CAN TRIPONDERAL MASS INDEX BE A NEW INDICATOR IN PREDICTING THE CARDIOMETABOLIC RISK IN OBESE ADOLESCENTS?

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Introduction

Body mass index (BMI) is claimed to be unreliable in the determination of body fat and cardiometabolic risk. Waist circumference and waist-to-height ratio (WHtR) are used in the evaluation of cardiometabolic risk, however they have low reproducibility and are unpractical. Triponderal mass index (TMI; weight/height^3), however, is suggested to be superior to BMI in determining body fat and obesity.

Objective

In this study, the relation of TMI with body fat ratio and metabolic parameters and its superiority to other indexes in the determination of cardiometabolic risk were examined.

Methods

Obese adolescents with a BMI>95% according to the data of Turkish children were involved in the study. Anthropometric parameters, blood pressures, fasting glucose, lipid levels were measured. Body fat ratio was evaluated with bioelectric impedance analysis. Metabolic syndrome (MS) was described according to International Diabetes Federation (IDF) criteria.

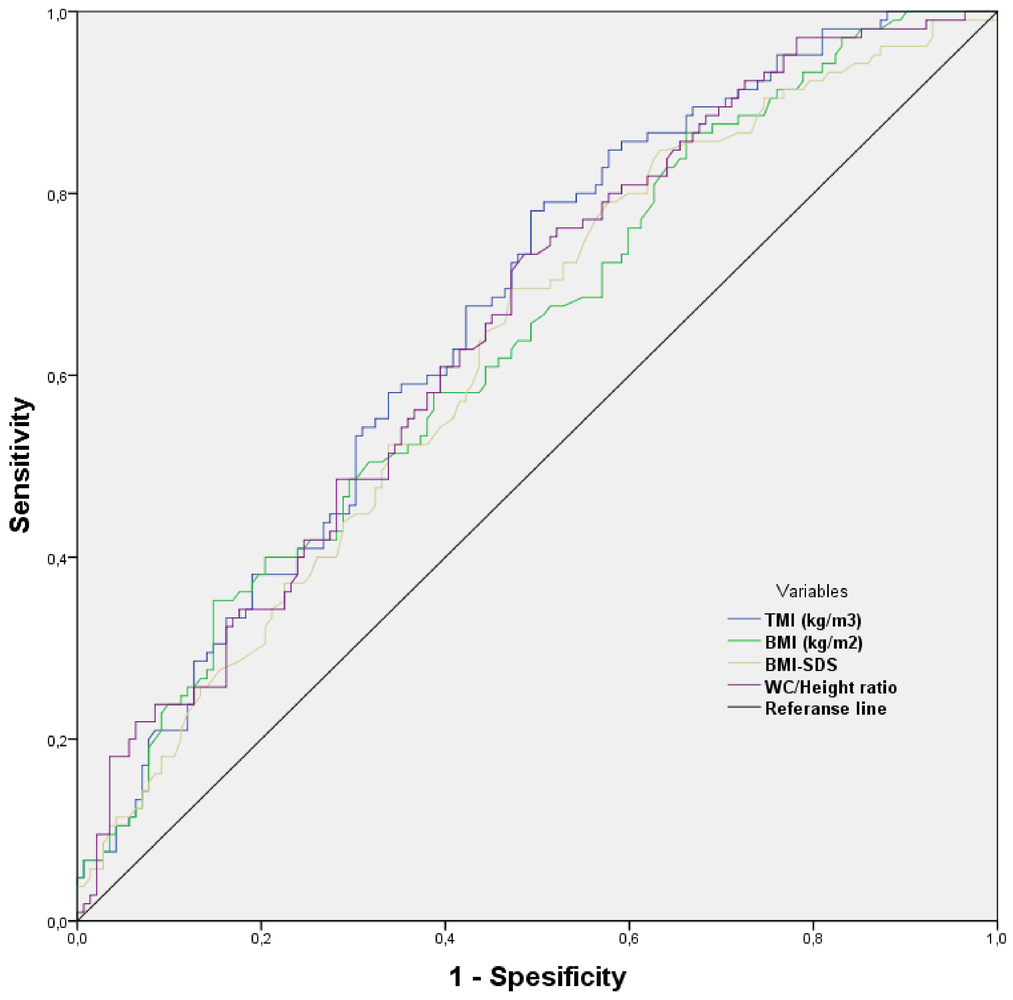

Table 3. Sensitivity and specificity of different indices to identify metabolic syndrome (p <0.05)

İndex	Area	P	Lower treshold	Upper treshold
TMI (kg/m^3)	0.668	<0.001	0.601	0.734
BMI(kg/m^2)	0.637	<0.001	0.568	0.706
BMI SDS	0.629	0.001	0.560	0.699
WHtR	0.655	<0.001	0.588	0.723

Results

- Of 247 obese adolescents (14.8±1.5 years, 158 female, 105 MS) involved in the study, BMI 34.1±4.7kg/m^2; BMI SDS 3.03±0.6; TMI 20.8±2.9kg/m^3, WHtR 0.63±0.06 and body fat ratio was established as 40.1±7.4%.
- BMI, BMI-SDS, TMI, WHtR) were significantly higher in the MS group (n=105 (Table 1).
- Relationship between BMI, BMI SDS, WHtR, TMI and waist circumference, body fat ratio and metabolic parameters are summarized in Table 2.
- BMI showed a potent correlation with BMI SDS and TMI and moderate correlation with WHtR and BMI.
- TMI had no significant correlation with metabolic parameters except that weak correlation with HDL-K, fasting insulin and HOMA-IR.
- In the prediction of MS diagnosis, when diagnostic sensitivity and specifities of TMI, BMI, BMI SDS, WHtR were evaluated with ROC analysis, area under the curve were similar and significantly high (Figure 1).

Table 1. Demographic, anthropometric and metabolic parameters according to presence of metabolic syndrome

	MS(-)(n=142)	MS (+) (n=105)	*P
Age (year)	14.8 ±1,85	14.7±1.5	0.646
Gender (Girls/Boys)	101/41	57/48	0.006
BMI (kg/m^2)	33.1±4.4	35.5±4.7	<0.001
TMI (kg/m^3)	20.1±2.8	21.8±2.7	<0.001
BMI SDS	2.9±0.5	3.2±0.5	<0.001
WHtR	0.62±0.06	0.65±0.06	<0.001
Fat mass (kg)	39.9±7.4	39.8±10.8	0.026
Fat ratio (%)	39.9±7.4	40.4±7.6	0.609
Fasting insulin (IU/L)	21.9±11.8	29.1±17.8	<0.001
HOMA-IR	4.6±2.6	6.5±4.5	<0.001

Table 2. Relationship between BMI, BMI index SDS, waist circumference / height ratio, TMI and waist circumference, body fat ratio and metabolic parameters

	Obese (n = 247)							
	BMI (kg/m^2)		BMI-SDS		WHtR		TMI (kg/m^3)	
	r	*P	r	*P	r	*P	r	*P
Waist circumference (cm)	**0.726**	**<0.001**	**0.557**	**<0.001**	-	-	**0.624**	**<0.001**
Body fat ratio (%)	**0.407**	**<0.001**	**0.594**	**<0.001**	**0.334**	**<0.001**	**0.500**	**<0.001**
Fasting glucose (mg/dl)	0.060	0.350	0.038	0.557	0.035	0.580	0.053	0.410
Triglycerides (mg/dl)	0.066	0.308	0.048	0.460	0.044	0.497	0.065	0.309
HDL-K (mg/dl)	**-0.220**	**<0.001**	**-0.210**	**0.001**	**-0.161**	**0.011**	**-0.237**	**<0.001**
Fasting insulin (IU/mL)	**0.249**	**<0.001**	**0.215**	**0.001**	**0.300**	**<0.001**	**0.224**	**<0.001**
HOMA-IR	**0.217**	**0.001**	**0.200**	**0.002**	**0.254**	**<0.001**	**0.199**	**0.002**

Conclusion

While TMI shows body fat ratio more accurately compared to BMI and WHtR, it has no superiority to BMI SDS. Nevertheless, since TMI can be calculated more practically compared to BMI SDS, it can be used in predicting body fat ratio. On the other hand, our findings suggest thatTMI has no superiority to BMI, BMI SDS, WHtR in displaying cardiometabolic risk.