Abstract

The excess body fat in overweight/obese people has serious health implications including cardiovascular health. Historically, body mass index has been the preferred for the assessment of adiposity; however, a number of studies have shown that this method has limitations because it does not distinguish between visceral and subcutaneous fat. Consequently, waist circumference (WC) is regarded as a more representative index of obesity. Proper assessment of overweight/obesity is essential especially in populations with a high incidence of obesity as was the case in the current study our study population which has a 65% incidence of obesity. Previous studies conducted in this population have mainly used BMI as an index of obesity and therefore the impact of obesity on cardiovascular target organ changes may not be well understood. Therefore, in this study we used both indices (BMI and WC) to assess the impact of increased adiposity on preclinical cardiovascular target organ changes. We recruited 551 individuals of African ancestry and took anthropometric measurements. Both conventional and 24-hour blood pressure (BP) were measured. Echocardiography and pulse wave velocity were performed to measure cardiac and vascular changes, respectively. Additionally, we collected blood samples to measure serum lipid and hormone (renin, aldosterone, insulin, and leptin) concentrations and 24-hour urine samples to assess urinary sodium excretion. When participants were stratified according to BMI status, total cholesterol (TCHOL), triglycerides (TRGL) and LDL-cholesterol (LDL) were significantly higher in the overweight/obese group compared to the normal BMI individuals. On the other hand, HDL-cholesterol (HDL) was significantly higher in the normal weight individuals compared to the overweight/obese group. When WC was used to classify the participants, TCHOL, TRGL and LDL were significantly higher in the high WC women, while no significant differences were observed in men. Similar to women, HDL was significantly higher in the normal WC group compared to the increased WC group. After correcting for covariates, both BMI and WC were significantly associated with all the lipid profiles in men, while only TRGL and HDL were associated with the two indices. Overweight/obese participants had significantly high insulin and leptin levels compared to normal BMI participants. There was no significant difference in renin and aldosterone concentrations between participants with increased WC and those with normal WC. When participants were stratified according to BMI, blood pressure was significantly higher in the total population, men, and women in the overweight/obese group compared to the normal weight participants. However, when stratification was done according to WC, gender differences

were observed. Significant differences in blood pressure were only observed in women but not in men. Only night-time blood pressure was significantly different between the two male groups. Differences were also observed in the PWV and LVMI between the groups. Individuals with high BMI and WC had a significantly higher PWV and LVMI compared to the normal weight group. We then assessed the combined effects of BMI and WC on target organs. Individuals with a normal BMI and normal WC had the lowest PWV and LVMI, followed by individuals with a normal WC and an increased BMI. Then individuals with increased BMI and increased WC had the highest PWV and LVMI. None of the participants with normal BMI had increased WC. These findings indicate that an increase in BMI and WC is associated with an increase in circulating plasma lipids in women but not in men. Since a raised BP and plasma lipids is associated with cardiovascular pathology, increased adiposity is more detrimental to women than men in this population. Furthermore, our results show an independent relationship between the indices of adiposity (BMI and WC) and preclinical cardiovascular pathology (increased PWV and LVMI). Even though general adiposity (BMI) occurs independent of visceral adiposity (WC), visceral adiposity does not develop independent of general adiposity. Therefore, a reduction of BMI does not necessarily translate into WC reduction, but WC reduction always results in BMI reduction. This means reduction of WC is more beneficial than the reduction of BMI in this population.