

## Blood Pressure Variability at Midlife: Independent Harbinger of CHD, Stroke and All-Cause Long-Term Mortality

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### **Objective:**

Recent data suggested that visit-to-visit variability of blood pressure is reproducible and not a random phenomenon. We present results from the Israeli IHD study (IIHD) to determine the association of blood pressure with long-term all-cause and cause-specific mortality.

### **Patients and Methods:**

Of 10,059 men, aged 40-65, tenured civil servants and municipal employees in the areas of Tel Aviv, Haifa and Jerusalem, 9398 participated in three extensive examinations in 1963, 1965 and 1968. Hazard ratios (HR) associated with quartiles of the standard deviation of systolic blood pressure for standard deviation of systolic blood pressure (SD-SBP) across study visits, were calculated using Cox's PH model for 5-yr CHD incidence, 29-year stroke and CHD mortality and 37-year all-cause mortality, with the lowest quartile serving as the referent.

### **Results:**

SD-SBP was not associated with 5-yr incidence of CHD. Conversely, the multivariate analysis of 29-year CHD mortality (1968-1997, 1592 deaths among 9198 men) yielded a significant association with the SD-SBP. The table shows the HR in Quartiles 2-4 of SD-SBP, adjusted for age, cigarette smoking, diabetes mellitus, serum cholesterol and socioeconomic status (SES).

**Table: Hazard ratios for CHD mortality by quartiles of SD of SBP**

Variable	HR	P	[95% CI]
Age (5yrs)	1.45	0.000	1.39 1.50
Baseline SBP (20mmHg)	1.38	0.000	1.31 1.44
Quartile 2	1.13	0.150	0.96 1.32
Quartile 3	1.50	0.000	1.29 1.73
Quartile 4	1.53	0.000	1.31 1.77
Ever smoked	1.45	0.000	1.31 1.64
Diabetes	2.30	0.000	1.94 2.76
cholesterol 63 (40mg/dL)	1.31	0.000	1.25 1.38
SES	0.96	0.075	0.93 1.00

The results for Stroke mortality (N=606) similarly indicated increasing risk with increasing size of SD-SBP: HRs=1.23(0.96-1.59), 1.27(0.99-1.63) and 1.60(1.26-2.03). For total mortality (1968-2005) the corresponding hazards were: 1.06 (0.99-1.13), 1.13(1.06- 1.20) and 1.20 (1.12-1.28). Analysis of stroke mortality using SD of diastolic pressure revealed a similar pattern, HR=1.24, 1.27 and 1.74 for quartiles 2, 3, 4 respectively.

### **Conclusion:**

In this cohort of tenured male workers, higher variability of SBP measurements taken in 1963-5-8 have been clearly predictive of very long-term CHD and stroke mortality.