The Association between Trace Elements and Risk of Coronary Heart Disease in United States Adults

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BACKGROUND:

- Coronary heart disease (CHD) arises due to a reduced supply of oxygen-rich blood to the heart's muscles, usually caused by the narrowing of the blood vessels by plaques deposited in their lumen.
- It is the leading cause of mortality across all gender, race, and ethnic groups in the U.S. and affects 18.2% of adults aged 20 years and over.
- Trace elements are chemical elements found in the body in minute amounts that play an essential role in specific biological and molecular processes in the body (example: iron in hemoglobin).
- There is an inconsistent association of trace elements with CHD in literature.
- We evaluated:
  - ➢The relationship between the serum concentration of various trace elements and CHD risk among U.S. adults aged 20 to 79 years in the 2011-2018 NHANES cycle.
  - ➢Whether there is a racial disparity in CHD occurrence among U.S. adults aged 20 to 79 years in the 2011-2018 NHANES cycle.

METHODS:

Study design and Data source

Cross-sectional study using secondary data from the National Health and Nutrition Examination Survey (NHANES) for the 2011-2018 cycles.

Study Participants

Eligibility criteria

- ➢ Age 20 to 80 years
- ➢ Non-pregnant females

Exposure: Trace elements

zinc, copper, manganese, selenium, and cobalt.

Outcome: Coronary Heart Disease

- Definition – history of angina, prior CHD, prior heart attack, chest pain walking uphill, and severe chest pain lasting more than thirty minutes.
- Study participants with a positive response to any of the above listed variables were classified as having CHD.

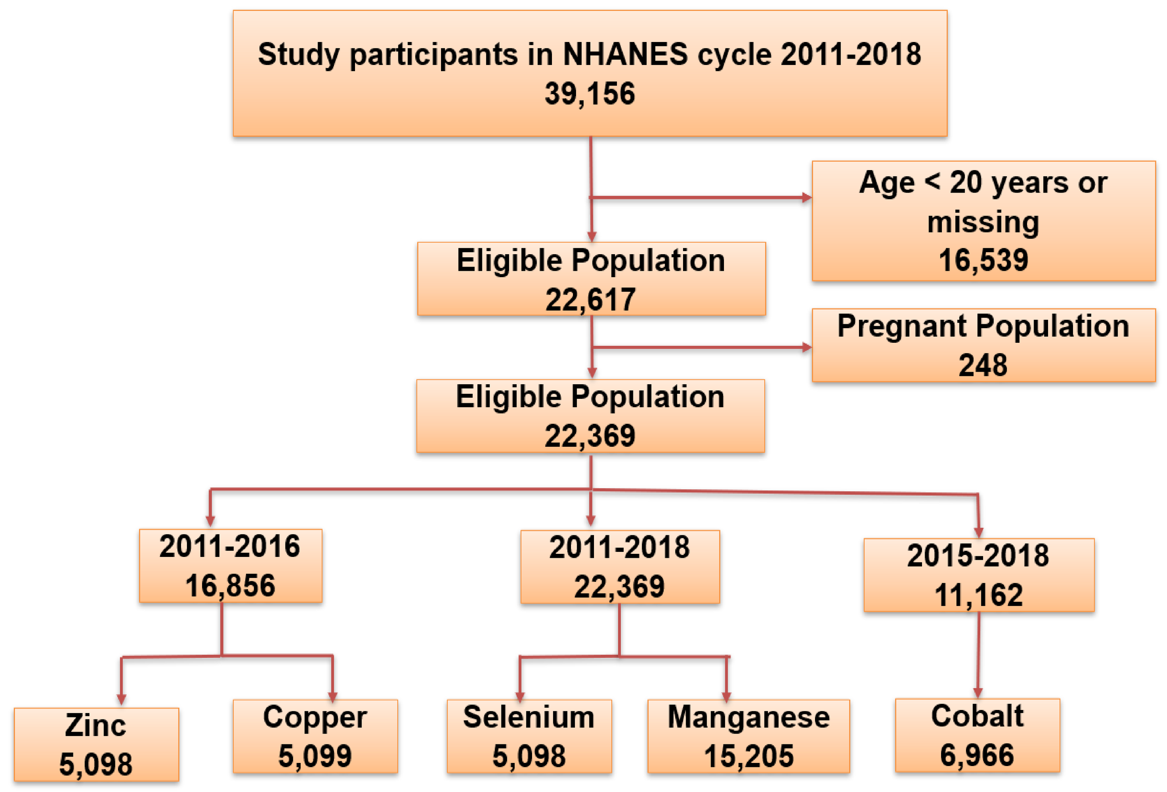

Figure 1. Study Participants' flow chart using data from the 2011 to 2018 NHANES cycles

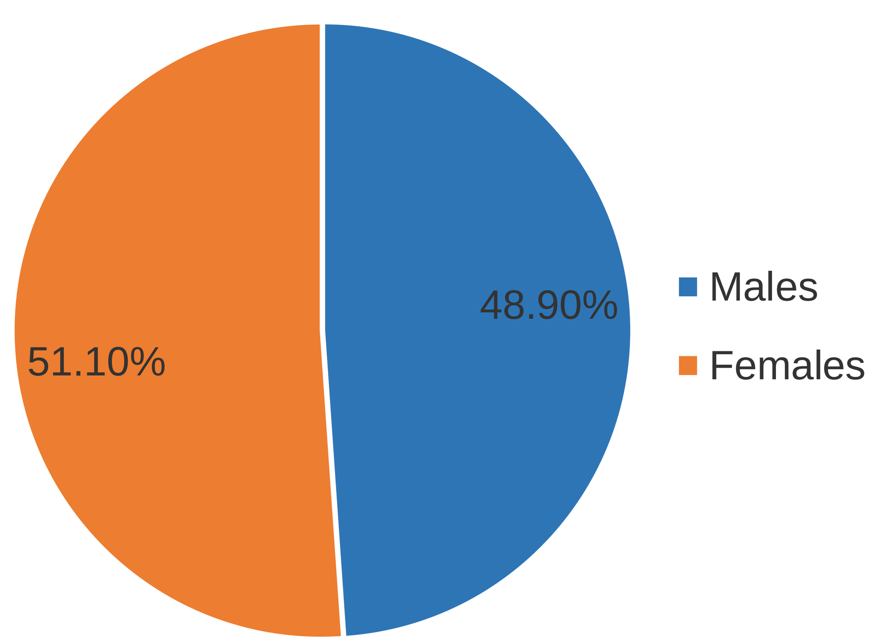

Figure 2. Sex Distribution among Study Participants using Data from the 2011 to 2018 NHANES cycles (n=22,369)

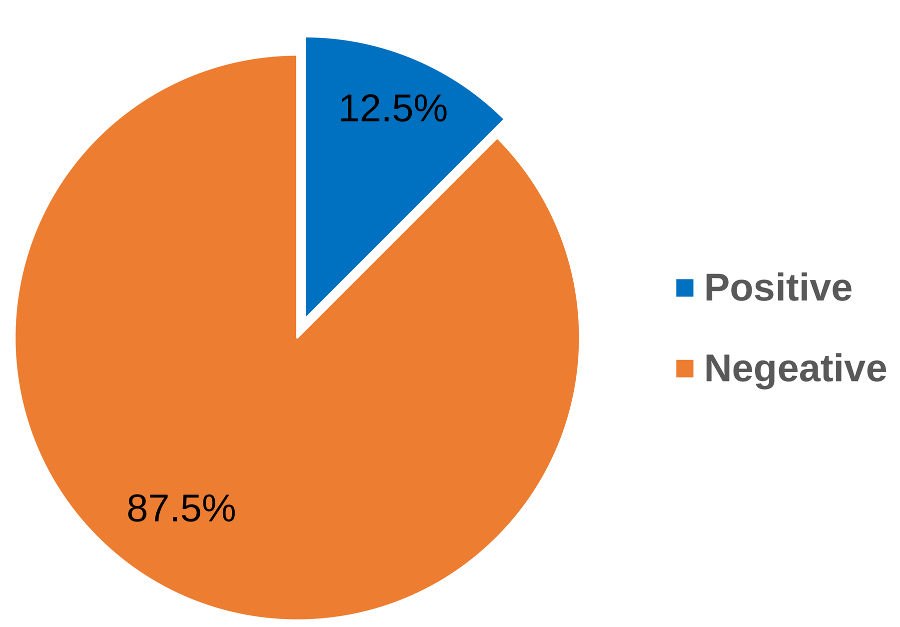

Figure 3. Prevalence of Coronary Heart Disease (CHD) in the Study Population (n=22,369)

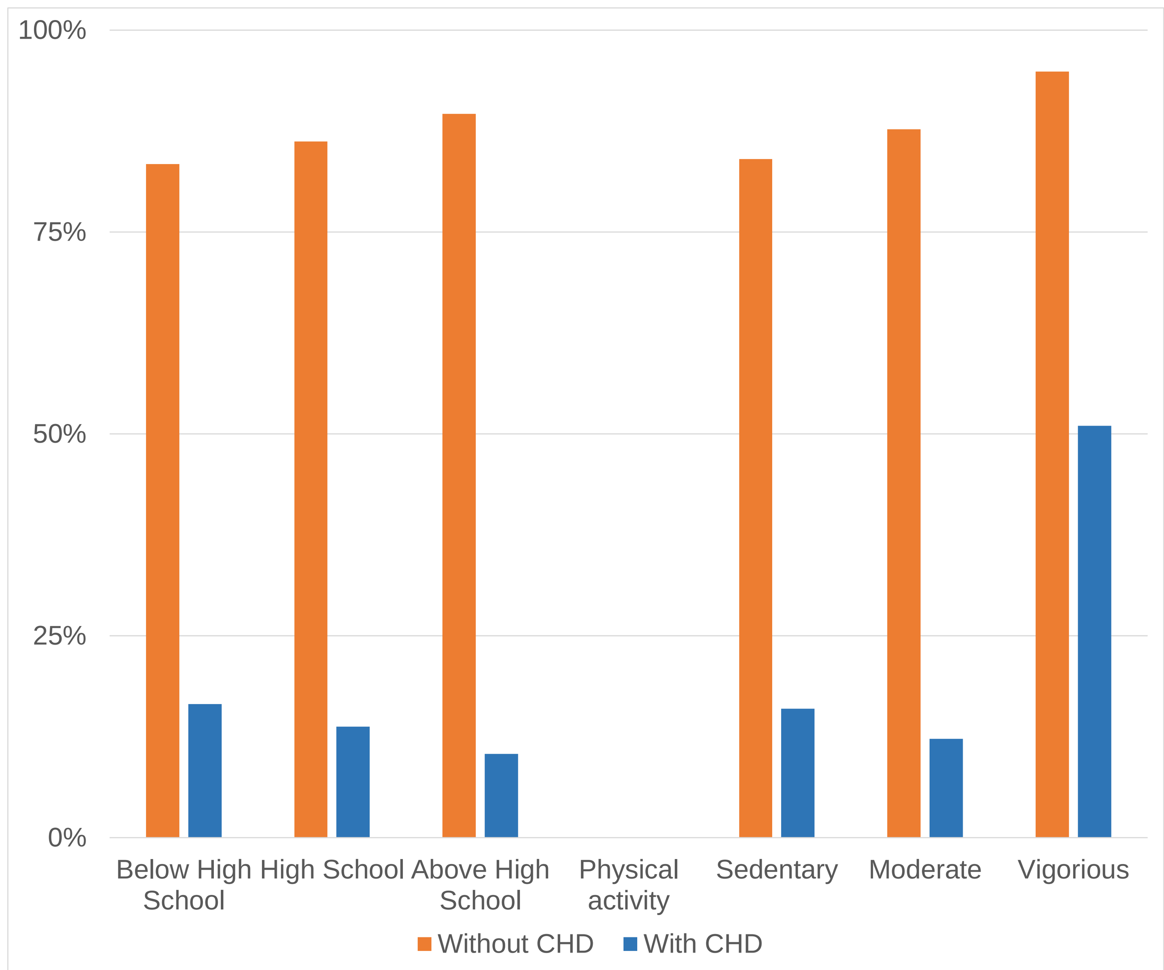

Figure 4. Distribution of Level of Education and Physical Activity of Study Participants according to CHD Status

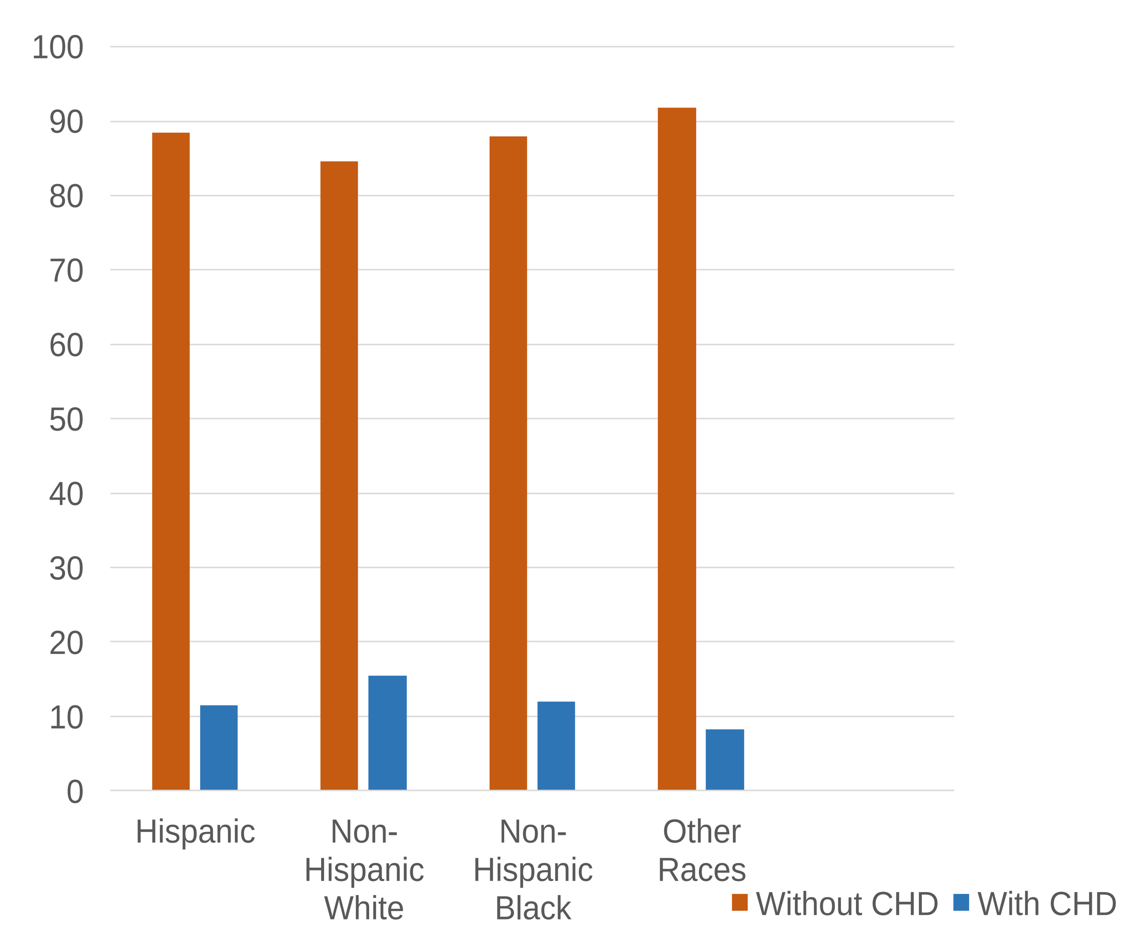

Figure 5. Distribution of Race according to CHD Status among Study Participants using Data from the 2011 to 2018 NHANES cycles (n=22,369)

Table 1. Models for the association of Trace Elements and Coronary Heart Disease among U.S. adults in the NHANES Datasets 2011-2018

	Quartile 1	Quartile 2	Quartile 3	Quartile 4
Zinc (µg/dL)	<71.1	≥71.1 to <80.4	≥80.4 to <90.3	≥90.3
OR (95% CI)	1 (Ref)	0.94 (0.72-1.23)	0.92 (0.70-1.20)	0.91 (0.69-1.19)
Copper (µg/L)	<99.4	≥99.4 to <114.6	≥114.6 to <133.7	≥133.7
OR (95% CI)	1 (Ref)	1.13 (0.85-1.50)	1.29 (0.97-1.72)	1.39 (1.03-1.90)
Selenium (µg/dL)	<178.5	≥178.5 to <192.8	≥192.8 to <208.2	≥208.2
OR (95% CI)	1 (Ref)	0.68 (0.52-0.88)	0.71 (0.54-0.91)	0.71 (0.55-0.93)
Manganese (µg/L)	<7.41	≥7.41 to <9.26	≥9.26 to <11.67	≥11.67
OR (95% CI)	1 (Ref)	0.87 (0.75-1.00)	0.93 (0.81-1.08)	0.98 (0.84-1.14)
Cobalt (µg/L)	<0.12	≥0.12 to <0.15	≥0.15 to <0.19	≥0.19
OR (95% CI)	1 (Ref)	1.04 (0.86-1.27)	1.19 (0.98-1.46)	1.43 (1.17-1.74)

Model is age, sex, race, activity level, smoking, education, family income to poverty ratio, waist circumference, and underlying medical diagnoses adjusted.

CONCLUSIONS:

- There was a positive association between higher blood copper levels and CHD.
- There was an inverse association between selenium concentrations and CHD.
- Higher concentrations of cobalt was associated with higher odds of CHD.
- Zinc and Manganese were not associated with CHD.
- Hispanics, blacks, and other races had lower CHD odds than non-Hispanic whites.

References:

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