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Central adiposity is associated with reduced cerebral perfusion: evidence from the Irish Longitudinal Study on Ageing (TILDA)

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Abstract

Introduction: 36% the over 50s in Ireland are obese based on body mass index (BMI: reflective of fat store peripherally) while 52% are 'centrally obese' based on waist circumference (indicative of fat located viscerally).⁽¹⁾ Visceral fat is thought to be a major site for inflammatory cytokine production and has been linked to other vascular risk factors such as hypertension and diabetes,⁽²⁾ potentially providing a mechanism for brain atrophy.⁽³⁾ The aim of the present work was to examine associations between obesity and grey matter (GM)/white matter (WM) perfusion as measured using pseudo-continuous arterial spin labelling (pCASL) MRI.

Materials and Methods: This study was embedded within the Irish Longitudinal Study on Ageing (TILDA), a nationally representative sample of > 8,000 older adults.⁽⁴⁾ At wave three, 561 participants underwent brain MRI using a 3T scanner (*Achieva*, Philips, Netherlands); after exclusions, 484 participants data were included for this analysis. Cerebral blood flow (CBF [ml/100g/min]) values were calculated and their associations with BMI and waist-to-hip ratio (WHR) measures modelled using multiple linear regression. We also examined 6 groups: 'normal', 'overweight', and 'obese' as defined by BMI, with and without central obesity, as defined by WHR.⁽⁵⁾ Models were adjusted for age, sex, smoking, alcohol consumption, physical activity, education, heart disease, hypertension, anti-hypertensive use, and depression.

Results: The mean age was 69 years (± 7.2 years); 52% were female. Higher BMI and WHR were both related to lower GM and WM CBF: BMI per 1 SD (GM: β : -1.451, 95%CI: -2.300 to -0.607, $P < 0.001$; WM: β : -0.575, 95%CI: -0.939 to -0.210, $P = 0.002$) and WHR (GM: β : -1.667, 95%CI: -2.856 to -0.477, $P = 0.006$; WM: β : -0.688, 95%CI: -1.178 to -0.197, $P = 0.006$). The combination of overall obesity (BMI ≥ 30 kg/m²) and central obesity (WHR > 0.85 [female], > 0.90 [male]) was associated with lower CBF (GM: β : -4.303, 95%CI: -7.015 to -1.591, $P = 0.002$; WM: β : -2.029, 95%CI: -3.185 to -0.873, $P < 0.001$) compared to subjects without central obesity (GM: β : -0.959, 95%CI: -6.490 to 4.572, $P = 0.733$; WM: β : -0.051, 95%CI: -2.060 to 1.958, $P = 0.960$).

Discussion: Our results show that central adiposity is a risk factor for impaired cerebral perfusion independent of BMI. Recent studies have shown that accumulation of fat in this area is a risk factor for cognitive impairment⁽⁶⁾ and thus this study could partly explain the vascular origins.

Conflict of Interest

There is no conflict of interest

References

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