Lipid accumulation product is a predictor of non-alcoholic fatty liver disease in childhood obesity

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OBJECTİVES:

We aimed to evaluate the performance of lipid accumulation product (LAP) to predict non-alcoholic fatty liver disease (NAFLD) in obese children.

METHODS:

Eighty obese chidren (39 girl) were included in this study (6-18 years). Height, weight, body mass index (BMI), waist circumference (WC), puberty stage, blood pressure and biochemical values were obtained from the medical records. SDS and percentiles were calculated. LAP was calculated as

[WC (cm) - 58] x triglyceride concentration (mmol/L) in girls;

[WC (cm) - 65] x triglyceride concentration (mmol/L) in boys.

Other two variant LAP values were described according to 3% (minLAP) and 50% (adjLAP) of WC values previously considered for age and gender in childhood. The total cholesterol/HDL-cholesterol index (TC/HDL-C) was calculated. NAFLD was showed by ultrasound. The AUC and appropriate cutoff points for LAP, adjLAP and minLAP were calculated by ROC analysis.

RESULTS:

Anthropometric measurements, biochemical values and indexes in patients with and without liver fat are summarized in the Table 1. LAP showed a positive and moderate correlation with puberty stage (rho=0.409; p<0.001), fasting insulin (rho=0.507; p<0.001), HOMA-IR (rho=0.470; p<0.001), uric acid (rho=0.522; p<0.001), TC/HDL-C (rho=0.494; p<0.001) and a weak negative correlation with HDL-C (rho=-3.833; p<0.001). Similar results were detected for minLAP and adjLAP. It was found that LAP values could be used to diagnose hepatosteatosis (AUC = 0.698; p = 0.002). Sensitivity and specificity values for LAP ≥ 42.70 cases were found as 53.7% and 84.6%, respectively (Figure 1). The cut-off points for LAP were AUC = 0.704;

p = 0.033 in males and AUC = 0.693; p = 0.013 in pubertal. While the cutoff point for adjLAP ≥ 40.05 (AUC=0.691; p=0.003), sensitivity (58.5%) and specificity (74.4%) were calculated. While the cutoff point for minLAP ≥ 53.47 (AUC=0.673; p = 0.0083), sensitivity (56.1%) and specificity (76.9%) were found. LAP exhibited a high diagnostic accuracy for identifying NAFLD (AUC=0.698; p=0.002).

Table 1: Clinical features and laboratory findings of patients with and without non-alcoholic fatty liver disease (NAFLD)

NAFLD		No (n=39)	Yes (n=41)		
Variable		Mean±SD Median (IQR)	Mean±SD Median (IQR)	Statistical Analysis*	p
Age, year		11.1±2.8	11.9±2.6	t=1.299	0.198
Gender	Girl (n=38)	25 (31.3%)	13 (16.3%)	c^2=8.411	0.004
	Boy (n=42)	14 (17.4%)	28 (35.0%)		
Puberty stage					
Stage 1 (n=22)		16 (20.0%)	6 (7.4%)	c^2=12.633	0.013
Stage 2 (n=22)		5 (6.3%)	17 (21.3%)		
Stage 3 (n=12)		7 (8.8%)	5 (6.3%)		
Stage 4 (n=15)		6 (7.4%)	9 (11.2%)		
Stage 5 (n=9)		5 (6.3%)	4 (5.0%)		
Weight SDS		2.55 (0.90)	2.99 (1.21)	Z=2.691	0.007
Height SDS		0.73±0.96	0.97±1.37	t=0.895	0.374
BMI		26.90 (6.19)	30.71(4.43)	Z=3.316	0.001
BMI SDS		2.38±0.48	2.76±0.59	t=3.108	0,003
BMI %		98.7 (1.7)	99.7 (1)	Z=3.124	0.002
WC, cm		89.7±13.3	98.8±10.5	t=3.399	0.001
Systolic TA, mmHg (n=28)		115.0 (14.3)	122.5 (10.0)	Z=3.241	0.001
Diastolic TA, mmHg (n=28)		73±8	77±9	t=1.672	0.100
Fasting glucose, mg/dl		90±8	89±7	t=0.756	0.452
Fasting insulin, uU/ml		12.70 (9.70)	17.40 (8.25)	Z=3.311	0.001
HOMA-IR		2.93±1.5	4.01±1.54	t=3.169	0.002
ALT, IU/L		17 (10)	28 (22)	Z=4.528	<0.001
AST, IU/L (n=30)		20 (6)	21 (9)	Z=1.103	0.285
Uric acid, mg/dl (n=77)		4.7 (1.3)	5.2 (1.5)	Z=2.821	0.005
Cholesterol, mg/dl		163±34	170±26	t=1.141	0.257
Triglyceride, mg/dl		91.0 (52.0)	114 (62)	Z=1.771	0.077
HDL-C, mg/dl (n=79)		45 (13)	47 (16)	Z=0.300	0.764
LDL-C, mg/dl (n=79)		94±28	101.3±19.5	t=1.302	0.197
Cholesterol/HDL-C, (n=79)		3.74 (0.91)	3.88 (1.41)	Z=1.595	0.111
LAP		30.4 (20.3)	42.8 (43.0)	Z=3.047	0.002
AdjLAP (%50)		32.1 (23.9)	43.3 (40.7)	Z=2.936	0.003
MinLAP (%3)		45.9 (23.9)	56 (48.5)	Z=2.666	0.008

** t: Students' t test Z: Mann-Whitney test ▫2: Chi-square test*

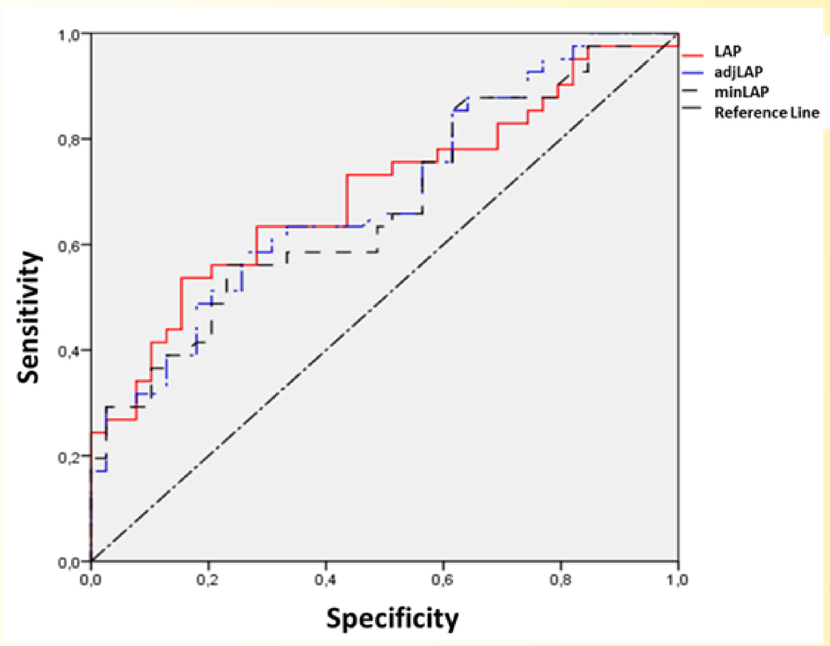

Figure 1: ROC curve of LAP, adjLAP and minLAP

CONCLUSİONS:

LAP is a is a powerfull and easy tool to predict NAFLD in childhood and is correlated with TC/HDL-C and uric acid level. This is the first study assessing the accuracy of LAP in childhood obesity.