observational studies, or multiple studies with inconsistent recommendations or major limitations.		No recommendations can be made
Level D: Expert opinion, case reports, reasoning from first principles.	Weak recommendation (Based on evidence)	

Source: prepared by the authors



Table 2 shows that the clinical recommendations of both clinical practice guidelines and systematic reviews regarding the identification of children and adolescents considered the assessment of cardiovascular risk factors <sup>(1, 2, 8, 13, 15, 17, 18, and 19)</sup>. It should be noted that the most important risk factors according to the level of evidence were overweight and obesity (A, strong) and bad sleep habits (B, moderate). For screening recommendations, the studies (1, 2, 8, 13, 16, 17, 18 and 19) focused on blood pressure measurement beginning at the age of 3 years old, using the oscillometric devices appropriate for the age, sex and build of children and adolescents according to AAP recommendations <sup>(20)</sup>, as well as the assessment of ambulatory blood pressure monitoring (ABPM) with moderate levels of evidence (C, moderate) <sup>(21)</sup>.

When diagnosing hypertension according to the blood pressure percentile based on standards for age, sex, height, level of blood pressure elevation, and number of visits/measurements <sup>(1, 2, 8, 13, 15, 17, 18,19)</sup> the levels of evidence were B and D, that is, moderate and weak levels of evidence.

Recommendations for prevention are directed towards lifestyle modification, especially to maintain a healthy weight and diet, physical activity and good sleep habits <sup>(1, 2, 8, 13, 18 and 19)</sup>. For people at high risk of hypertension, recommendations are made regarding the consumption of DASH-type diets, moderate and intense physical activity, good sleep habits, and the avoidance of tobacco use <sup>(14, 16 and 19)</sup>. Prevention actions for blood pressure show that most have the highest level of evidence (A, strong).



Table 2: Evidence-based recommendations for hypertension in children and adolescents, 2016-2021, (n=10).

Recommendations for the identification of hypertension	Level of evidence
<i>Assessment of cardiovascular risk factors in children and adolescents under care:</i>	
- Family history of hypertension and overweight or obesity.	C, moderate
- Renal disease, history of obstruction or coarctation of the aorta or diabetes.	D, weak
- Diabetes mellitus.	D, weak
- Masked hypertension and repaired coarctation of the aorta (CoA)	A, strong
- African-American, Hispanic or Latino race or ethnicity.	D, weak
- Low birth weight and male sex.	D, weak
- High sodium diet and no DASH-type diets	C, moderate
- Low consumption of fresh fruits and vegetables.	D, weak
- Sleep deprivation and insufficient sleep.	B, moderate
- Sedentary time.	C, moderate
- Taking medications that increase blood pressure.	D, weak
- High body mass index.	A, strong
<i>Blood pressure screening recommendations</i>	
- Blood pressure should be measured annually starting at 3 years of age.	C, moderate
- Use oscillometric devices to measure blood pressure.	C, weak
- Use only validated ABPM devices for children.	D, weak
- Use of electronic medical records for blood pressure decision support.	B, moderate
- Monitor blood pressure from the age of 3 years at every medical visit when there are one or more risk factors.	C, moderate
- Diagnose hypertension if blood pressure is equal to or greater than the 95th percentile on 3 different visits to the clinic.	C, moderate
<i>Preventive measures with regard to blood pressure</i>	
General population:	
- Follow-up visits to identify risk factors, measure blood pressure and determine body mass index.	D, weak
- Achieve a healthy body weight (body mass index <85% percentile).	C, weak
- Dietary and sleep habits counseling, and increase of physical activity.	C, moderate
If blood pressure is elevated:	
- Blood pressure measurement every 6 months by auscultation.	D, weak
<i>Healthy lifestyle interventions:</i>	
- Routine nutritional counseling and consumption of a diet high in olive oil polyphenols.	A, strong
- Eat modified DASH-type diet for adolescents: 8 servings of fruits and vegetables per day, 3 servings of nuts, seeds, legumes and low-fat dairy products per day.	A, strong
- Avoid excessive consumption of sugar, soft drinks, saturated fats and salt.	A, strong
- Avoiding foods high in sodium can be helpful.	D, weak
- Weight control (BMI) should be considered appropriate.	D, weak
- Children and adolescents from 5 to 17 years of age should engage in moderate to vigorous physical activity for at least 60 minutes per day.	A, strong
- The recommended daily physical activity should be aerobic.	A, strong
- Vigorous-intensity activities, including those that strengthen muscles and bones, should be included at least three times a week.	A, strong
- Avoid more than 2 hours of sedentary activities per day.	A, strong



---

- Achieving normal sleep habits and refraining from the use of tobacco products.	D, weak
- Implement physical activity and diet considering individual and family characteristics.	A, strong
- Integrate parents and family as partners in the behavior change process.	A, strong
- Set realistic goals.	A, strong
- Develop a reward system to promote health.	A, strong
<i>Blood pressure measurement recommendations:</i>	
- Verify that no hypertension-stimulating drugs, salty foods or even tobacco have been consumed during the 24 hours prior to the measurement.	D, weak
- Prior to the measurement, the individual should be seated with the back supported in a quiet room for 5 minutes and without talking, with the feet resting on the floor and not suspended.	D, weak
- For accurate measurements, a variety of cuff sizes should be available and the one that is appropriate for the arm size should be used.	D, weak
- It can be measured with an aneroid sphygmomanometer or an oscillometric device validated for children (see <a href="http://www.dableducational.org">www.dableducational.org</a> ). Wrist monitors have not been validated in children in any major study and should therefore be avoided.	C, moderate
- Measure the pressure on the right arm, under the clothing and supported with the blood pressure cuff at the level of the heart.	D, weak
- The stethoscope should be placed below the lower edge of the cuff and above the antecubital fossa.	D, weak
- The pressure should be increased rapidly to 30 mm Hg above the level at which the radial pulse is extinguished.	D, weak
- The control valve should be opened so that the deflation rate of the cuff is approximately 2 mm Hg per beat.	D, weak
- Best practice is to measure blood pressure by auscultation of the right upper arm with an appropriately sized cuff at 3 different visits.	D, weak
- The systolic level, the first appearance of a clear tapping sound (phase I Korotkoff) and the diastolic level (the point at which the sounds disappear, phase V Korotkoff) should be recorded. In some children Korotkoff sounds can be heard at 0 mm Hg. If the Korotkoff sounds persist as the level approaches 0 mm Hg, then the point of sound damping (phase IV Korotkoff) is used to indicate diastolic pressure.	B, moderate
- For the diagnosis of hypertension in case of blood pressure elevation during a first visit in asymptomatic patients, measurements should be repeated during another 2 visits 1 month apart (Grade C), or with less time apart in high-risk cases.	B, moderate

---

Source: Own development.

## Discussion

This study is a systematic scoping review regarding the main current recommendations of the best available evidence that can guide health professionals in the identification, screening, and prevention of hypertension in children and adolescents <sup>(1, 2, 8, 13-19)</sup>; this review was classified with



articles with high level of quality on the subject. However, it should be considered that up to now, the level of recommendation of most of these studies has come from observational studies (levels of evidence C and D), so we continue working on studies with a higher level of evidence that will help to confirm them in order to improve the future health of children and adolescents <sup>(1, 18, 19)</sup>. The most widely published guidelines for the prevention of hypertension are those of the AAP <sup>(20)</sup> and the guidelines used by researchers and clinicians in Mexico.

The AAP <sup>(20)</sup> defines normal blood pressure for children aged 1 to 13 years as systolic or diastolic pressure below the 90th percentile as a function of age, sex, and height. Hypertension is divided into three classifications: elevated blood pressure with values at or above the 90th percentile but below the 95th percentile (blood pressure of 120/80 mm Hg); stage 1 hypertension with values from the 95th to the 99th percentile, and stage 2 hypertension with values above the 99th percentile. For this, health professionals at the primary level use simplified blood pressure percentile tables as a tool. For adolescents 13 years of age and older, the optimal blood pressure and hypertension categories are now the same as those used for adults, according to the American Heart Association/American College of Cardiology. Normal blood pressure is less than 120/80 mm Hg; elevated blood pressure is 120 to 129/less than 80 mm Hg; stage 1 hypertension is 130 to 139/80 to 89 mm Hg; and stage 2 hypertension is greater than or equal to 140/90 mm Hg <sup>(13)</sup>.

Blood pressure readings taken at home or at school should not be used to diagnose hypertension, but can be used as an aid in monitoring diagnosed hypertension. If the patient has auscultation-confirmed blood pressure readings above the 95th percentile based on age and sex at three different clinic visits, then hypertension will be diagnosed. The use of 24-hour ambulatory blood pressure monitoring to confirm a diagnosis of hypertension is also emphasized. The diagnosis should be made by a specialized physician <sup>(1, 13, 22)</sup>.





For the detection of children with risk factors and/or elevated blood pressure in the primary care setting, timely referral and appropriate treatment are key to the successful prevention and control of patients. The main recommendations for the identification of hypertension are aimed at assessing cardiovascular risk factors. The main cardiovascular risk factors to be evaluated in any pediatric screening are family history of hypertension, sex (male), race (Latinos), sedentary lifestyle, and obesity. Overweight or obesity is the main risk factor; it is believed that at least three-quarters of pediatric hypertension is caused by this factor <sup>(23)</sup>. Results of studies in children and adolescents indicate that hypertension rates increase in a stepwise manner as the degree of adiposity increases <sup>(24)</sup>. Those individuals with waist circumferences greater than the 85th percentile have higher 24-hour sustained daytime and nighttime systolic and diastolic blood pressure <sup>(25)</sup>. It is recommended that healthcare professionals perform weight measurements since the early stages of a child's life <sup>(1, 2, 16, 25)</sup>.

For the detection of high blood pressure in the pediatric age group, it is recommended that blood pressure measurements be taken at least once a year from the age of 3 years onward. Since hypertension is usually asymptomatic, perform the measurements at each annual check-up visit for the healthy child or adolescent. If the child has risk factors such as obesity, taking medications that increase blood pressure, renal disease, diabetes, or a history of obstruction or coarctation of the aorta, blood pressure should be measured at each health care visit. The diagnosis of hypertension in infants (children under 1 year of age) is complex; clinical practice guidelines do not recommend routine blood pressure assessments for term infants <sup>(1, 2, 13)</sup>.

In relation to blood pressure measurement, it is important that healthcare professionals use the correct methods and techniques and the right instruments. There are approved devices for children, as described by [stridebp.org](http://stridebp.org) <sup>(26)</sup>. An anamnesis and physical examination should be performed on



all pediatric patients to identify and detect the causes of hypertension, report cardiovascular risk factors, and identify organ damage or other cerebrovascular diseases <sup>(13)</sup>. For this purpose, existing electronic tools for clinical decision-making used in developed countries can be used to follow the recommended guidelines based on the patient's blood pressure readings <sup>(27)</sup>. It would be important to evaluate the adaptation of such tools to the Mexican context for their implementation in the medical field.

Prevention of hypertension is based on promoting healthy body weight and lifestyles. Preventing weight gain can help lower high blood pressure. The healthy diet should be strongly encouraged and appealing to the child and adolescent, and should include the reduction of sodium intake <sup>(13)</sup>. The DASH-type diet lowers and maintains blood pressure; this diet has been the main dietary intervention for patients with hypertension. This diet includes chicken, fish, nuts, cereals, and small amounts of red meat, sweets, and sugar-sweetened beverages <sup>(14)</sup>. A study regarding the DASH-type diet in adolescent girls found that those girls who ate at least two servings of dairy products plus three servings of fruits and vegetables per day reduced elevated blood pressure by just over one-third <sup>(1)</sup>. The effectiveness of this diet is due to the fact that fruits, vegetables and dairy products provide sources of calcium, magnesium and potassium, which lower blood pressure by regulating vasoconstriction and promoting vasodilation <sup>(14)</sup>.

Together with a healthy diet, vigorous physical activity is an essential component in reducing the risk of hypertension, hypertension itself, and the cardiometabolic risk <sup>(1, 13, 18,19)</sup>. The U.S. Department of Health and Human Services issued physical activity guidelines for individuals in the United States, recommending 60 minutes or more of moderate to vigorous physical activity every day for children aged 6 to 17 years <sup>(13, 19)</sup>. However, for children with hypertension and obesity, even 40 minutes of moderate aerobic activity 3 days a week reduced systolic blood



pressure by an average of 6.6 mm Hg and helped prevent vascular system dysfunction <sup>(8, 14,19)</sup>. Other non-pharmacological interventions included motivational interviewing, goal setting, self-monitoring, and professional support to promote adherence to a healthy diet and exercise <sup>(1, 8, 13, 16,18)</sup>.

A limitation of this literature review was that at this time there are no clinical practice guidelines for hypertension in children and adolescents in Mexico, and there is very little information on epidemiological and research data on the aforementioned population, which somewhat restricted the discussion of how international recommendations are being applied in the Mexican population. So this is an opportunity for the nursing profession to participate in the generation of these clinical practice guidelines and research projects in order to contribute to the prevention and control of hypertension in children and adolescents in primary care.

Among the general recommendations for clinical practice, the objectives of blood pressure management in children and adolescents focus on reducing target organ damage in adolescence and cardiovascular risk in adulthood. In children under 13 years of age diagnosed with hypertension, therapy should aim to reduce blood pressure below the 90th percentile. For adolescents aged 13 to 18 years, therapy should aim for a blood pressure lower than 130/80 mm Hg. These goals can be achieved through prevention activities such as controlling body weight, engaging in consistent physical activity, maintaining a healthy diet, reducing alcohol intake, avoiding or quitting smoking, reducing salt intake, and controlling cholesterol levels <sup>(28)</sup>. The child, adolescent and family counseling should emphasize realistic lifestyle changes and age-appropriate dietary choices to avoid the need for pharmacological intervention. The European Society of Hypertension describes cognitive interventions and resources that have worked in making lifestyle changes in children and adolescents<sup>(29)</sup> and on training for health care personnel regarding



prevention and diagnostic activities <sup>(13, 26, 27, 30,31)</sup>, which is important to know and disseminate. Therefore, the nursing professional can make an important contribution in their clinical practice to improve the quality of life of the children and adolescents in their care.

## **Conclusions**

This review summarizes the best available evidence to guide health professionals in the identification, screening, and prevention of high blood pressure in children and adolescents in primary care. However, the evidence on effective methods for implementing the recommended guidelines for healthy lifestyles in childhood is limited. Strategies to prevent the development of hypertension risk factors in childhood include education, counseling, and supportive reinforcement for parents, in addition to healthy child care. In addition, there should be a healthy environment with access to healthy foods and affordable resources for children and adolescents to safely engage in physical activity. The development of a Nursing Intervention Guide for the identification, diagnosis, and prevention of hypertension in the pediatric population is recommended. It is necessary to implement the current recommended guidelines for the prevention of hypertension to benefit the health status of children and adolescents.

## **Conflict of interest**

The authors stated that there is no conflict of interest.

## **Funding**

The authors stated that no funding was received.



## Bibliographic References

1. Lurbe E, Agabiti-Rosei E, Cruickshank J K, Dominiczak A, Erdine S, Hirth A. European society of hypertension guidelines for the management of high blood pressure in children and adolescents. *Journal of hypertension* [Internet]. 2016 [Cited November 02, 2021];34(10):1887-1920 Available at: <https://doi:10.1097/HJH.0000000000001039>
2. Song P, Zhang Y, Yu J. Global prevalence of hypertension in children: A systematic review and meta-analysis. *JAMA pediatrics* [Internet]. 2019 [Cited November 02, 2021];173(12):1154-1163. Available at: <https://doi:10.1001/jamapediatrics.2019.3310>
3. Jansen EC, Dunietz GL, Matos-Moreno A, Solano M, Lazcano-Ponce E. Bedtimes and blood pressure: A prospective cohort study of Mexican adolescents. *American Journal of Hypertension* [Internet]. 2020 [Cited June 02, 2022];33(3):269-277. Available at <https://doi.org/10.1093/ajh/hpz191>
4. Daimee U, Lande M, Tang W, Tu X, Veazie P, Bisognano J, et al. Blood pressure and left ventricular mass index in healthy adolescents. *Blood pressure monitoring* [Internet]. 2017 [Cited November 02, 2021];22(1):48–50. Available at: <https://pubmed.ncbi.nlm.nih.gov/27824679/>
5. Falkner B, Lurbe E. Primordial prevention of high blood pressure in childhood: An opportunity not to be missed. *Hypertension* [Internet]. 2020 [Cited November 02, 2021];75(5):1142-1150. Available at: <https://pubmed.ncbi.nlm.nih.gov/32223379/>
6. Straus S, Glasziou P, Richardson W, Haynes R. Evidence-based medicine e-book: How to practice and teach EBM Cap. 1 y 2. 5th ed. Spain: Elsevier Health Sciences; 2018.
7. Villeneuve M, Betker C. Nurses, nursing associations, and health systems evolution in Canada. *OJIN: The Online Journal of Issues in Nursing*. [Internet]. 2020 [Cited November 02, 2021];25(1):1-13. Available at: <https://doi.org/10.3912/OJIN.Vol25No01Man06>
8. Dionne J, Harris K, Benoit G, Feber J, Poirier L, Cloutier L, et al. Hypertension Canada guideline committee hypertension Canada's 2017 guidelines for the diagnosis, assessment, prevention, and treatment of pediatric hypertension. *The Canadian Journal of Cardiology* [Internet]. 2017 [Cited November 02, 2021];33(5):577–585. Available at: <https://pubmed.ncbi.nlm.nih.gov/28449829/>
9. Garritty CH, Gartlehner G, Nussbaumer-Streit B, King V, Hamel C, Kamel C, et al. Cochrane rapid reviews methods group offers evidence-informed guidance to conduct rapid reviews. *Journal of Clinical Epidemiology* [Internet]. 2021 [Cited November 02, 2021];130:13-22. Available at: <https://pubmed.ncbi.nlm.nih.gov/33068715/>
10. Critical Appraisal Skills Programme Español CASPe. Instrumentos para la lectura crítica [Internet]. Spain; 2022 [Cited November 02, 2021];130:13-22. Available at: <https://redcaspe.org/>
11. Servicio de Evaluación de Tecnologías Sanitarias. Fichas de lectura crítica Web 3.0 [Internet]. Departamento de Salud, Gobierno Vasco; 2022 [Cited November 02, 2021]. Available at: <http://www.lecturacritica.com/es/>
12. Appraisal of Guidelines Research & Evaluations. AGREE II Instrument [Internet]. 2017 [Cited November 02, 2021];43-52. Available at: <https://www.agreetrust.org/wp-content/uploads/2017/12/AGREE-II-Users-Manual-and-23-item-Instrument-2009-Update-2017.pdf>
13. Flynn J, Kaelber D, Baker-Smith C, Blowey D, Carroll A, Daniels S, et al. Clinical practice guideline for the screening and management of high blood pressure in children and adolescents.



- Pediatrics [Internet]. 2017 [Cited November 02, 2021];140(3):e20171904. Available at: <https://pubmed.ncbi.nlm.nih.gov/28827377/>
14. Bricarello P, Poltronieri F, Fernandes R, Retondario A, Santos de Moraes T, Guedes de Vasconcelos F, et al. Effects of the dietary approach to stop hypertension (DASH) diet on blood pressure, overweight and obesity in adolescents: A systematic review. *Clinical nutrition ESPEN* [Internet]. 2018 [Cited November 02, 2021];28:1-11. Available at: <https://pubmed.ncbi.nlm.nih.gov/30390863/>
  15. Fobian A, Elliot L, Louie T. Systematic review of sleep, hypertension, and cardiovascular risk in children and adolescents. *Current hypertension reports* [Internet]. 2018 [Cited November 02, 2021];20(5):42. Available at: <https://doi.org/10.1007/s11906-018-0841-7>
  16. Gartlehner G, Vander E, Orr C, Kennedy S, Clark R, Viswanathan M. Screening for hypertension in children and adolescents: updated evidence reports and systematic review for the US preventive services task force. *JAMA* [Internet]. 2020 [Cited November 02, 2021];324(18):1884-1895. Available at: <https://pubmed.ncbi.nlm.nih.gov/33284560/>
  17. Hamoen M, De Kroon M, Welten M, Raat H, Twisk J, Heymans M. et al. Childhood prediction models for hypertension later in life: a systematic review. *Journal of hypertension* [Internet]. 2019 [Cited November 02, 2021];3(5):865-877. Available at: <https://pubmed.ncbi.nlm.nih.gov/30362985/>
  18. Rabi D, McBrien K, Sapir-Pichhadze R, Nakhla M, Ahmed S, Dumanski S, et al. Hypertension Canada's 2020 comprehensive guidelines for the prevention, diagnosis, risk assessment, and treatment of hypertension in adults and Children. *The Canadian journal of cardiology* [Internet]. 2020 [Cited November 02, 2021];36(5):596-624. Available at: <https://pubmed.ncbi.nlm.nih.gov/32389335/>
  19. US Preventive Services Task Force. Screening for high blood pressure in children and adolescents: US preventive services task force recommendation statement. *JAMA* [Internet]. 2020 [Cited November 02, 2021];324(18):1878-1883. Available at: <https://jamanetwork.com/journals/jama/fullarticle/2772767>
  20. American Academy of Pediatrics. Classification of recommendations for clinical practice guidelines [Internet]. EE UU: Steering committee on quality improvement and management; 2004 [Cited November 02, 2021];114(3):874-877. Available at: <https://publications.aap.org/pediatrics/article-abstract/114/3/874/67150/Classifying-Recommendations-for-Clinical-Practice?redirectedFrom=fulltext>
  21. Macumber I. Ambulatory blood pressure monitoring in children and adolescents: a review of recent literatura and new guidelines. *Curr Hypertens Rep* [Internet]. 2017 [citado 02 nov 2021];19(96):1878-1883. Available at: <https://pubmed.ncbi.nlm.nih.gov/29071489/>
  22. Dionne M. Updated guideline may improve the recognition and diagnosis of hypertension in children and adolescents; Review of the 2017 AAP Blood Pressure clinical practice guideline. *Curr hypertens rep* [Internet]. 2017 [Cited November 02, 2021];19(84):2-14. Available at: <https://pubmed.ncbi.nlm.nih.gov/29035421/>
  23. Landsberg L, Aronne L, Beilin J, Burke V, Lloyd-Jones D, Sowers J. Obesity-related hypertension: pathogenesis, cardiovascular risk, and treatment: a position paper of the obesity society and the American society of hypertension. *J Clin Hypertens (Greenwich)* [Internet]. 2013 [Cited November 02, 2021];15(1):14-33. Available at: <https://pubmed.ncbi.nlm.nih.gov/23282121/>



24. Cheung L, Bell C, Samuel J, Poffenbarger T, Redwine K, Samuels J, et al. Race and obesity in adolescent. *Hypertension Pediatrics* [Internet]. 2017 [Cited November 02, 2021];139(5):e20161433. Available at: <https://pubmed.ncbi.nlm.nih.gov/28557717/>
25. So H, Yip G, Choi K, Li A, Leung L, Wong S, et al. Association between waist circumference and childhood-masked hypertension: A community-based study. *Journal of pediatrics and child health* [Internet]. 2016 [Cited November 02, 2021];52(4):385–390. Available at: <https://pubmed.ncbi.nlm.nih.gov/27145500/>
26. European Society of Hypertension and International Society of Hypertension. Blood pressure monitoring. Validated devices listing principals and procedure [Internet]. 2019 [Cited November 02, 2021]. Available at: <https://www.eshonline.org/guidelines/blood-pressure-monitoring/>
27. Al Kibria G, Swasey K, Sharmeen A, Day B. Estimated change in prevalence and trends of childhood blood pressure levels in the United States after application of the 2017 AAP Guideline. *Prev Chronic Dis* [Internet]. 2019 [Cited November 02, 2021];16:e12180528. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6362707/>
28. Bouhanick B, Sosner P, Brochard K, Mounier-Véhier C, Plu-Bureau G, Hascoet S, et al. Hypertension in children and adolescents: A position statement from a panel of multidisciplinary experts coordinated by the French society of hypertension. *Frontiers in pediatrics* [Internet]. 2021 [Cited November 02, 2021];9:680803:1-18 Available at: <https://doi.org/10.3389/fped.2021.680803>
29. Gonzalez R, Llapur R, Díaz C, Illa M, Yee E, Pérez D. Estilos de vida, hipertensión arterial y obesidad en adoelscentes *Revista Cubana de Pediatría* [Internet]. 2015 [Cited May 15, 2023];87(3):273-284. Available at: <http://scielo.sld.cu/pdf/ped/v87n3/ped03315.pdf>
30. Gorostidi M, Gijón-Conde T, De la Sierra A, Rodilla E, Rubio E, Vinyoles E, et al. Guía de practica sobre el diagnóstico y tratamiento de la hipertensión arterial en España 2022. Sociedad Española de hipertensión-Liga española para la lucha contra la hipertensión arterial (SEH-LELHA) [Internet]. Spain; 2022 [Cited October 02, 2022];39:174-194. Available at: <https://www.elsevier.es/es-revista-hipertension-riesgo-vascular-67-pdf-S1889183722000666>
31. Tagle R. Diagnóstico de hipertensión. *Rev Med Clin CONDES* [Internet]. 2018 [Cited May 15, 2023];29(1):12-20. Available at: <https://www.sciencedirect.com/science/article/pii/S0716864018300099>

**How to cite this article:** Cárdenas-Villarreal V, Hernández-Martínez N, Guevara-Valtier M, Cruz-Chávez N. Recomendaciones para la prevención de la hipertensión arterial en niños y adolescentes: Revisión sistemática de alcance. *SANUS* [Internet]. 2023 [cited dd mmm yyyy];8: e343. Available at: DOI/URL.

