Blood pressure variability and the association with dementia or cognitive impairment: a systematic review and meta-analysis

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Background

- Recent empirical work demonstrates an association between intra-individual blood pressure variability (BPV) with stroke, cerebral small vessel disease, and major cardiovascular events, however, the association with brain function remains less clear.
- Intra-individual BPV is typically calculated from consecutive blood pressure measures such as 24-hour ambulatory blood pressure monitoring (ABPM) or between multiple visits to a general physician.
- It remains uncertain whether BPV or mean blood pressure holds more significance in understanding vascular contributions to cognitive impairment.

Objective

- Our objective was to systematically review the literature and quantify the association between intra-individual BPV with dementia or cognitive impairment, comparing the magnitude of the association between BPV and cognitive outcomes with the effect sizes for mean blood pressure.

Methods

- A systematic review of electronic databases was performed on MEDLINE, EMBASE, PSYCINFO and SCOPUS from inception until 20th April 2021 (PROSPERO CRD42017081977).

Eligibility criteria

Population

- Adults over 18 years with no upper age limit.
- With or without hypertension
- Free from sub-acute stroke within 4 weeks.
- Recruitment from primary care, community cohort, electronic database registry, or randomised controlled trial populations.

Exposure

- BPV quantified by any metric over any duration.

Comparison

- Low versus high or mean 1). BPV; 2) arterial pressure.

Outcome

1. Prevalent or incident dementia or cognitive impairment or cognitive decline diagnosed by standardised criteria.

Statistical analyses

Multi-level meta-analyses of odds ratios (OR) in R version 3.5.2 using the metafor package (for dependence effect sizes)

Results

- 54 estimated ORs were reported; 21 for systolic BPV, 11 for mean systolic pressure, 15 for diastolic BPV, and 7 for diastolic pressure.

- Both higher systolic BPV (OR = 1.25; 95% CI 1.16 to 1.35, I² = 87%) and mean systolic pressure per 10 mmHg increase were associated with higher odds for dementia/cognitive impairment (OR = 1.12; 95% CI 1.02 to 1.29, I² = 82%) (Fig 1).

- Likewise, higher diastolic BPV was associated with higher odds for dementia/cognitive impairment (OR = 1.20; 95% CI 1.12 to 1.29, I² = 83%), as was mean diastolic pressure per 5 mmHg increase (OR = 1.16; 95% CI 1.04 to 1.29, I² = 3%).

- There was evidence of a pairwise interaction for BPV vs. mean pressure effect sizes (p <0.01), indicating that BPV was more strongly associated with dementia/cognitive impairment than were mean pressure effect sizes.

Conclusions

- Systolic and diastolic BPV were more strongly associated with dementia/cognitive impairment than were mean blood pressure effect sizes.