

Metabolic syndrome in children with hypertension – a single center, cross-sectional study

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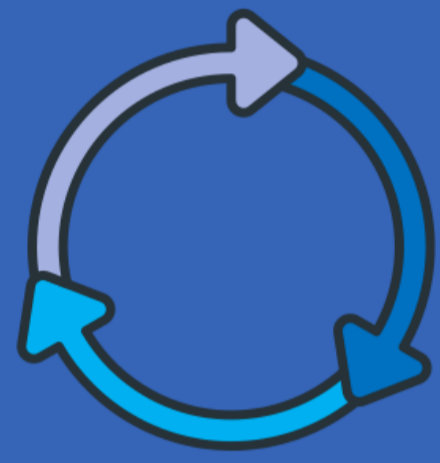


THE CHILDREN'S MEMORIAL HEALTH INSTITUTE



Aim of the study

The aim of the study was to assess the prevalence and clinical characteristics of metabolic syndrome (MS) in children with hypertension (HT)



Material and methods

The study included 420 patients hospitalized in the Children's Memorial Health Institute in Warsaw between 2012 and 2022.

All patients underwent complete hypertension diagnosis evaluation including:

- Anthropometric measurements
- Office blood pressure and ABPM measurements
- Biochemical tests
- Hypertension-mediated organ damage (HMOD) assessment (LVMI, cIMT, PWV)

Results

The prevalence of MS in all patients was 14.5%; higher in age groups 10–15 (18.3%) and lower in patients 16–18 years old (9.4%). MS was significantly more frequent in patients with primary hypertension (PH) than secondary hypertension (SH; 5.5% vs 17.7%; $p = 0.003$). Among all participants, 35.2% had increased waist circumference, 17.4% reduced HDL cholesterol, 13% elevated triglycerides, and 7.4% had increased fasting plasma glucose (FPG). Triglycerides, LDL, and FPG levels were significantly higher in patients with MS, whereas HDL was significantly lower ($p < 0.001$ for all except FPG; $p = 0.061$). Serum uric acid (UA) levels were significantly higher in PH than SH (5.8 vs 5.2 mg/dl; $p < 0.001$) and in MS vs non-MS patients (6.3 vs 5.5 mg/dl; $p < 0.001$). HMOD analysis showed significantly higher cIMT-SDS values in patients with MS (1.26 vs 0.92; $p = 0.012$). Left ventricular hypertrophy (LVH) was more pronounced in MS (42% vs 29%; $p = 0.08$). Correlations between MS, its components and HMOD were generally weak, with the highest observed between waist circumference and LVMI ($r = 0.23$). Table 1 shows that Polish criteria diagnose fewer cases of metabolic syndrome than IDF criteria due to higher waist circumference cut-offs.

Table 1. Comparison of polish and IDF criteria for metabolic syndrome diagnosis

Polish MS criteria

Abdominal obesity (measured with waist circumference)

• ≥ 88 cm women & ≥ 102 cm men

or

• BMI ≥ 30 kg/m²

+ 2 criteria

• Fasting glucose ≥ 100 mg/dL or OGTT ≥ 140 mg/dL

or HbA1c $\geq 5.7\%$ or glucose-lowering therapy

• Non-HDL ≥ 130 mg/dL or use of lipid-lowering agents

• Blood pressure ≥ 130 and/or 85 mmHg (office measurements) or ≥ 130 and/or 80 mmHg (home measurements) or antihypertensive therapy

IDF criteria

• ≥ 90 cc or \geq adult cut off (10–15 y/o)

• ≥ 94 cm σ & ≥ 80 cm \varnothing (≥ 16 y/o)

• Diagnosis not possible if < 10 y/o

+ 2 criteria

• TG ≥ 150 mg/dL or HTG treatment

• HDL < 40 mg/dL σ or < 50 mg/dL \varnothing

• SBP ≥ 130 mmHg or DBP ≥ 85 mmHg

• Glycemia ≥ 100 mg/dL or DM2

SBP – systolic blood pressure, DBP – diastolic blood pressure, TG – triglycerides, HTG – hypertriglyceridemia, DM2 – diabetes mellitus type 2

Fig. 1. Number of patients with MS in relation to age

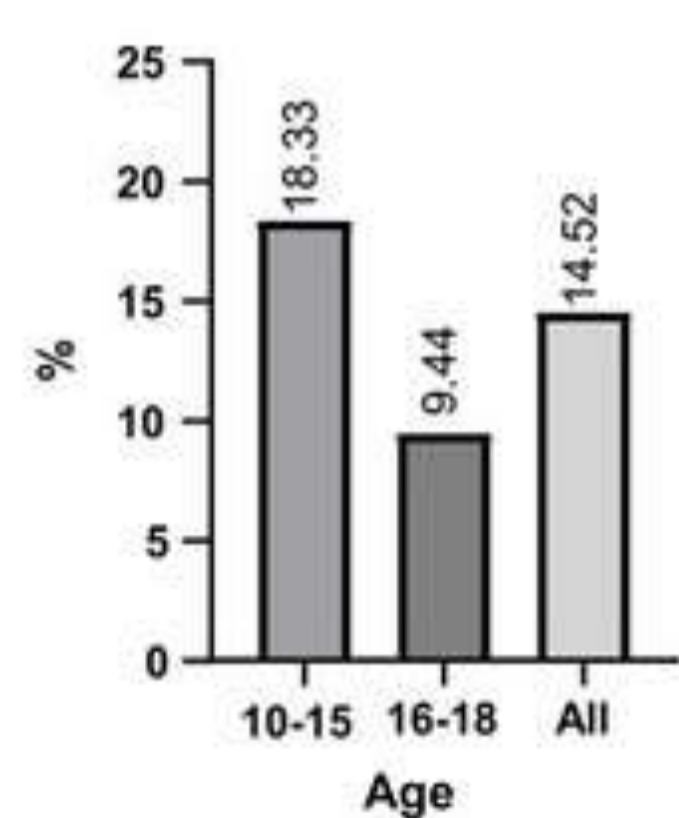


Fig. 2. Number of patients with MS in relation to the type of HT

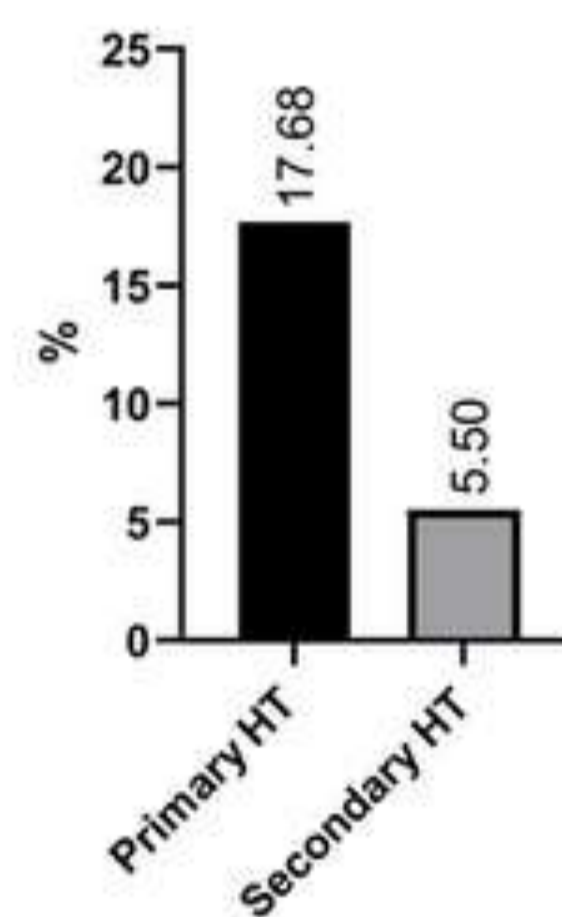


Fig. 3. Comparison of MS diagnosis between polish and IDF criteria in different age groups

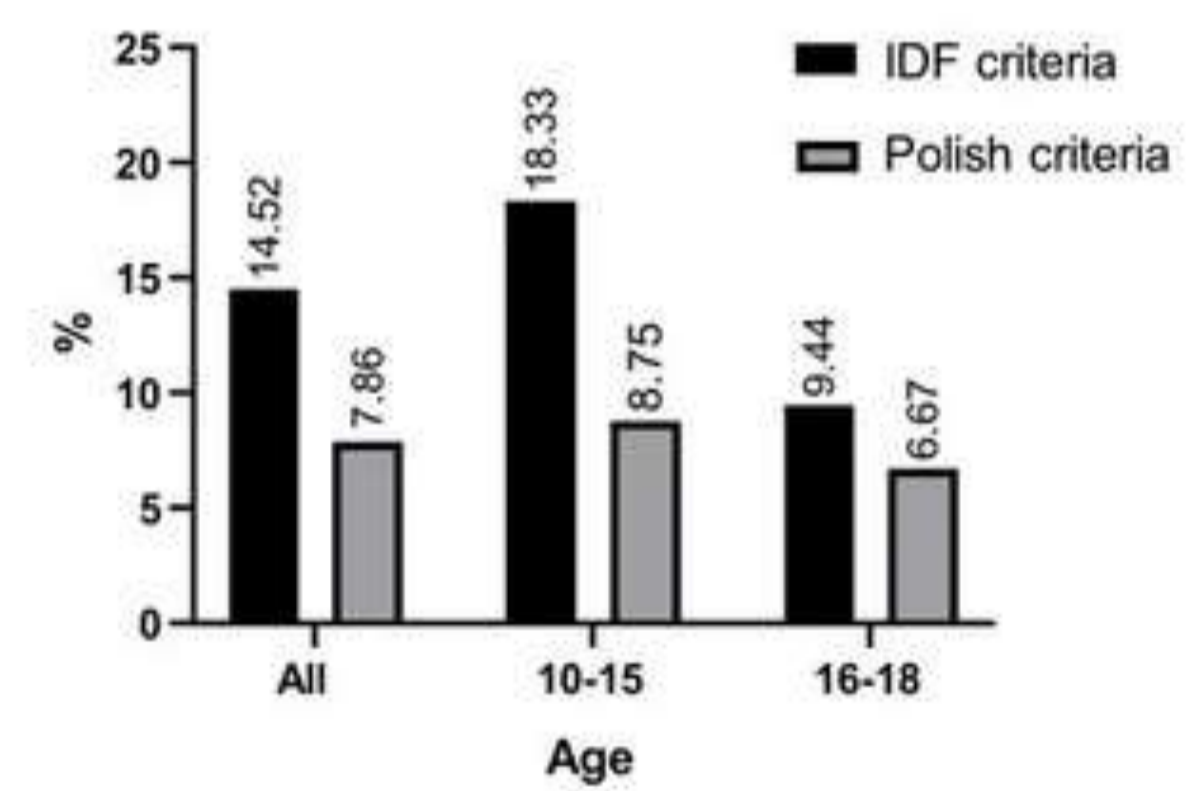


Fig. 4. Comparison of MS diagnosis between polish and IDF criteria in different types of HT

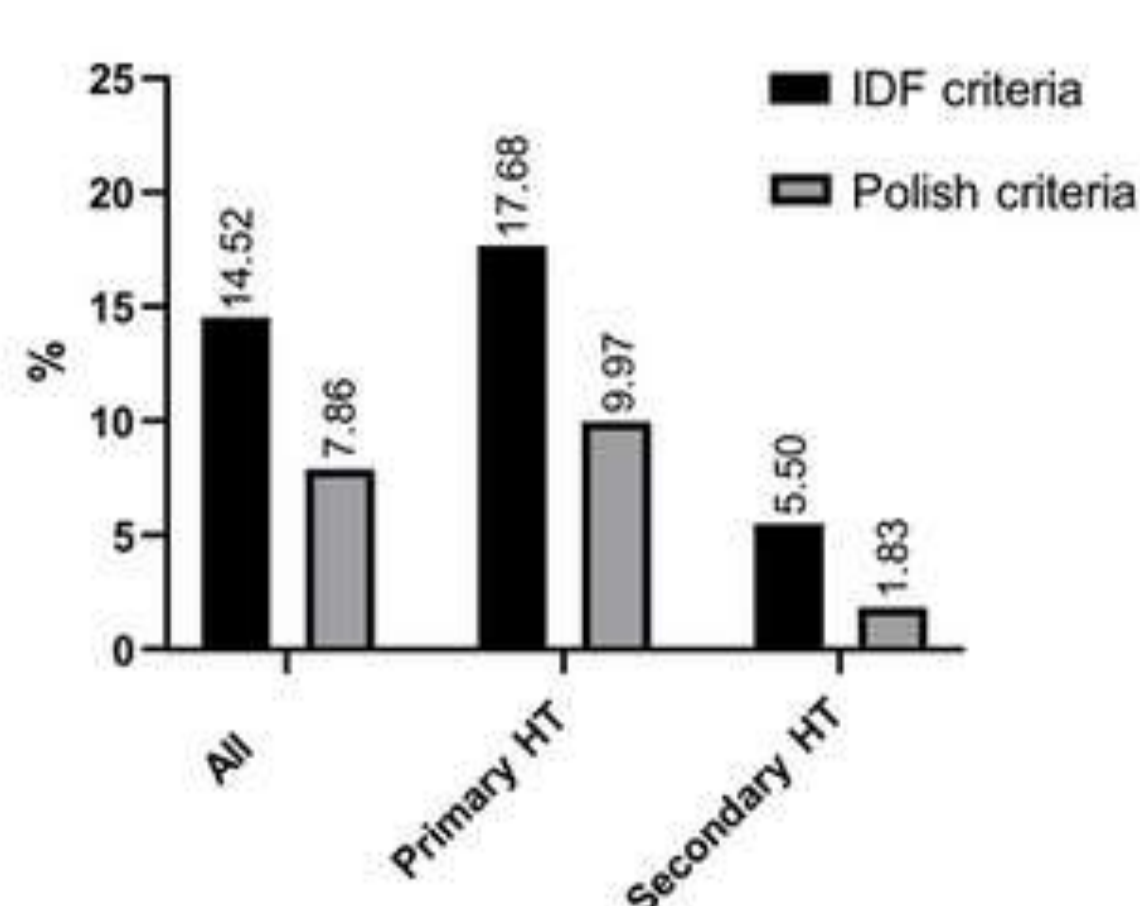


Fig. 5. Serum UA level in patients in relation to the type of HT

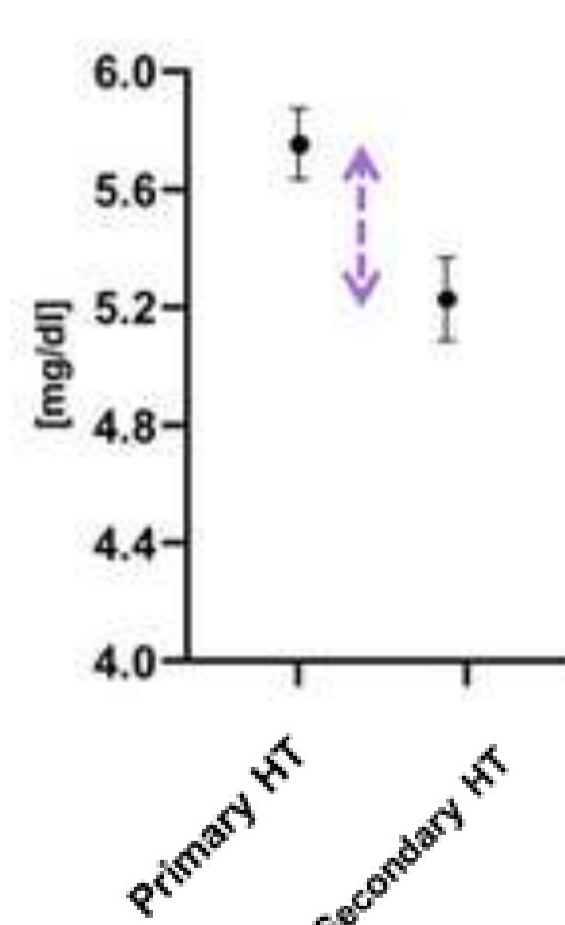
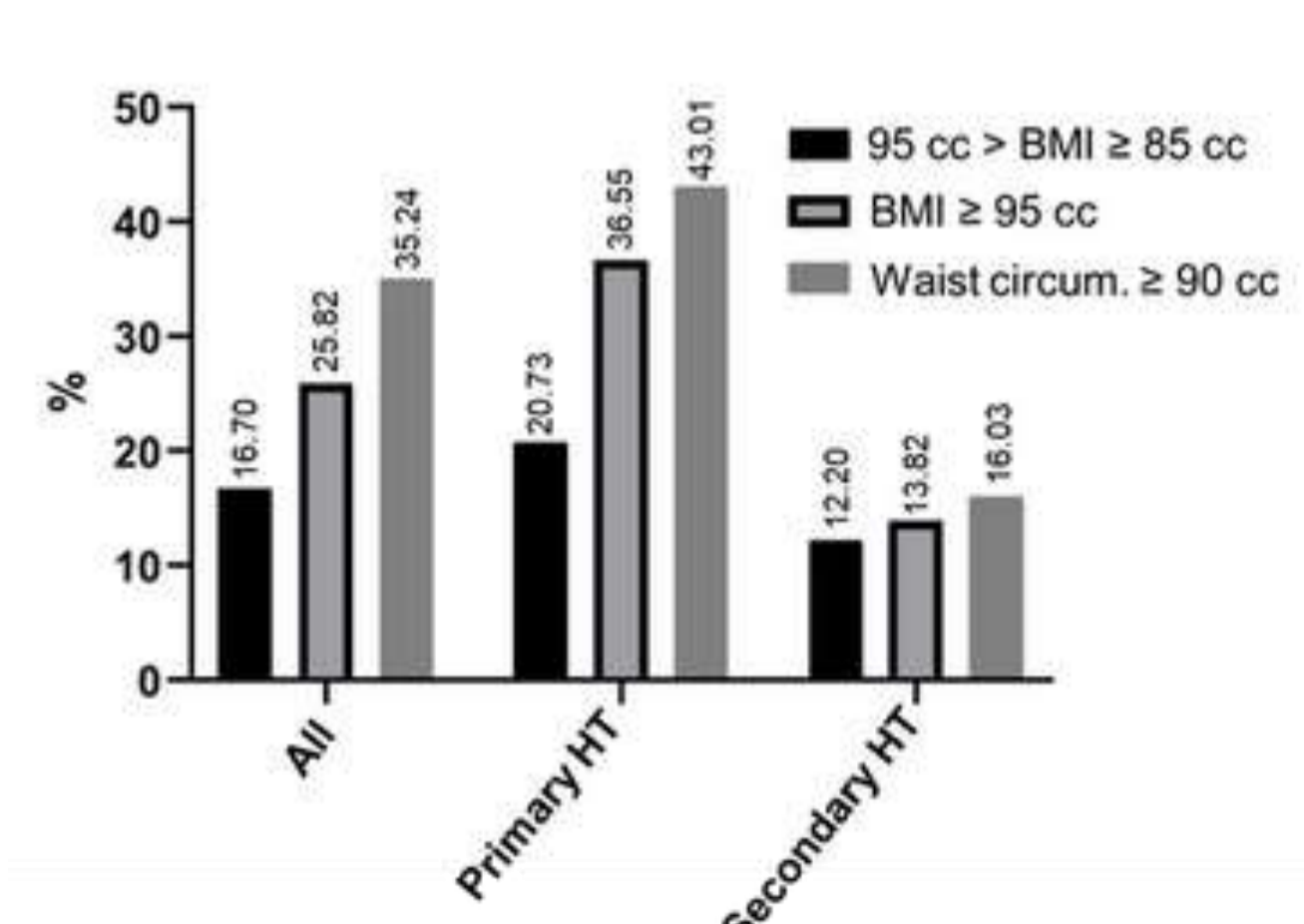


Fig. 6. Number of overweight, obese and with increased waist circumference patients in relation to the type of HT



Conclusions

- MS was diagnosed more frequently in children aged 10–15 y/o than 16–18 y/o
- MS was more frequent in primary vs secondary hypertension
- Waist circumference primarily drives differences in MS diagnosis rates between PH and SH
- MS was associated with higher levels of UA, lipids and glucose level
- Polish criteria for diagnosis of MS decrease the number of patients diagnosed with MS in comparison to IDF's criteria
- Serum uric acid level was significantly higher in patients with PH than SH