

ASSOCIATION OF MULTIMORBIDITY AND DISEASE CLUSTERS WITH NEURO-IMAGING AND COGNITIVE MARKERS OF BRAIN HEALTH IN 43,160 INDIVIDUALS

SHEHAB UDDIN AL ABID; CATHERINE M CALVIN; DANIAL QURESHI; MICHELE VELDSMAN; ELĀBIETA KUŸMA; THOMAS J. LITTLEJOHNS

Senior Research Associate, National Heart Foundation Hospital & Research Institute; Senior Epidemiologist, Nuffield Department of Population Health, University of Oxford, Oxford, UK.

Background: Recent research has found that living with two or more chronic conditions, termed multimorbidity, is associated with an increased risk of developing dementia. In the current study, we investigated whether multimorbidity is associated with a range of dementia-related neuroimaging and cognitive markers of brain health that typically manifest prior to a clinical diagnosis of dementia. **Methods:** We included 43,160 participants aged 45-83 years free from neurological conditions, including dementia, who attended the UK Biobank imaging assessment from 2014-onwards. Multimorbidity was defined as the presence of ≥ 2 long-term conditions from a standardised criteria of 39 conditions. Latent class analyses were used to identify disease clusters. Neuroimaging outcomes were measured using magnetic resonance imaging (MRI), and cognition was assessed by seven tests measuring different cognitive domains. Linear regression models, adjusted for socio-demographic and neuroimaging confounders, were used to test the association between multimorbidity and disease clusters with neuroimaging and cognitive outcomes. **Results:** Multimorbidity was present among 14,339 (33.2%) participants. In fully-adjusted models, presence of multimorbidity was associated with several measures of poorer brain health. This included lower volumes of grey matter (β : -0.03 standard deviation (SD); 95% confidence interval (CI): -0.04, -0.02), total brain (β : -0.01 [-0.02, -0.01]), left hippocampus (β : -0.03 [-0.05, -0.01]), increased white matter hyperintensity volume (v : 0.09 [0.07, 0.10]), poorer executive function (β : 0.04 [0.02, 0.06]), verbal declarative memory (β : -0.03 [-0.05, -0.01]), and processing speed (β : -0.07 [-0.10, -0.05]). A strong dose-response relationship was observed with the increasing number of multimorbid conditions and the aforementioned outcomes. Strength of associations varied across disease clusters, with a cluster predominantly driven by cardio-metabolic conditions showing the strongest associations with brain health outcomes. Clusters driven by 'respiratory', 'mental health' and 'miscellaneous' conditions were inconsistently associated with neuroimaging and cognitive outcomes. **Conclusion:** Multimorbidity, primarily cardio-metabolic multimorbidity, was associated with poorer brain health. These findings provide insights into the potential pathways underlying previously observed associations between multimorbidity and dementia risk.

Keywords: Dementia, Cognitive marker

Date of received: 05/05/2024

Date of accepted: 19/05/2024

DOI: <https://doi.org/10.3329/bjm.v35i20.73270>

Citation: Abid SUA, Calvin CM, Qureshi D, Veldsman M, KuŸma E; Littlejohns TJ. Association of multimorbidity and disease clusters with neuroimaging and cognitive markers of brain health in 43,160 individuals. *Bangladesh J Medicine* 2024; Vol. 35, No. 2, Supplementation: 162.