Positive Association Between Plasma Fibrinogen Level and Incident Hypertension Among Men
Population-Based Cohort Study

Anoop Shankar, Jie Jin Wang, Elena Rochtchina, Paul Mitchell

Abstract—Elevated plasma fibrinogen is implicated in cardiovascular disease. However, it is not clear whether fibrinogen levels predict the development of hypertension. We examined the relationship between plasma fibrinogen level and hypertension in a population-based cohort study of 3654 participants (mean age: 61.5 years; range: 49 to 84 years) at the baseline examination (1992–1994) in the Blue Mountains region, west of Sydney, Australia, who were examined 5 years (1997–1999) later. Main outcomes of interest were prevalent hypertension (systolic blood pressure $\geq 140$ mm Hg, diastolic blood pressure $\geq 90$ mm Hg, or a combination of self-reported hypertension diagnosis and use of antihypertensive medications) at baseline ($n=2212/3180$) and 5-year incidence of hypertension among baseline normotensive individuals ($n=361/637$). Elevated plasma fibrinogen level was positively associated with prevalent hypertension both among men and women and positively associated with 5-year incident hypertension among men, independent of several cardiovascular risk factors. Multivariable odds ratio (95% CI) of 5-year incident hypertension comparing tertile 3 of plasma fibrinogen ($\geq 3.9$ g/L) with tertile 1 ($\leq 3.2$ g/L) was 1.95 (1.03 to 3.68; $P=0.040$). This prospective association, however, was not observed in women (odds ratio; 95% CI) comparing tertile 3 versus tertile 1 of plasma fibrinogen (1.00; 0.54 to 1.86; $P=0.986$). Subgroup analyses stratified by smoking, body mass index, diabetes, and blood pressure categories supported this male gender–specific pattern of association. These data provide prospective epidemiological evidence of an essential link between plasma fibrinogen level and incident hypertension among men but not among women, a finding consistent with that observed in the Atherosclerosis Risk in Communities Study.

Key Words: fibrinogen $\bullet$ blood pressure $\bullet$ hypertension $\bullet$ cohort studies $\bullet$ inflammation $\bullet$ risk factors $\bullet$ Blue Mountains Eye Study

Across several studies, plasma fibrinogen is a consistent predictor of cardiovascular disease, subclinical atherosclerosis, peripheral vascular disease, and decreased survival. Several previous cross-sectional epidemiological studies reported a positive association between plasma fibrinogen level and elevated blood pressure and/or prevalent hypertension. In contrast, the only prospective study on this topic by Folsom et al reported that plasma fibrinogen level predicted 6-year incident hypertension among middle-aged men only, but not women, in the biracial Atherosclerosis Risk in Communities (ARIC) Study. The prospective association between plasma fibrinogen level and incident hypertension is still not clear, particularly by gender. In this report, we examined the association between plasma fibrinogen level and 5-year incident hypertension among men and women in an older Australian population, after adjusting for smoking, alcohol intake, body mass index (BMI), and other cardiovascular risk factors.

Methods

The Blue Mountains Eye Study (BMES) is a population-based cohort study of age-related eye diseases and other health outcomes in an older urban Australian population. After a door-to-door census of residents living in 2 postcodes in the Blue Mountains region, west of Sydney, persons born before January 1, 1943, were invited to attend a detailed examination at a local hospital. Baseline examination was performed on 3654 of 4433 (82.4%) eligible persons during 1992–1994. During the 5-year follow-up examination (1997–1999), 2335 (75.1%) surviving participants were re-examined. This study followed the recommendations of the Declaration of Helsinki, was approved by the Western Sydney Area Health Services Human
Research Ethics Committee, and written informed consent was obtained from all of the participants.

**Exposure Measurement**

The baseline examination and 5-year follow-up examination followed similar protocols and included measuring weight, height, and systolic and diastolic blood pressures (BP) by a trained interviewer and administering a standardized questionnaire collecting information regarding demographic characteristics, cigarette smoking, alcohol intake, physical activity, and medical histories.

Fasting blood specimens were drawn from 3222 participants (88%), centrifuged onsite, and then couriered within the same day to Westmead Hospital, Sydney, for hematology and clinical biochemistry assessment. Plasma fibrinogen was determined using the prothrombin time–derived technique on an ACL 300R coagulometer. White blood cell count was determined using a Coulter counter method. Total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C) and triglycerides (TGs) were measured on a Reflotron reflectance photometric analyzer (Boehringer Mannheim Diagnostics [currently Roche Diagnostics]). Fasting plasma glucose was measured by hexokinase method.

Age was defined as age at the baseline examination; education was categorized into beyond high school, high school, and below high school; BMI was calculated as weight (kilograms) divided by height (meters’); diabetes status was categorized using American Diabetes Association criteria, as follows: diabetes (diagnosis of diabetes by a physician and use of diabetic medications or fasting glucose levels ≥7.0 mmol/L [126 mg/dL]), fasting hyperglycemia (fasting glucose levels 6.1 mmol/L [110 mg/dL] to <7.0 mmol/L [126 mg/dL]), or normoglycemia (fasting glucose levels <6.1 mmol/L [110 mg/dL]); cigarette smoking was categorized into current (current status: yes or no), former (positively answered to “have you ever smoked regularly before?” and had given up smoking ≥12 months before the study examination), and never smoker; alcohol intake was categorized nondrinker, <once/week, 1 to 6 days per week, 1 to 2 drinks per day, ≥3 drinks per day, and don’t know/missing); physical inactivity (yes or no), and physical inactivity (yes or no) was categorized as answering negatively to “have you participated in any recreational exercise/walk in the last 2 weeks.”

**Outcomes of Interest**

Details of BP measurement and prevalence of hypertension in this older Australian community have been described previously. Briefly, systolic and diastolic BP were recorded by trained observers from the right arm with a mercury sphygmomanometer using a cuff size appropriate for the participant’s arm circumference, after he or she had been comfortably seated for 10 minutes. Hypertension was defined as per the Seventh Report of the Joint National Committee (JNC7) on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure as systolic BP of ≥140 mm Hg, diastolic BP of ≥90 mm Hg, or a combination of self-reported hypertension diagnosis and use of antihypertensive medications. BP was also classified according to JNC7 BP stages (normal [systolic values <120 mm Hg and diastolic values <80 mm Hg], prehypertension [systolic values 120 to 139 mm Hg or diastolic values 80 to 89 mm Hg], stage 1 hypertension [systolic values 140 to 159 mm Hg or diastolic values 90 to 99 mm Hg], and stage 2 hypertension [systolic values ≥160 mm Hg or diastolic values ≥100 mm Hg]). Prevalent hypertension was defined as the presence of hypertension according to these criteria at the baseline examination (1992–1994). Normotensive individuals at baseline who developed hypertension according to these criteria at the 5-year follow-up examination (1997–1999) were defined to have incident hypertension. Similar to previous studies, we also examined progression by ≥1 JNC7 BP stage during the 5-year follow-up period. For this analysis, we excluded 36 individuals who were taking antihypertensive medications, because their BP level could be affected by medication use.

To examine the association between plasma fibrinogen and 5-year incident hypertension, the current study included 637 hypertension-free individuals (286 men and 351 women) at the baseline examination from the 2334 individuals who participated in both the baseline and 5-year follow-up examination, after excluding those with missing baseline plasma fibrinogen tests (n=179), systolic or diastolic BP (n=20), and those with preexisting hypertension (n=1498). Similarly, we examined the cross-sectional association between plasma fibrinogen and prevalent hypertension among 3180 of the total 3654 individuals who participated in the baseline examination, after excluding missing baseline plasma fibrinogen tests (n=454) and systolic or diastolic BP measurements (n=20).

**Statistical Methods**

Baseline plasma fibrinogen was categorized into sex-specific tertiles (men: 1.6 to 3.2, 3.3 to 3.8, and 3.9 to 7.1 [g/L]; women: 2.2 to 3.4, 3.5 to 4.1, and 4.2 to 7.7 [g/L]) for the main analyses. Fibrinogen was also analyzed as a continuous variable (per 1 g/L increase). We performed separate analyses by gender. We used the χ² test and ANOVA to compare the relationship of selected baseline characteristics by gender. We first examined the cross-sectional association between plasma fibrinogen and prevalent hypertension and subsequently examined the prospective association between plasma fibrinogen and incident BP outcomes. We used multivariable logistic regression models to determine the odds ratio (OR) and 95% CI of prevalence hypertension (n=2212; first outcome of interest, cross-sectional analysis), 5-year incident hypertension (n=361; second outcome of interest, prospective analysis), and prospective increase by ≥1 JNC7 BP stage among study participants not taking antihypertensive medications (n=222; third outcome of interest, prospective analysis), controlling for potential confounders. We used 2 logistic regression models: an age (years)-adjusted model and a multivariable-adjusted model, additionally adjusting for smoking (current, former, or never), alcohol intake (nondrinker, <once/week, 1 to 6 days per week, 1 to 2 drinks per day, ≥3 drinks per day, or don’t know/missing), physical inactivity (yes or no), mean arterial BP (mm Hg), TC level (mmol/L), HDL-C level (mmol/L), and TG level (mmol/L); among women we additionally adjusted for menopausal status (absent or present) and ever use of hormone replacement therapy (yes or no). Logistic regression models with plasma fibrinogen tertiles as ordered categories scaled to the median for each tertile were used to assess trends in risk. To examine the consistency of the association between fibrinogen and incident hypertension, we performed analyses within subgroups of selected variables, including smoking categories (never, former, or current), BMI (<25 kg/m² or ≥25 kg/m²), and JNC7 BP categories (normal [systolic values <120 mm Hg and diastolic values <80 mm Hg], prehypertension [systolic values 120 to 139 mm Hg or diastolic values 80 to 89 mm Hg]). We calculated the population attributable risk (Levin formula) of incident hypertension associated with a plasma fibrinogen level ≥3.9 g/L (highest tertile). SAS version 9.2 was used for all of the analyses.

**Results**

**Baseline Characteristics**

Selected baseline characteristics of the cohort subjects included in the cross-sectional analyses are presented in Table 1. Mean age was 66 years. Women were more likely to be never smokers and nondrinkers, more likely to have higher TC and HDL-C levels and higher systolic BPs, and less likely to have diabetes mellitus and lower TG levels and circulating white blood cell counts compared with men.

Similarly, selected baseline characteristics of the cohort subjects included in the incident hypertension analysis are presented in Table 2. Mean age was 61.7 years among men and 61.2 years among women. Women were more likely to be never smokers and nondrinkers compared with men. Men had higher BMI and were more likely to have diabetes, lower TC and HDL-C, and higher TG levels compared with women.
TABLE 1. Baseline Characteristics of the Cohort Subjects (n=3180) Included in the Cross-Sectional Analysis by Gender

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Men (n=1366)</th>
<th>Women (n=1814)</th>
<th>P*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y†</td>
<td>66.0 (0.3)</td>
<td>66.0 (0.2)</td>
<td>0.71</td>
</tr>
<tr>
<td>Smoking, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never smoker</td>
<td>32.4</td>
<td>60.5</td>
<td></td>
</tr>
<tr>
<td>Former smoker</td>
<td>51.9</td>
<td>25.7</td>
<td></td>
</tr>
<tr>
<td>Current smoker</td>
<td>15.7</td>
<td>13.8</td>
<td></td>
</tr>
<tr>
<td>Alcohol intake, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nondrinker</td>
<td>22.3</td>
<td>38.9</td>
<td></td>
</tr>
<tr>
<td>&lt;Once per wk</td>
<td>15.7</td>
<td>21.2</td>
<td></td>
</tr>
<tr>
<td>1 to 6 d per wk</td>
<td>18.5</td>
<td>14.7</td>
<td></td>
</tr>
<tr>
<td>1 to 2 drinks per d</td>
<td>21.9</td>
<td>17.9</td>
<td></td>
</tr>
<tr>
<td>≥3 drinks per d</td>
<td>19.9</td>
<td>5.1</td>
<td></td>
</tr>
<tr>
<td>Don’t know/missing</td>
<td>1.7</td>
<td>2.2</td>
<td></td>
</tr>
<tr>
<td>BMI, kg/m²†</td>
<td>26.2 (0.1)</td>
<td>26.2 (0.1)</td>
<td>0.45</td>
</tr>
<tr>
<td>Diabetes mellitus, %</td>
<td>9.9</td>
<td>6.6</td>
<td>0.001</td>
</tr>
<tr>
<td>Physical inactivity, %‡</td>
<td>36.2</td>
<td>37.8</td>
<td>0.36</td>
</tr>
<tr>
<td>TC, mmol/L†</td>
<td>5.8 (0.03)</td>
<td>6.2 (0.03)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>HDL-C, mmol/L†</td>
<td>1.3 (0.01)</td>
<td>1.6 (0.01)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>TG, mmol/L†</td>
<td>1.9 (0.03)</td>
<td>1.7 (0.03)</td>
<td>0.003</td>
</tr>
<tr>
<td>JNC7 Stages, %</td>
<td></td>
<td></td>
<td>0.33</td>
</tr>
<tr>
<td>Normal</td>
<td>5.6</td>
<td>4.3</td>
<td></td>
</tr>
<tr>
<td>Prehypertension</td>
<td>59.4</td>
<td>61.0</td>
<td></td>
</tr>
<tr>
<td>Stage 1 hypertension</td>
<td>28.0</td>
<td>27.3</td>
<td></td>
</tr>
<tr>
<td>Stage 2 hypertension</td>
<td>7.0</td>
<td>7.4</td>
<td></td>
</tr>
<tr>
<td>Systolic BP, mm Hg†</td>
<td>144.6 (0.6)</td>
<td>147.8 (0.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Diastolic BP, mm Hg†</td>
<td>83.8 (0.3)</td>
<td>83.1 (0.2)</td>
<td>0.07</td>
</tr>
<tr>
<td>White blood cell count, ×10³ cells/L†</td>
<td>6.6 (0.05)</td>
<td>6.4 (0.04)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Women only</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Menopausal status, %</td>
<td>NA</td>
<td>93.9</td>
<td></td>
</tr>
<tr>
<td>Ever use of hormone replacement therapy, %</td>
<td>NA</td>
<td>28.6</td>
<td>NA</td>
</tr>
</tbody>
</table>

NA indicates not applicable.
*P value based on ANOVA or χ² test, as appropriate.
†Data presented as mean±SD.
‡Defined as those who responded negatively to moderate physical activity, including walking.

Among baseline subjects who participated in the follow-up examination (n=2334), the main reason for exclusion from the incident hypertension analysis was the presence of hypertension at the baseline examination. Compared with subjects who were included in the incident hypertension analysis (n=637), subjects who were not included (n=1697) were significantly older, more likely to consume ≥3 drinks per day, more likely to have diabetes, and more likely to be physically inactive.

Cross-Sectional Analysis

Table 3 presents the cross-sectional relationship between tertiles of plasma fibrinogen and prevalent hypertension at the baseline examination. Increasing tertiles of plasma fibrinogen was positively associated with prevalent hypertension both among men and women. This association was present both in the age-adjusted and the multivariable-adjusted model; corresponding models of trend were also statistically significant.

Prospective Analysis

In Table 4, among men, there was a clear positive association between increasing tertiles of plasma fibrinogen and 5-year incident hypertension, both in the age-adjusted and the multivariable-adjusted model. The multivariable OR (95% CI) of incident hypertension comparing men in the highest tertile (≥3.9 g/L) with those in the lowest fibrinogen tertile (≤3.2 g/L) was 1.95 (1.03 to 3.68). The corresponding model for assessing trend across plasma fibrinogen tertiles was also statistically significant (P trend=0.04). When plasma fibrinogen tertiles were analyzed as continuous variable, the multivariable OR (95% CI) of incident hypertension associated with 1 g/L increase in plasma fibrinogen was 1.47 (1.08
to 2.01) among men. Similarly, there was a clear positive
association between increasing tertiles of plasma fibrinogen
and an increase by 1 JNC7 BP stage over 5 years among
men who were not using antihypertensive medications (OR
[95% CI] comparing highest versus lowest tertile of plasma
fibrinogen: 2.28 [1.15 to 4.52]; \( P \) trend = 0.018). No similar
associations were observed in corresponding analyses among
women (Table 5).

We performed several sets of supplementary analyses. First
(data not presented), we examined the association between
plasma fibrinogen as a continuous variable (per 1 g/L increase)
and 5-year incident hypertension and increase by 1 JNC7
BP stage over 5 years within subgroups of smoking catego-
riness (never, former, and current), BMI (> 25 kg/m² and > 25
kg/m²), and JNC7 BP stages (normal BP and prehyperten-
sion). Taken together, the association between plasma fibrin-
ogen and incident BP outcomes within these subgroups
seemed to be relatively consistent, and a positive association
was evident only among men but not women; however, the
OR estimates failed to reach conventional levels of statistical
significance (\( \alpha = 0.05 \)) in some subgroups because of limita-
tions in statistical power.

Second, to examine whether the observed association be-
tween fibrinogen level and incident hypertension was ex-
plained by inflammation, we additionally adjusted for circu-
lating white blood cell count (continuous variable) in the
multivariable model in Tables 2 and 3; the magnitude of ORs
were essentially similar. For example, among men, compared
with individuals in tertile 1 of plasma fibrinogen, the multi-
variable OR (95% CI) of incident hypertension associated

| TABLE 4. Tertiles of Plasma Fibrinogen and 5-Year Incidence of BP Outcomes Among Men |
|---------------------------------------------|---------------------------------------------|
| Increasing Tertiles of Plasma Fibrinogen, g/L | OR (95% CI) for 5-Year Incident Hypertension*† | OR (95% CI) for Increase by \( \geq 1 \) JNC7 BP Stage Over 5 Years Among Individuals Not Taking Antihypertensive Medications*†‡ |
| No. at Risk | Age-Adjusted OR (95% CI)* | Multivariable OR (95% CI)*† | No. at Risk | Unadjusted OR (95% CI)* | Multivariable OR (95% CI)*† |
| Tertile 1 (1.6 to 3.2) | 96 (42) | 1 (referent) | 1 (referent) | 89 (24) | 1 (referent) | 1 (referent) |
| Tertile 2 (3.3 to 3.8) | 87 (50) | 1.73 (0.96 to 3.12) | 1.49 (0.78 to 2.85) | 83 (27) | 1.31 (0.68 to 2.52) | 1.39 (0.69 to 2.81) |
| Tertile 3 (3.9 to 7.1) | 103 (60) | 1.79 (1.02 to 3.15) | 1.95 (1.03 to 3.68) | 100 (40) | 1.81 (0.98 to 3.34) | 2.28 (1.15 to 4.52) |
| \( P \) trend | 0.043 | 0.040 | 0.058 | 0.018 |
| 1 g/L increase in fibrinogen | 286 (152) | 1.33 (1.01 to 1.77) | 1.47 (1.08 to 2.01) | 272 (91) | 1.35 (1.01 to 1.80) | 1.52 (1.12 to 2.08) |

*OR (95% CI): estimated from logistic regression model adjusted for age (years).
†OR (95% CI): estimated from multivariable logistic regression model additionally adjusted for smoking (current, former, or never), alcohol intake (nondrinker, < once per week, 1 to 6 days per week, 1–2 drinks per day, \( \geq 3 \) drinks per day, or don’t know/missing), physical inactivity (yes or no), mean arterial blood pressure (mm Hg), TC level (mmol/L), HDL-C level (mmol/L), and TG level (mmol/L).
‡JNC 7: we excluded 14 men who were taking antihypertensive medications, because their JNC 7 BP staging could be affected by the antihypertensive medication that they were consuming.
with tertiles 2 and 3 was, respectively, 1.49 (0.78 to 2.85) and 1.90 (1.00 to 3.62; \( P \) trend=0.047). Among men, we calculated the population-attributable risk of hypertension associated with plasma fibrinogen levels \( \geq 3.9 \) g/L (highest tertile), and the population-attributable risk was 17.3%.

### Discussion

In the Blue Mountains cohort of older Australians, in cross-sectional analysis, we found that elevated plasma fibrinogen level was positively associated with prevalent hypertension both among men and women. In contrast, in prospective analysis, elevated plasma fibrinogen level was positively associated with 5-year incident hypertension among men but not women. This association was independent of smoking, alcohol intake, BMI, and other related factors. Among men, the OR of incident hypertension increased in a dose-dependent manner with increasing plasma fibrinogen tertiles, and the association was consistently present in subgroup analyses stratified by smoking, BMI, and JNC7 BP categories. The findings from this long-term follow-up study of older, community-dwelling Australians are consistent with the recent observation reported by Folsom et al\(^{24}\) suggesting a moderate positive association between plasma fibrinogen and incident hypertension among men but not among women in a middle-aged, biracial US cohort.

Our finding of an association between baseline plasma fibrinogen level and 5-year incident hypertension shows high internal validity as indicated by the independence of the association from traditional risk factors, evidence suggesting a dose-response trend in the magnitude of association, and the consistency of these findings across stratified subgroups, as well as in the magnitude of association. Consistency of the male-specific nature of this observed association between fibrinogen and incident hypertension with prospective findings from the geographically dissimilar ARIC Study\(^{24}\) suggest that these findings are less likely to be because of chance. Furthermore, although several\(^{18-21}\) but not all\(^{18-23}\) previous cross-sectional epidemiological studies reported a positive association between plasma fibrinogen level and elevated BP and/or prevalent hypertension, most previous studies reporting a positive association were confined to men.\(^{8,11,13,15-17}\)

Among women, our finding of a positive association between plasma fibrinogen and hypertension in cross-sectional analysis but null association in prospective analysis is similar to the results from the ARIC Study.\(^{24}\) This finding probably reflects the plasma fibrinogen elevation secondary to increase in shear stress, endothelial dysfunction, and progressive vascular disease in severe hypertension.\(^{23,30,31}\) This possibility of reverse causality also highlights the importance of prospective analyses to clarify time sequence in any observed association between plasma fibrinogen and hypertension.

The observed lack of association between fibrinogen level and incident hypertension among women in the current study is analogous to the association between fibrinogen and other cardiovascular outcomes among women compared with men, including a weaker association with coronary heart disease\(^{22,10}\) and a lack of association with carotid intima–media thickness\(^{34-36}\) and peripheral vascular disease.\(^{27}\)

Several plausible mechanisms could explain an observed association between elevated fibrinogen levels and hypertension, including the relation of fibrinogen to increased viscosity and peripheral vascular resistance,\(^{20,32}\) hyperinsulinemia and insulin resistance,\(^{33,34}\) and markers of inflammation.\(^{34-36}\)

Gender differences in insulinemia and insulin resistance may also explain the observed lack of association among women.\(^{37-39}\) In rat models, dietary lard-induced increases in BP, shown to be mediated by insulin resistance,\(^{40}\) depend on the presence of testosterone.\(^{41}\) Alternatively, de Simone et al.\(^{42}\) showed that blood viscosity tended to increase with age in men but to decrease with age and menopausal status in women. Because the majority of women in our cohort had already undergone menopause by the time of their baseline examination (Table 2), the differing effects on blood viscosity among men and women of increasing age during follow-up provide an alternate explanation to our findings.

The main advantages of our study include its stable general population sample base, prospective follow-up, and the use of
standardized protocols for exposure and outcome assessment. Several study limitations also need to be considered while interpreting our findings. BP levels were based on a single reading at both surveys. This could have resulted in misclassification of hypertension status (likely to be overestimation). However, previously reported hypertension prevalence,27 incidence,43 and trend over time23 from our cohort are comparable to other older general population samples, though higher than in middle-aged samples.24 Furthermore, any misclassification is likely to be nondifferential in nature and should bias the risk estimates toward a null effect. C-reactive protein, a more specific marker of inflammation, was not available to make a simultaneous comparison with fibrinogen level. Finally, it is possible that our results are biased by selective survival of the cohort. However, because fibrinogen level has been shown to be related to decreased survival,3 selective survival is likely to underestimate our findings.

Perspectives

Findings from our study support the hypothesis of an association between elevated plasma fibrinogen level and incident hypertension among men. A corollary observation to our findings is that the recently reported BP-lowering effect of fibrates in both animal44–46 and human47,48 studies could be mediated, at least in part, by reduction in plasma fibrinogen levels. Future analyses from larger cohort studies among women are required to make conclusions regarding a lack of association among women.

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Disclosures

None.

References


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