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NEWS

# SEX-SPECIFIC EFFECTS OF OBESITY ON CARDIAC STRUCTURE AND FUNCTION: A MAGNETIC RESONANCE STUDY OF THE HAMBURG CITY HEALTH COHORT

## PURPOSE

To analyze the effect of obesity according to waist-to-hip ratio (WHR) and body mass index (BMI) on cardiac structure and function, depending on sex.

## METHODS AND MATERIALS

Individuals between 45-74 years of age underwent 3T cardiovascular magnetic resonance (CMR) imaging as part of the population-based prospective “Hamburg City Health” cohort study. WHR and BMI were assessed upon study inclusion. Subjects with known cardiac diseases were excluded. Generalized regression models were conducted including sex, BMI or WHR, their interaction (if statistically significant), and age.

## RESULTS

We included 2,173 subjects (43% female, mean age 64±8 years). Median WHR was 0.94 [interquartile range: 0.88; 1.00] and median BMI was 26.3 [23.8; 29.3]. According to the WHR, 80% of subjects were obese (WHR ≥ 0.85 in females/ 0.90 in males). Based upon BMI, 20% of subjects were obese (BMI ≥ 30). An increase in WHR by 0.1 was associated with a 3.9g [2.5;5.4] higher left ventricular (LV) end-diastolic mass (EDM). It was also associated with lower LV and right ventricular (RV) end-diastolic volumes (EDV) (LV: -4.4ml [-6.2;-2.6], p<0.001; RV: -5.7ml [-8.2;-3.2], p<0.001), and end-systolic volumes (ESV) (LV: -1.9ml [-3.0;-1.3], p<0.001; RV: -1.9ml [-3.0;-0.8], p=0.001), leading to lower stroke volumes (LV: -2.2ml [-3.4;-0.9], p<0.001; RV: -2.1ml [-3.5; -0.8], p=0.002). However, the negative association between WHR and RVEDV/RVSV was -4.5ml [0.6;0.8|/-2.9ml [0.2;0.6] per 0.1 increase in WHR weaker in females compared to males (p=0.024 and 0.033) (Figure 1). Due to the proportionally larger decrease in EDV, LVEF showed an increase of +0.7% [95% confidence interval: 0.2;1.1] (p=0.004) with every 0.1 increase in WHR. An increase in BMI was associated with a 2.3g [2.0;2.7] higher LVEDM (p<0.001), a higher LVEDV (0.5ml [0.2;0.8], p=0.002), and a 0.4ml [0.2;0.6] higher LVSV (p<0.001). RV structure and function was not significantly associated with BMI. The positive association between BMI and LVEDM was -0.9mg [-1.3; -0.4] per 1 point BMI weaker in females (p<0.001).

## CONCLUSIONS

An increase in WHR is associated with a higher LV mass and lower ventricular volumes. Its association with RV volumes is weaker in females than males. An increase in BMI is associated with ventricular dilatation and a higher LV mass, although this relationship is also weaker in females.

## CLINICAL RELEVANCE/APPLICATIONS

Abdominal obesity according to WHR is associated to concentric remodeling, while a higher body mass is associated with ventricular dilatation. The associations between WHR and RV remodeling, as well as between BMI and LV mass, are more pronounced in males than in females. These findings highlight the need for personalized risk assessment in obesity-related cardiovascular disease.