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Body mass index (BMI) is used to diagnose obesity in children and adolescents. Recently, the tri-ponderal mass index (TMI) has been reported to be nearly stable throughout adolescence and estimate body fat levels more accurately than BMI especially in adolescents

**Aim:** To compare the efficacy of TMI and BMI in forecasting of insulin resistance, hyperlipidemia and impaired liver enzymes

**Method:** One hundred and forty-three overweight or obese children which were classified with BMI z scores, were involved in the study. Children with BMI z-scores between +1.0 and +2.0 were overweight when children with BMI z-scores more than or equal to +2.0 were obese. BMI and TMI were calculated as weight(kg)/height(m<sup>2</sup>) and weight (kg)/height (m<sup>3</sup>), respectively. All anthropometric variables and laboratory results were collected retrospectively. The TMI thresholds to diagnose overweight status were 16.0 kg/m<sup>3</sup> for boys and 16.8 kg/m<sup>3</sup> for girls and were 18.8 kg/m<sup>3</sup> for boys and 19.7 kg/m<sup>3</sup> for girls to diagnose obese status. Fasting blood glucose, insulin, homeostasis model assessment insulin resistance (HOMA-IR), high (HDL) and low density (LDL) lipoprotein cholesterol, triglycerides, total cholesterol and liver function enzymes were evaluated. The HOMA-IR thresholds of Turkish children were used to diagnose insulin resistance (2.22 for prepubertal girls, 2.67 for prepubertal boys, 3.82 pubertal girls and 5.22 for pubertal boys).

**Results:** A total of 143 patients were enrolled in the study. Of the total cohort, 58% of patients (n = 83) were female, 42% (n = 60) were male. The mean age of all patients was 11.1 ± 2.9 years. According to the BMI sds, overweight group consisted of 37 patients (25.9%), while obese group consisted of 106 patients (74.1%), respectively. When the sample of study classified based on TMI thresholds, 3 groups were sampled as normal 21% (n=30), overweight 41.3% (n=59) and 37.8% (n=54) obese. Twenty-two overweight and 8 obese children were classified as normal when we used the TMI. There were no patient that TMI classified as obese while BMI sds classified overweight. There were 54 (37.7%) patients who were classified as obese, based on both TMI and BMI sds (Table 1). The frequency of insulin resistance was significantly higher in obese children than in overweight when BMI was used to classify study group (Table 2). Twenty-two overweight children with normal TMI had 22.7 % insulin resistance, 9.1 % high total cholesterol level, 4.5 % low HDL, high triglyceride level and liver enzymes with 50% higher LDL levels than 100 mg/dL. Two of 8 obese children with normal TMI had insulin resistance and low HDL levels. There was no increase in liver enzyme levels in any child with normal TMI. Forty-four obese children were classified as overweight according to the TMI. In this group, insulin resistance were detected in of 40.9%, low HDL in 34.1% , and at least one of elevated liver enzyme in 11.4%. Fifty-four patients were obese according to the both BMI z score and TMI. However, in this group, insulin resistance only detected in 46.3% of study group (Table 3).

**Table 1. Distribution of groups according to BMI and TMI**

BMI Group		TMI Group			Total
		Normal	Overweight	Obese	
BMI Group	Overweight	22	15	0	37
	Obese	8	44	54	106
	Total	30	59	54	143

BMI: Body Mass Index, TMI: tri-ponderal mass index

**Table 2. Insulin Resistance of groups according to BMI and TMI**

IR		TMI Group			Total	p	BMI Group			P
		Normal	OW	Obese			OW	Obese	Total	
IR	(+)	7	21	25	53	0.18	8	45	53	*0.024
	(-)	23	38	29	90		29	61	90	
	Total	30	59	54	143		37	106	143	

BMI: Body Mass Index, OW: Overweight, TMI: tri-ponderal mass index

**Table 3. Comparison of variables between groups according to the group combinations of BMI and TMI**

	n (%)	Group Combinations				
		TMI Normal & BMI OW	TMI Normal & BMI OB	TMI OW & BMI OW	TMI OW & BMI OB	TMI OB & BMI OB
IR	(+)	5 (22.7%)	2 (25%)	3 (20%)	18 (40.9%)	25 (46.3%)
	(-)	17 (72.7%)	6 (75%)	12 (80%)	26 (59.1%)	29 (53.7%)
High TC	(+)	2 (9.1%)	0 (0%)	2 (13.3%)	7 (15.9%)	7 (13%)
	(-)	20 (90.9%)	8 (100%)	13 (86.7%)	37 (84.1%)	47 (87%)
Low HDL	(+)	1 (4.5%)	2 (25%)	3 (20%)	15 (34.1%)	14 (25.9%)
	(-)	21 (95.5%)	6 (75%)	12 (80%)	29 (65.9%)	40 (74.1%)
High LDL	(+)	11 (50%)	3 (37.5%)	5 (33.3%)	16 (36.4%)	23 (42.6%)
	(-)	11 (50%)	5 (62.5%)	10 (66.6%)	28 (63.6%)	31 (57.4%)
High TG	(+)	1 (4.5%)	1 (12.5%)	1 (6.7%)	6 (13.6%)	9 (16.7%)
	(-)	21 (95.5%)	7 (87.5%)	14 (93.7%)	38 (86.4%)	45 (83.3%)
High SGOT	(+)	1 (4.5%)	0 (0%)	1 (6.7%)	4 (9.1%)	9 (16.7%)
	(-)	21 (95.5%)	8 (100%)	14 (93.7%)	40 (90.9%)	45 (83.3%)
High SGPT	(+)	1 (4.5%)	0 (0%)	1 (6.7%)	3 (6.8%)	5 (9.3%)
	(-)	21 (95.5%)	8 (100%)	14 (93.7%)	41 (93.2%)	49 (90.7%)
At least 1 high LE	(+)	1 (4.5%)	0 (0%)	1 (6.7%)	5 (11.4%)	9 (16.7%)
	(-)	21 (95.5%)	8 (100%)	14 (93.7%)	39 (88.6%)	45 (83.3%)
Total		22	8	15	44	54

BMI: Body Mass Index, High LDL : Low density lipoprotein >100 mg/dl, High TC: Total cholesterol >200 mg/dl, High TG: Triglyceride >150 mg/dl, IR: Insulin Resistance According to HOMA-IR thresholds of Turkish children, LE: liver enzyme, Serum glutamic oxaloacetic transaminase (SGOT), serum glutamic-pyruvic transaminase (SGPT), OW: Overweight, TMI: tri-ponderal mass index

In conclusion, when we use TMI, we may have a risk of skip over the insulin resistance more. However, if we assume that liver enzymes are elevated as a finding of visceral adiposity, TMI can be used as an auxiliary parameter to show visceral effects of adiposity. Normal TMI may indicate that visceral organ functions have not deteriorated yet.