Value of BMI-SDS, waist circumference-SDS and waist-to-height ratio in the identification of obese children and adolescents at an increased risk for cardio-metabolic complications

Identification of obese children/adolescents at an increased risk of cardio-metabolic complications is of paramount significance for early clinical intervention.

AIM

To determine the value of simple anthropometric measures of obesity (BMI-SDS, waist circumference [WC-SDS], waist-to-height ratio [WHR]) in the identification of individuals at an increased risk for selected cardio-metabolic complications (impaired glucose metabolism, dyslipidemia, increased blood pressure).

METHODS

395 obese children and adolescents (212 females)

Anthropometric analysis
- Body weight
- Body height
- Waist circumference
- Blood pressure

Standard 2-hours Oral Glucose Tolerance Test (OGTT)

Blood Profiling
- Triglycerides
- Total cholesterol
- LDL
- HDL

Unit Standardization
- UK & WHO references

Correlation analysis
- Spearman’s correlation analysis

Multiple Regression analysis

RESULTS

Correlations between BMI-SDS, WC-SDS, WHR and selected cardio-metabolic complications are presented in table 1. Correlations were not determined for total cholesterol, LDL and A1c.

Table 1

<table>
<thead>
<tr>
<th></th>
<th>HOMA-IR</th>
<th>Matsuda</th>
<th>HDL</th>
<th>Tg</th>
<th>SP-SDS</th>
<th>DP-SDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI-SDS</td>
<td>.18*</td>
<td>.10</td>
<td>-.23*</td>
<td>.27*</td>
<td>.28*</td>
<td>.15*</td>
</tr>
<tr>
<td>WC-SDS</td>
<td>.07</td>
<td>-.02</td>
<td>-.19*</td>
<td>.23*</td>
<td>.24*</td>
<td>.16*</td>
</tr>
<tr>
<td>WHR</td>
<td>.28*</td>
<td>.25*</td>
<td>.20*</td>
<td>.35</td>
<td>.17*</td>
<td>.20*</td>
</tr>
</tbody>
</table>

BM: Body mass index; WC: Waist circumference; WHR: Waist-to-height ratio; SDS: Standard deviation score; HOMA-IR: Homeostatic model assessment of insulin resistance; HDL: High density lipoprotein; Tg: Triglycerides; SP: Systolic pressure; DP: Diastolic pressure. *P<0.001

Using regression analysis we determined that analyzed anthropometric measures of obesity alone describe only a small proportion in the variability of HOMA-IR (19.5%), HDL (4.5%), Tg (11%), SP (10%), DP (4%). WHR had the highest impact in regression analysis models except for HDL (BMI-SDS).

Building a model (HOMA-IR)

The largest contribution to HOMA-IR model had WHR variable (figure 1). Final model equation (figure 3) describing relation between BMI-SDS, WC-SDS, WHR and HOMA-IR captures approximately 20% of population variability (figure 2).

\[
y = -5.22 - 3.63x_1 - 1.09x_2 + 40.3x_3 - 1.21x_1^2 - 78.5x_2^2 + 7.53(x_1 	imes x_2) + 13.37(x_2 	imes x_3)
\]

Final equation of HOMA-IR relation to BMI-SDS, WC-SDS and WHR: \(y\) - HOMA-IR

CONCLUSIONS

Simple anthropometric measures of obesity (BMI-SDS, WC-SDS, WHR) were correlated to selected cardio-metabolic complications (insulin resistance, dyslipidemia and hypertension) in obese children and adolescents.

These measures however seem to have only a limited value in the prediction models for the selected cardio-metabolic complications, WHR having the highest impact.

REFERENCES


