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# Screening for cardiovascular disease in children

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## Abstract

**Introduction:** Cardiovascular disease is one of the leading causes of death in the world with significant burden on the health care system.

**Review of Literature:** The focus of this paper is to look at previous studies, mostly systematic reviews and meta-analysis, in search of various clinical screening methods in the pediatric population for determining cardiovascular disease risk. Waist to height ratio can be used to screen children for cardiovascular disease with a specificity of 96% when using 0.55 as the cut-off point. An increase in waist circumference along with increased BMI places a child at a much higher risk of hypertension.

**Results:** The findings of this study demonstrate there are a variety of non-invasive methods for screening for cardiovascular risk in children such as waist circumference and waist to height ratio.

**Closing statement:** Waist to height ratio is very sensitive non-invasive method of determining a pediatric patients risk of cardiovascular disease rather than body mass index alone.

## Introduction

Cardiovascular disease is a very prevalent problem within the United States and continues to be a significant burden on the health care system with significant associated mortality and morbidity. As the incidence of childhood obesity and diabetes continues to increase so will the burden of cardiovascular disease. Cardiovascular disease significantly increases a person's risk for myocardial infarction, cerebrovascular injury, hypertension, peripheral and coronary artery disease, along with other conditions. Body mass index is typically used to assess cardiovascular disease in children. The purpose of this study is to look for ways to better screen children for risk of cardiovascular disease than using BMI alone.

## Statement of the Problem

BMI is typically used as an assessment for cardiovascular risk and can change drastically with minor errors in measurements. BMI does not take into account the type of tissue on a person. There are other methods that can be used to bring cardiovascular disease awareness to the patient and their family.

## Research Question

Is BMI and weight percentile enough information to help determine if a child is at increased risk for developing cardiovascular disease as they grow into adolescents and young adults?

In children aged 4-10 years of age, what are the clinical screening methods available to detect if the child is at increased risk for developing cardiovascular disease?

## Literature Review

Cardiovascular disease is the leading cause of death in the USA (Redondo et al., 2015).

Several of the studies were able to demonstrate fatty streaks and plaques in the coronary arteries of children between the ages of 10 and 14 (Rodrigues et al., 2103).

Children considered to be overweight or obese based on BMI were more likely to have dyslipidemia compared to children of healthy weight (adjusted OR 1.4, 99% CI 1.0-1.9) (Redondo et al., 2015).

High blood pressure is also associated with increased arterial stiffness (Hudson et al., 2015).

A diagnosis of hypertension is 3.5 times more likely in obese children [OR 3.5, 99% CI 2.0-6.1] (Redondo et al., 2015).

It was also found that 82.3% of obese children were obese as adults. (Juonalo et al., 2011).

One study with 14,493 participants and demonstrated that a waist to height ratio  $\geq 0.6$  better correlated with increased markers of dyslipidemia, C-reactive protein, fasting glucose levels and increased blood pressure. (Khoury et al., 2013).

Subjects with an increased BMI and a waist to height ratio  $< 0.5$  had nearly the same cardiometabolic risk factors as subjects with a normal BMI and low waist to height ratio. (Khoury et al., 2013).

Patients with both high BMI and waist to height ratio had a significantly increased risk of cardiometabolic markers. (Khoury et al., 2013).

## Discussion

Most pediatric patients have many well child checks, which is a great opportunity to collect information and track as the patient ages.

Some studies have demonstrated signs of atherosclerosis as young as 3 years of age, so early recognition is important.

The downfall of using BMI alone is that some very healthy people may have a high BMI.

A child with a high BMI, low waist to height ratio would be considered low risk for cardiovascular disease as the child most likely has a high amount of lean tissue and a low amount of adipose tissue.

Using waist circumference and waist to hip ratio along with BMI will help a clinician get a very clear picture of the patients adipose tissue mass and distribution.

Studies have demonstrated waist to height ratio to be 96% specific for cardiovascular risk in children.

A cut-off point of 0.55 has been proposed for waist to height ratio with a specificity of 96% for cardiovascular disease.

There is no need to convert waist to height ratio for age, race or gender.

Increased waist circumference has been linked with increased inflammatory and pro-thrombus markers.

Implementing the waist circumference and waist to height ratio at yearly intervals will more accurately identify the patients at increased risk of developing cardiovascular disease.

## Applicability to Clinical Practice

BMI is not the most accurate screening assessment for cardiovascular disease risk.

BMI does not differentiate between lean tissue and adipose tissue or the areas of distribution.

Every provider should obtain an accurate family history for each child.

Waist to height ratio and waist circumference measurements should be considered standard at child well check visits.

Waist circumference should be taken at the level of the iliac crest, at the end of normal expiration with the patient standing.

Any patient that has a waist to height ratio of 0.55 or greater would be considered obese and at a high risk of developing cardiovascular disease.

By implementing waist circumference into the clinic visit, providers can gain valuable information regarding a child's adipose tissue distribution and cardiovascular disease risk.

This information has been demonstrated to be as effective or more effective than BMI alone and can be used to help educate the patient and their family.

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Cardiovascular risk factors in pediatric patients based on medical and family history	
Moderate CVD risk	High CVD risk
BMI in the 95 <sup>th</sup> to 96 <sup>th</sup> percentile	BMI $\geq 97^{\text{th}}$ percentile
Hypertension without treatment	Hypertension without treatment
HDL-C level $< 40\text{mg/dL}$	History of current cigarette smoking
Kawasaki disease with regressed coronary aneurysms	Diabetes mellitus (type 1 or 2)
Systemic lupus	Postorthotopic heart transplant
Juvenile rheumatoid arthritis	Chronic renal disease
HIV	
Nephrotic syndrome	