A non-invasive model for detection of the metabolic syndrome in children and adolescents

Hu Lin1, Jinna Yuan1, Ye Hong1, Li Liang2, ChunXiu Gong3, FeiHong Luo4, GeLi Liu5, Feng Xiong6, ShaoKe Chen7, Guanping Dong1, Ke Huang1, Chunlin Wang2, Xuefeng Chen1, José G B Derraik1,8,9,10,*, JunFen Fu1,*

1 Endocrinology Department, Children's Hospital of Zhejiang University School of Medicine, Hangzhou, China; 2 Pediatric Department of the First Affiliated Hospital, Zhejiang University School of Medicine, Hangzhou, China; 3 Beijing Children's Hospital of Capital Medical University, Beijing, China; 4 Children's Hospital of Shanghai Fudan University, Shanghai, China; 5 General Hospital of Tianjin Medical University, Tianjin, China; 6 Children's Hospital of Guangxi Zhuang Autonomous Region, Nanning, China; 7 General Hospital of Tianjin Medical University, Tianjin, China; 8 Liggins Institute, University of Auckland, Auckland, New Zealand; 9 A Better Start – National Science Challenge, University of Auckland, New Zealand; 10 Department of Women’s and Children’s Health, Uppsala University, Uppsala, Sweden.

Aims

• To develop a non-invasive model for the detection of metabolic syndrome (MetS) in school children and adolescents

Methods

• Participants
7,330 children & adolescents aged 10–18 years in schools across China

• Assessments
Anthropometry measured by research nurses and fasting blood tests

• Data analysis
Prediction models from multivariable logistic regressions, using non-invasive anthropometric and clinical parameters

Results

• MetS prevalence 3.9%

• Prediction model alone (Figure 1; Table 1)
- Parameters were age, waist-to-height ratio, sex, hypertension, and acanthosis nigricans
- Acceptable discrimination (AUROC 0.75)
- Sensitivity 65.7% (190/289 MetS cases)
- PPV 36.5% but 72% of false-positives (231/320) had one metabolic abnormality other than central adiposity

• Mixed approach (Figure 2, Table 1)
- 1st step: all children with hypertension and central adiposity were considered as cases
- 2nd step: prediction model developed on remaining normotensive children with central adiposity, yielding possibly-helpful discrimination (AUROC 0.67)
- Mixed approach had higher sensitivity (75.4%) but lower PPV (30.7%)
- More false-positives (n=493) but 57.0% (n=281) had one metabolic abnormality besides central adiposity

Conclusions

• It is possible to detect most undiagnosed MetS cases in school children and adolescents with non-invasive methods
• Importantly, a large proportion of false-positive cases had metabolic abnormalities, so that the vast majority of youth identified by the models would warrant medical follow-up

For further information, please contact:
Dr José Derraik (j.derraik@auckland.ac.nz)
Prof Junfen fu (jfjf68@qq.com)