Profile of Atherosclerosis in a US Representative Sample

Jennifer G. Robinson, MD,[1] Kathleen M. Fox, PhD,[2] Michael F. Bullano, PharmD,[3] Susan Grandy, PhD,[3] for the SHIELD Study Group
[1]University of Iowa, Iowa City, IA; [2]Strategic Healthcare Solutions, LLC, Monkton, MD; [3]AstraZeneca Pharmaceuticals LP, Wilmington, DE

BACKGROUND

- Atherosclerosis, including coronary artery disease, cerebrovascular disease, and peripheral arterial disease, is one of the most common causes of death and disability in the US and throughout the world[1]
- More than 25 million people in the US have at least one clinical manifestation of atherosclerosis, and in many more individuals, atherosclerosis remains a latent precursor of significant CVD events, including MI and stroke[1]
- Identifying adults with atherosclerosis before an MI or stroke would be instrumental for early prevention
- Evidence is limited on the prevalence of atherosclerosis among adults in the US population and on understanding the characteristics of individuals with subclinical atherosclerosis before an MI or stroke

OBJECTIVE

- Evaluate the characteristics of individuals with a self-reported diagnosis of atherosclerosis but not yet associated with an MI or stroke to assist in the early identification of high-risk individuals

METHODS

Study Design

- **S**tudy to **H**elp **I**mprove **E**arly evaluation and management of risk factors **L**eading to **D**iabetes (SHIELD), a population-based survey conducted to better understand the risk for the development of diabetes and CVD, as well as disease burden
  - Based upon a screening questionnaire mailed to 200,000 nationally representative households, responses for 211,097 adults from 127,420 households (64% response rate) were obtained
  - A baseline survey (2004) was sent to 22,001 selected individuals derived from the screening respondents to capture self-reported information on health status, attitudes and behaviors, anthropometry, and medication use from this representative sample of the US population
- This study was a cross-sectional analysis of the baseline survey data

Study Population

- Respondents were 18 years of age or older
- Only those individuals without a history of clinical CVD at baseline (i.e., no history of heart disease/heart attack, stroke, or revascularization) were included in the analysis
- Respondents were categorized as having subclinical atherosclerosis at baseline if they reported a diagnosis of narrow or blocked arteries (i.e., carotid artery disease)
- A comparison cohort was identified as those respondents who did not report a diagnosis of atherosclerosis and who had no prior history of CVD event

Statistical Analyses

- Prevalence of subclinical atherosclerosis was calculated as the number of adults reporting a diagnosis of subclinical atherosclerosis at the baseline survey divided by the total number of respondents to the baseline survey
- Demographic features, comorbidities, obesity, and smoking of individuals with subclinical atherosclerosis were compared with those characteristics of respondents who did not report subclinical atherosclerosis or previous CVD event, using two-sided chi-square tests
- Logistic regression analyses identified characteristics associated with self-reported subclinical atherosclerosis. The model included respondents with and without subclinical atherosclerosis, and age, gender, race, household income, education, geographic region, abdominal obesity, dyslipidemia, circulatory problems, diabetes mellitus, hypertension, smoking, and cholesterol test performed in past year were independent variables
- Statistical significance was set *a priori* at $p < 0.05$

RESULTS

- 17,640 respondents completed the baseline survey, of whom 14,084 did not report a prior CVD event (3,556 respondents had a prior CVD event and were excluded)
- 13,596 of the 14,084 respondents did not report a diagnosis of subclinical atherosclerosis nor prior CVD event and were classified as the comparison cohort

Prevalence of subclinical atherosclerosis

- 488 of 14,084 respondents (3.5%) reported a diagnosis of subclinical atherosclerosis

Table 1. Baseline characteristics of SHIELD respondents with and without subclinical atherosclerosis

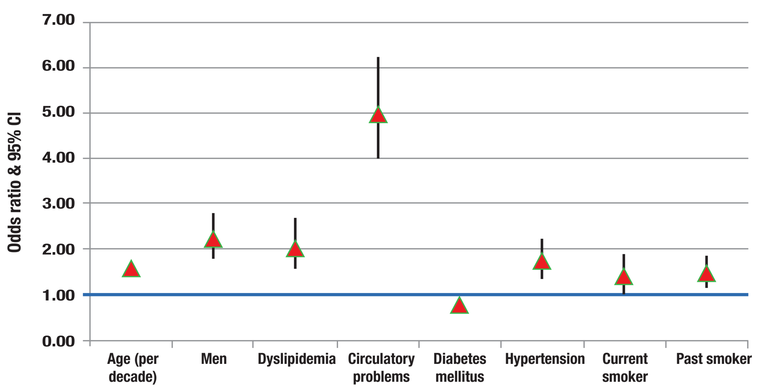
Characteristics	Subclinical atherosclerosis at baseline (n = 488)	No atherosclerosis at baseline (n = 13,596)
Age, years, mean (SD)	66.9 (12.8)*	51.3 (15.6)
Men, %	57*	36
Race, % white	88	87
Income, % ≥ $40,000/year	47*	58
Education, % some college or graduate degree	64*	71
Dyslipidemia, %	82*	48
Circulatory problems, %	41*	9
Hypertension, %	77*	43
Diabetes mellitus, %	37*	31
Body mass index ≥ 30 kg/m², %	52	48
Abdominal obesity, %	85*	71
Cholesterol test in past year, %	94*	71
Current smoker, %	17	18
Past smoker, %	49*	29

*$p < 0.01$

- Individuals reporting a diagnosis of atherosclerosis were significantly older, male, less educated, and had lower income than respondents without atherosclerosis ($p < 0.01$)
- Compared with respondents without atherosclerosis, a significantly greater proportion of respondents with atherosclerosis reported dyslipidemia, circulatory problems, hypertension, diabetes mellitus, abdominal obesity, and a cholesterol test in the past year, and were past smokers (all $p < 0.01$)
- There was no difference between respondents with subclinical atherosclerosis and individuals without atherosclerosis for race, body mass index of ≥30 kg/m², or current smoking

Predictors of Subclinical Atherosclerosis

Figure 1. Odds ratio of having subclinical atherosclerosis (n = 9,672)



Odds ratio = 1.0 indicates that there is no increased or decreased risk of subclinical atherosclerosis. When 95% confidence interval crosses 1.0, then the association is not statistically significant

- Logistic regression analyses demonstrated that older individuals, men, smokers, and individuals with a diagnosis of dyslipidemia, circulatory problems, or hypertension were at increased odds of having subclinical atherosclerosis ($p < 0.05$)
  - Odds of subclinical atherosclerosis were 2 times greater among men than women and among respondents with dyslipidemia, compared with respondents without dyslipidemia ($p < 0.0001$)
  - Respondents with circulatory problems* were 5 times more likely to have subclinical atherosclerosis than respondents without circulatory problems ($p < 0.0001$)
    *Survey question: "Have you ever been told by a doctor that you have circulation problems of any kind?"
- There was no significant increased odds of subclinical atherosclerosis for race, household income, education, abdominal obesity, or having a cholesterol test in past year after adjusting for other covariates
- Model c-statistic = 0.964

LIMITATIONS

- Prior history of CVD events and the diagnosis of atherosclerosis were self-reported and could not be confirmed through respondents' medical records or diagnostic procedures
- Household panels, like the SHIELD study, tend to under-represent certain socio-economic extremes of the population and do not include military or institutionalized individuals

SUMMARY

- The proportion of respondents reporting a diagnosis of subclinical atherosclerosis was low; many more respondents may have had subclinical atherosclerosis that was not symptomatic or diagnosed
- Several characteristics, easily obtained through self-report, distinguished respondents with subclinical atherosclerosis
  - Older age, male gender, and smoking were predictive of respondents with subclinical atherosclerosis
  - Clinically, having dyslipidemia, circulatory problems, or hypertension was predictive of individuals with subclinical atherosclerosis
- The risk factors for self-reported subclinical atherosclerosis, defined as blocked arteries or carotid artery disease in this study, are similar to those for coronary artery calcium in the Multiethnic Study of Atherosclerosis (MESA)[2]

CONCLUSIONS

- Demographic and clinical factors can be easily and routinely assessed by primary care physicians to detect those at risk of subclinical atherosclerosis
- Atherosclerosis is a chronic and progressive disease, and its optimal prevention requires lifelong attention to weight management, smoking abstinence, and aggressive risk factor identification and treatment
- If management of risk factors and treatment of comorbid conditions are implemented early in the process, atherosclerosis may be delayed or slowed, which can lead to prevention of CVD events

Abbreviations

Abbreviation	Definition
CI	Confidence interval
CVD	Cardiovascular disease
MI	Myocardial infarction
SHIELD	Study to Help Improve Early evaluation and management of risk factors Leading to Diabetes
US	United States

References

1. Faxon DP, et al. *Circulation* 2004;109:2595–2604
2. Kronmal RA, et al. *Circulation* 2007;115:2722–2730

This research was supported by AstraZeneca Pharmaceuticals LP
Presented at the XV International Symposium on Atherosclerosis, Boston, MA, June 14-18, 2009