

Differing associations between cardiovascular risk factors and levels of volumes or coalescence of white matter hyperintensities



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WMH coalescence does not always align with volumetric burden. Individuals with high levels of coalescence but limited WMH load have higher cardiovascular risk than individuals with low coalescence but high WMH load.

INTRODUCTION	METHODS	RESULTS	CONCLUSIONS																																																												
White matter hyperintensities (WMH) – hallmark of cerebral small vessel disease. Visual rating scales (VRS): Classical evaluation of WMH burden based on visual description Volumetric assessment: Automated alternative to VRS without accounting for shape	Statistical analysis: • Spearman correlation between WMH assessments • Categories cut-off at 7th decile of WMH and CS for group definitions. • Mann-Whitney U test or Chi² test for comparisons of groups across quartiles of CS and WMH. HW – LC LW – HC	Separation of WMH and CS according to the group divisions color-coded by Fazekas score Correlations • WMH – VRS = 0.727 • WMH – CS = 0.881 • CS – VRS = 0.678 Off diagonal groups • 5.2% High WMH - Low CS HW-LC (n=37) • 4.1% Low WMH – High CS LW-HC (n=32)) LW – HC vs LC - HW • Higher pulse pressure in LW-HC • Higher FRS in LW-HC <table><tr><th></th><th>LW-LC</th><th>LW-HC</th><th>HW-LC</th><th>HW-HC</th></tr><tr><td>HbA1c</td><td>38.6 [34.4; 43.5]</td><td>41.7 [34.9; 46.8]</td><td>38.3 [33.9; 44.4]</td><td>39.2 [35.3; 44.0]</td></tr><tr><td>Systolic BP</td><td>139 [126.5; 150.8]</td><td>138.3 [131; 155]</td><td>135.5 [128.5; 144]</td><td>144.5 [133.4; 157.1]</td></tr><tr><td>Diastolic BP</td><td>79 [72.5; 86]</td><td>75.8 [68.8; 85.6]</td><td>78 [71; 82]</td><td>79.5 [72.5; 87.5]</td></tr><tr><td>Pulse Pressure</td><td>58.5 [50; 68]</td><td>65.25 [57.5; 70]</td><td>58 [48.5; 68.5]</td><td>63.5 [54.5; 73.0]</td></tr><tr><td>HDL Cholesterol</td><td>1.5 [1.3; 1.8]</td><td>1.55 [1.4; 1.9]</td><td>1.6 [1.2; 2.2]</td><td>1.5 [1.2; 1.9]</td></tr><tr><td>Age (years)</td><td>69 [66;73]</td><td>72 [69; 75]</td><td>71 [68; 75]</td><td>74 [70.8; 79]</td></tr><tr><td>Female sex (%)</td><td>224 (47.3)</td><td>17 (53.1)</td><td>22 (59.5)</td><td>67 (35.6)</td></tr><tr><td>Ever smoker (%)</td><td>206 (43.4)</td><td>15 (46.8)</td><td>19 (51.4)</td><td>100 (53.2)</td></tr><tr><td>Framingham RS</td><td>18.5 [11.0; 28.4]</td><td>22.2 [16.4; 28.7]</td><td>17.7 [10.3; 22.8]</td><td>26.94 [15.02; 36.10]</td></tr><tr><td>WMH volume</td><td>1781 [1060; 2526]</td><td>4219 [3506; 4924]</td><td>7361 [5887; 8442]</td><td>11831 [8461; 17759]</td></tr><tr><td>Coalescence score</td><td>0.65 [0.45; 1.00]</td><td>2.21 [2.09; 2.47]</td><td>1.61 [1.34; 1.78]</td><td>3.12 [2.56; 3.48]</td></tr></table> Diastolic, Systolic BP and Pulse pressure (mmHg) – HbA1c mmol/L – Framingham Risk Score (%) – WMH normalized to median TIV (mm3). LW-LC – Low WMH and Low Coalescence; LW-HC – Low WMH and High Coalescence; HW-LC – High WMH and Low Coalescence; HW-HC – High WMH and High Coalescence Overall high correlation between WMH volume, Coalescence score and VRS Existence of unexpected combination of WMH volume and CS scores. Higher levels of WMH confluence in individuals with higher cardiovascular risk WMH volumetric burden to be studied in conjunction with lesion shape.		LW-LC	LW-HC	HW-LC	HW-HC	HbA1c	38.6 [34.4; 43.5]	41.7 [34.9; 46.8]	38.3 [33.9; 44.4]	39.2 [35.3; 44.0]	Systolic BP	139 [126.5; 150.8]	138.3 [131; 155]	135.5 [128.5; 144]	144.5 [133.4; 157.1]	Diastolic BP	79 [72.5; 86]	75.8 [68.8; 85.6]	78 [71; 82]	79.5 [72.5; 87.5]	Pulse Pressure	58.5 [50; 68]	65.25 [57.5; 70]	58 [48.5; 68.5]	63.5 [54.5; 73.0]	HDL Cholesterol	1.5 [1.3; 1.8]	1.55 [1.4; 1.9]	1.6 [1.2; 2.2]	1.5 [1.2; 1.9]	Age (years)	69 [66;73]	72 [69; 75]	71 [68; 75]	74 [70.8; 79]	Female sex (%)	224 (47.3)	17 (53.1)	22 (59.5)	67 (35.6)	Ever smoker (%)	206 (43.4)	15 (46.8)	19 (51.4)	100 (53.2)	Framingham RS	18.5 [11.0; 28.4]	22.2 [16.4; 28.7]	17.7 [10.3; 22.8]	26.94 [15.02; 36.10]	WMH volume	1781 [1060; 2526]	4219 [3506; 4924]	7361 [5887; 8442]	11831 [8461; 17759]	Coalescence score	0.65 [0.45; 1.00]	2.21 [2.09; 2.47]	1.61 [1.34; 1.78]	3.12 [2.56; 3.48]	REFERENCES 1 - Jones, S., et al. (2020). Cohort Profile Update: Southall and Brent Revisited (SABRE) study: a UK population-based comparison of cardiovascular disease and diabetes in people of European, South Asian and African Caribbean heritage. International journal of epidemiology, 49(5), 1441-1442e. 2 - Sudre, C. H et al.. (2015). Bayesian model selection for pathological neuroimaging data applied to white matter lesion segmentation. IEEE transactions on medical imaging, 34(10), 2079-2102. 3 - McPhillie, R., et al (2021). Beyond WMH volume: coalescence score as a new measure of cerebral small-vessel disease pattern. Alzheimer's & Dementia, 17, e053034. Contact: c.sudre@ucl.ac.uk
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