

# A low or high ankle brachial index increased the risk for all-cause mortality in Native Americans

Resnick HE, Lindsay RS, McDermott MM, et al. Relationship of high and low ankle brachial index to all-cause and cardiovascular disease mortality: the Strong Heart Study. *Circulation*. 2004;109:733-9.

## QUESTION

In Native Americans, is a low or high ankle brachial index (ABI) associated with an increased risk for all-cause and cardiovascular disease (CVD) mortality?

## METHODS

**Design:** Cohort study with a mean follow-up of 8.3 years.

**Setting:** Native American communities in the United States.

**Participants:** 4393 Native Americans 45 to 74 years of age (mean age 56 y, 59% men) who were followed for all-cause and CVD mortality.

**Risk factors:** Baseline ABI categorized as low (ABI < 0.9), normal (ABI ≥ 0.9 and ≤ 1.4), or high (ABI > 1.4). Potential confounders included age, sex, diabetes, lipid levels, hypertension, renal function, fibrinogen levels, and smoking history. Associations between categories of ABI and all-cause mortality (with adjustment for confounding) were assessed using Cox regression models.

**Outcomes:** All-cause and CVD mortality.

## MAIN RESULTS

4.9%, 85.9%, and 9.2% of participants were in the low, normal, and high ABI groups, respectively. During follow-up, 23.3% of participants died, with 26.6% of deaths attributed to CVD. Overall, and among a subgroup of participants with diabetes, the

rate of all-cause mortality was greater in each of the low and high ABI groups than in the normal ABI group (Table). Among subgroups of participants with impaired fasting glucose and those without diabetes, the rate of all-cause mortality was greater in the high ABI group than in the normal ABI group; the low and normal ABI groups did not differ for all-cause mortality (Table). The rates of CVD mortality were greater in each of the low and high ABI groups than in the normal ABI group for all participant groups (Table). After adjusting for the potential confounders, associations between ABI and both all-cause mortality (low ABI hazard ratio [HR] 1.7,

95% CI 1.3 to 2.1, and high ABI HR 1.8, CI 1.5 to 2.1) and CVD mortality (low ABI HR 2.5, CI 1.7 to 3.6, and high ABI HR 2.1, CI 1.5 to 2.9) remained significant.

## CONCLUSION

In Native Americans, a low or high ankle brachial index was associated with an increased risk for all-cause and cardiovascular disease mortality.

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## Association between ankle brachial index (ABI) and all-cause and cardiovascular disease (CVD) mortality in Native Americans\*

Comparisons	Participant groups	All-cause mortality		CVD mortality	
		Deaths/1000 person-y	Rate ratio (95% CI)	Deaths/1000 person-y	Rate ratio (CI)
Low vs normal ABI	No diabetes	27.5 vs 17.7	1.6 (0.9 to 2.7)	11.0 vs 3.5	3.2 (1.4 to 7.5)
	IFG	38.5 vs 18.4	2.0 (0.9 to 5.1)	15.4 vs 2.8	5.7 (1.3 to 25.1)
	Diabetes	70.5 vs 31.0	2.3 (1.8 to 3.0)	31.7 vs 8.6	3.8 (2.5 to 5.6)
	All participants	53.8 vs 23.6	2.3 (1.9 to 2.9)	23.6 vs 5.6	4.3 (3.0 to 6.1)
High vs normal ABI	No diabetes	35.9 vs 17.7	2.1 (1.4 to 3.2)	8.6† vs 3.5	2.5 (1.1 to 5.9)
	IFG	37.6 vs 18.4	2.2 (1.2 to 4.0)	9.4 vs 2.8	3.6 (1.0 to 12.7)
	Diabetes	75.7 vs 31.0	2.6 (2.1 to 3.1)	23.3 vs 8.6	2.9 (2.0 to 4.1)
	All participants	61.8 vs 23.6	2.8 (2.3 to 3.3)	18.1 vs 5.6	3.4 (2.5 to 4.6)

\*Low ABI = ABI < 0.9; normal ABI = ABI ≥ 0.9 and ≤ 1.4; high ABI = ABI > 1.40; IFG = impaired fasting glucose. CI defined in Glossary.

†Incidence rate provided by author.

## COMMENTARY

The study by Resnick and colleagues accomplished several tasks, while setting the stage for further research. First, the use of a large and homogeneous study population confirmed the value of an ABI < 0.9 as a risk stratifier for coronary artery disease. This in itself is valuable. Furthermore, the ABI is a simple, noninvasive clinical examination that seems to allow the prediction of risk for CVD at an early stage.

The second interesting finding is the potential for high ABI (defined as ABI > 1.4) to be an equally strong risk stratification factor. It is perhaps too early to recommend widespread use of this second observation because the population studied had a high prevalence of CVD. Rather, it should be validated in a different set of patients.

Consistency across populations for low ABI values exists; therefore, the argument could be made that there should be no difference with high ABI indices. However, once the ABI is determined, what is the use of the result over time and how does it change with corresponding changes in other risk factors? This solid investigation lays the groundwork for further research in this area.

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