

## Publication

### Association of leptin and insulin with childhood obesity and retinal vessel diameters

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Childhood obesity is associated with an impaired retinal microcirculation. The aim of the study was to investigate the association between specific obesity-related biomarkers, physical fitness and retinal vessel diameters in school children.; We studied 381 children aged 10-11 years (body mass index (BMI):  $19.3 \pm 3.7$  (-2)) in a school-based setting.; Anthropometric measurements and blood sampling were conducted using standard protocols for children. The serum biomarkers leptin, adiponectin, insulin as well as interleukin-6 (IL-6) were analyzed. Physical fitness was determined by a six-item-test battery and physical activity by use of a questionnaire. Central retinal arteriolar equivalent (CRAE), central retinal venular equivalent (CRVE) and the arteriolar-to-venular diameter ratio (AVR) were assessed with a non-mydratic vessel analyzer (SVA-T) using a computer-based program.; Compared with normal weight children ( $n=254$ ), obese children ( $n=39$ ) showed higher leptin ( $P<0.001$ ), higher insulin ( $P<0.001$ ), higher IL-6 ( $P<0.001$ ) and lower adiponectin levels ( $P=0.013$ ). Obese children demonstrated wider CRVE ( $P=0.041$ ) and lower AVR ( $P<0.001$ ). Higher leptin levels were associated with wider CRVE ( $P=0.032$ ) and lower AVR ( $P=0.010$ ), that was BMI dependent. Insulin levels were associated with arteriolar ( $P=0.045$ ) and venular dilatation ( $P=0.034$ ) after adjustment for BMI. No significant associations between adiponectin levels, IL-6 levels, physical fitness or physical activity and retinal vessel diameter were observed. Lower leptin levels were independently correlated with higher physical fitness ( $r=-0.33$ ;  $P<0.001$ ).; Leptin and insulin levels are associated with changes of the retinal microcirculation. Especially insulin seems to be a good target marker for the cardiometabolic risk assessment in children since elevated insulin levels are independently associated with microvascular end-organ alterations at an early stage. Lifestyle intervention studies are warranted to examine whether improvement of physical fitness or weight reduction can affect cardiometabolic risk markers and reverse alterations of the retinal microcirculation.

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