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Circulating alpha-tocopherol and insulin sensitivity among elderly men with chronic kidney disease

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OBJECTIVES

Insulin resistance is common in individuals with chronic kidney disease (CKD) and may be partly explained by modifiable risk factors. In the general population, vitamin E supplementation has been suggested to improve both insulin sensitivity and secretion. We here explore the potential role of vitamin E as a modifiable risk factor for insulin resistance among individuals with CKD.

METHODS

Cross-sectional analysis including 273 non-diabetic men aged 70-71 years with CKD defined as either cystatin-C estimated glomerular filtration rate (eGFR) <60 mL/min/1.73m^2 or urinary albumin excretion rate (UAER) ≥20 µg/min. Insulin sensitivity index (M/I ratio) was measured by hyperinsulinemic euglycemic glucose clamps. Serum α-, β-, and γ-tocopherol concentrations were measured by high-performance liquid chromatography and expressed as mg/total serum cholesterol and triglycerides (in mmol). Uni- and multivariate regression models were fitted to assess the association between M/I and circulating concentrations of tocopherols.

RESULTS

The mean serum concentration of α-, β-, and γ- was 1.61±0.28, 0.04±0.01, and 0.19±0.07 mg/mmol, respectively. In crude and fully-adjusted multivariable regression analyses, serum α-tocopherol levels were directly and strongly associated with M/I (standard β=0.18, P=0.001), see **Table 1** and **Fig.1**. No such association was observed for serum β- and γ-tocopherol concentrations.
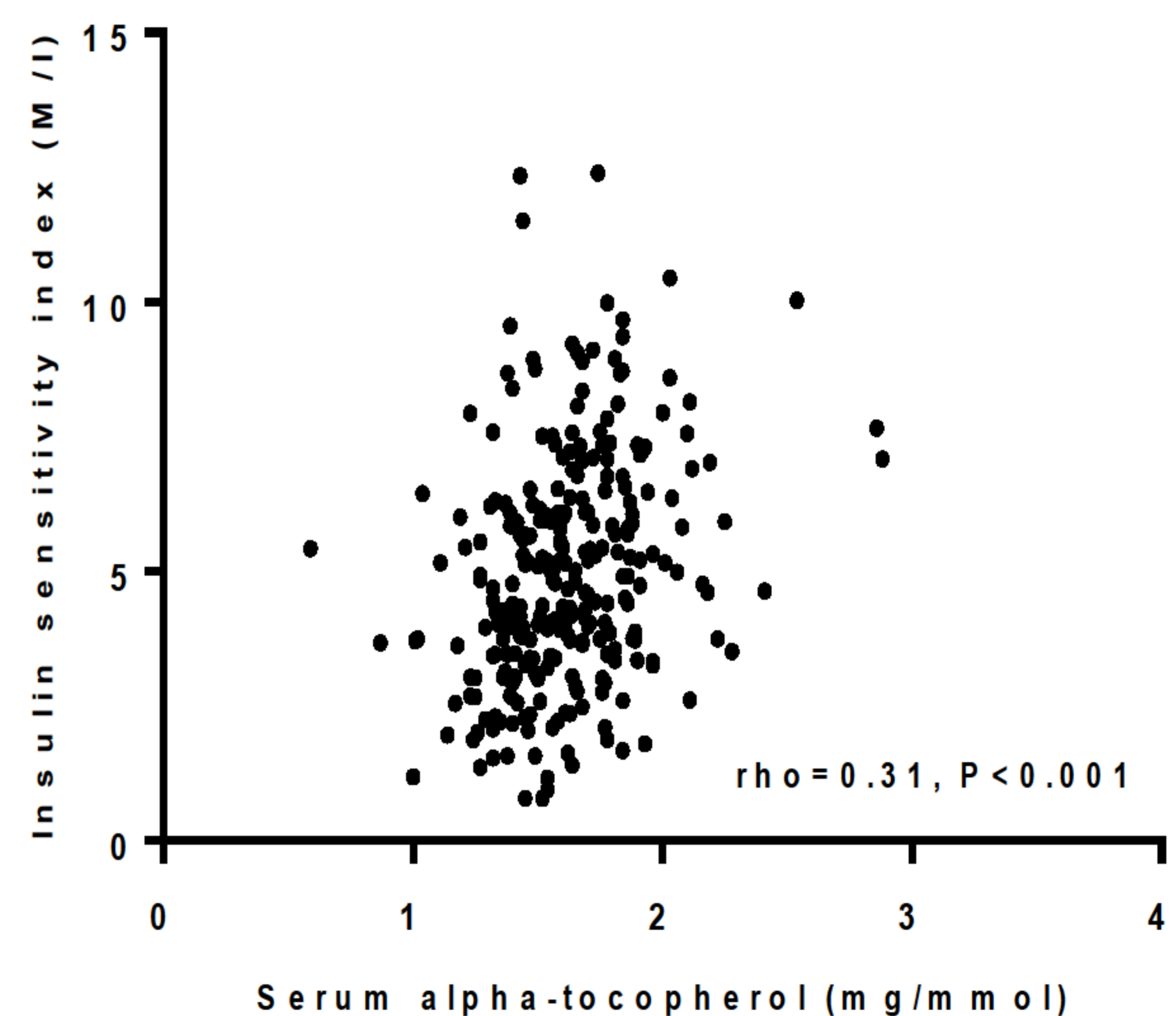

Figure 1 Association between serum α-tocopherol and insulin sensitivity index (M/I) in 273 CKD older men without diabetes.

Variables	Univariate rho (P)	Multivariate [a] β-coefficent (P)
Age, years	0.01 (0.82)	0.00 (0.99)
BMI, kg/m^2	-0.52 (<0.001)	-0.36 (<0.001)
Physical activity, n (%)	0.13 (0.04)	0.16 (0.003)
Smokers, (%)	0.11 (0.06)	-
Cardiovascular disease, (%)	-0.14 (0.02)	-0.09 (0.09)
Hypertension, (%)	-0.17 (0.01)	-0.10 (0.06)
UAER (µg/min)	-0.15 (0.02)	-0.03 (0.56)
eGFR, ml/min per 1.73m^2	0.13 (0.04)	0.03 (0.65)
Adiponectin, mg/L	0.41 (<0.001)	0.25 (<0.001)
hs-CRP	-0.21 (<0.001)	0.00 (0.99)
Serum α-tocopherol (mg/mmol)	0.31 (<0.001)	0.18 (0.001)
Serum β-tocopherol (mg/mmol)	0.05 (0.39)	-
Serum γ-tocopherol (mg/mmol)	0.01 (0.82)	-

Table 1. Univariate and multivariate correlates with insulin sensitivity index M/I (mg·min-1·kg-1/100mU/liter) in 273 CKD older men without diabetes.

CONCLUSIONS

Serum α-tocopherol concentration associates with insulin sensitivity in non-diabetic older men with CKD. Although observational in nature, such finding is consistent with the hypothesis that vitamin E supplementation may improve insulin sensitivity in this patient population.