

Blood pressure in advanced age

- with focus on epidemiology, cognitive impairment
and mortality

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Akademisk avhandling

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Abstract

The general conception is that blood pressure increases with age, but that diastolic blood pressure (DBP) starts decreasing in the elderly. There are, however, indications that systolic blood pressure (SBP) might also decline in advanced age, but further studies are needed to establish whether this is true. Midlife hypertension is an acknowledged risk factor for mortality and dementia. Some research has, however, suggested more complicated associations between blood pressure and these outcomes in old age, as *low* blood pressure has been linked to both increased mortality and increased risk of dementia. Research on this subject, especially in very old people (≥ 85 years of age), is still limited. The purpose of the present thesis was to investigate blood pressure epidemiology in old age and associations between blood pressure and mortality and cognition in very old people.

Subjects were mainly derived from the Umeå 85+ /GERDA (Gerontological Regional DAtabase) study, a study on individuals aged 85 years, 90 years or ≥ 95 years carried out in northern Sweden and Finland in 2000-2007. For analysis of blood pressure change with age, data from this study were combined with data from the U70 study that was carried out in the city of Umeå, Sweden between 1981-1990 and included individuals aged 70-88 years. Investigations were performed during a home visit in the Umeå 85+ /GERDA study and at a geriatric centre in the U70 study. SBP and DBP were measured in the supine position in both studies and pulse pressure (PP) was calculated as SBP-DBP. Main outcome variables were 4-year mortality, Mini-Mental State Examination (MMSE) scores, dementia and blood pressure change with age and over the years. Treatment with antihypertensive drugs was also considered.

Blood pressure changes with age and time were investigated using 1133 blood pressure measurements from 705 individuals aged ≥ 70 years performed between 1981 and 2005. DBP continually decreased with increasing age, whereas SBP and PP increased up to age 74.5 and 80.6 years, respectively, to then start decreasing. Mean SBP and DBP also decreased over the years. The prevalence of treatment with antihypertensive drugs increased during the same period and is probably one explanation for the decrease in blood pressure with time. Blood pressure also decreased in longitudinal analyses of those individuals who participated in more than one data collection. Women had higher SBP and PP than men.

The association between blood pressure and 4-year mortality was investigated in a sample of 348 individuals aged ≥ 85 years. Results indicated a non-linear association between SBP and mortality, i.e. both lower and higher SBP were associated with increased mortality. The lowest mortality risk was associated with an SBP of 164 mmHg (95% confidence interval 154-184 mmHg). The analyses were adjusted for a number of diseases and health factors and thus suggest a negative effect of low SBP on survival, independent of health status. There was no association between DBP or PP and 4-year mortality.

The impact of blood pressure on MMSE scores and dementia was investigated both in a cross-section of 575 individuals and longitudinally in two samples including 102 and 205 individuals, respectively, all ≥ 85 years old. Cross-sectional analysis demonstrated nonlinear associations between SBP and PP and MMSE scores, indicating poorer cognitive function with both low and high blood pressure. The association between DBP and MMSE scores was linear, higher DBP being associated with higher scores. Individuals with dementia had lower blood pressure than those without dementia. Longitudinally, over five years, no association between baseline blood pressure and incident dementia or change in MMSE scores could be demonstrated. Mean blood pressure declined over this time period, and this decline was greater in individuals who developed dementia than in those who remained dementia free. A greater decline in blood pressure was associated with a greater decline in MMSE scores.

In conclusion, this study has shown a decrease in both SBP and DBP in advanced age and also that low blood pressure is associated with both increased mortality and poor cognitive function in very old people. These associations might not be fully explained by underlying disease or poor health status; the underlying mechanisms are so far mostly speculative. Very high blood pressure might also remain a risk factor for the mentioned outcomes even in very old age, at least in some people. No association between baseline blood pressure and cognitive decline or incident dementia could be demonstrated, but blood pressure decline was associated with cognitive decline and incident dementia. The direction of this association remains to be determined. Blood pressure also decreased over the years from 1981 to 2005, probably partly due to an increasing prevalence of treatment with antihypertensive drugs.

Keywords

Blood pressure, hypertension, very old, mortality, epidemiology, cognitive impairment, dementia.

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