Phosphorus levels and future coronary calcification in community-dwelling young adults: the Coronary Artery Risk Development in Young Adults (CARDIA) study

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Introduction

- The major objective of this study was to determine whether an association exists between phosphorus levels and coronary artery calcium (CAC) levels in community-dwelling young adults.

Methods

- CARDIA is an ongoing prospective, multicenter, observational study of cardiovascular disease in young adults. Initially, 5,115 participants, aged 18 to 30 years, were studied between 1985 and 1986 in Birmingham, Alabama; Chicago, Illinois; Minneapolis, Minnesota; and Oakland, California. A random sampling scheme was used to ensure that population-based samples were balanced within centers by age, race, sex, and education level.

- An Imatron (South San Francisco, California) C-150 electron beam scanner, a GE (Fairfield, Connecticut) Lightspeed multidetector scanner, or a Siemens (Berlin, Germany) VZ multidetector scanner was used for computed tomography (CT) scanning of the coronary arteries.

- The analysis was restricted to subjects with CT scans at year 15. Linear regression was used to examine the associations of baseline serum phosphorus levels. Logistic regression was used to examine the association between baseline phosphorus levels and CAC 15 years later.

Results

- Table 1 shows the baseline characteristics of the 3,015 participants who underwent coronary CT scanning. The mean phosphorus level was 3.6 mg/dL; calcium, 9.5 mg/dL; and calcium-phosphorus product 26.3 mg²/dL². The mean estimated glomerular filtration rate was 116.6, and values for 0.2% of participants were below 60.

- Multivariate associations of serum phosphorus (Table 2) included younger age, female sex, African American race, family history of myocardial infarction, low body mass index, HDL-cholesterol, triglycerides, and lower systolic blood pressure.

- At year 15, 3.2% of the study population had minimal CAC, 4.8% had mild CAC, 1.1% had moderate CAC, and 0.5% had severe CAC (Figure 1). Higher phosphorus levels were associated with a greater likelihood of higher CAC categories (adjusted odds ratio 1.18 per 0.5 mg/dL, P = 0.0208. Multivariate P-spline plot analysis (Figure 2) suggested that phosphorus levels above 3.9 mg/dL were associated with greater likelihood of CAC ≥ 100.

Conclusions

- Phosphate levels in the normal range may be risk factors for coronary artery atherosclerosis in community-dwelling young adults. Intervention trials may be indicated to ascertain the causality of this association.

![Figure 1. Cumulative frequency distribution (%) of coronary artery calcium (CAC) scores at year 15. The dotted vertical line delineates the following categories: minimal (0-49), mild (50-99), moderate (100-499), severe (500-999), and greater than 1000.](image)

![Figure 2. Spline plot relating adjusted odds ratio (AOR, with 95% confidence intervals) of CAC ≥ 100.](image)