

Adopting Moderate Alcohol Consumption in Middle Age: Subsequent Cardiovascular Events

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ABSTRACT

PURPOSE: Moderate alcohol use is part of a healthy lifestyle, yet current guidelines caution nondrinkers against starting to drink alcohol in middle age. The purpose of this study was to evaluate whether adopting moderate alcohol consumption in middle age would result in subsequent lower cardiovascular risk.

METHODS: This study examined a cohort of adults aged 45-64 years participating in the Atherosclerosis Risk in Communities study over a 10-year period. The primary outcome was fatal or nonfatal cardiovascular events.

RESULTS: Of 7697 participants who had no history of cardiovascular disease and were nondrinkers at baseline, within a 6-year follow-up period, 6.0% began moderate alcohol consumption (2 drinks per day or fewer for men, 1 drink per day or fewer for women) and 0.4% began heavier drinking. After 4 years of follow-up, new moderate drinkers had a 38% lower chance of developing cardiovascular disease than did their persistently nondrinking counterparts. This difference persisted after adjustment for demographic and cardiovascular risk factors (odds ratio 0.62, 95% confidence interval, 0.40-0.95). There was no difference in all-cause mortality between the new drinkers and persistent nondrinkers (odds ratio 0.71, 95% confidence interval, 0.31-1.64).

CONCLUSION: People who newly begin consuming alcohol in middle age rarely do so beyond recommended amounts. Those who begin drinking moderately experience a relatively prompt benefit of lower rates of cardiovascular disease morbidity with no change in mortality rates after 4 years.

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Several epidemiologic studies have concluded that moderate alcohol intake is associated with reduced cardiovascular risk¹⁻⁵ and have demonstrated lower mortality in drinkers with moderate intake.⁶⁻⁸ Whether such findings should be used to modify health care recommendations about initiation of alcohol use in middle age remains controversial.^{1,9} Current American Heart Association guidelines state that moderate alcohol consumption is beneficial for cardiovascular health, but the American Heart Association clearly states that nondrinkers should not begin drinking alcohol in middle age due to possible counter-balancing ill consequences of alcohol consumption. "Given these and other risks, the American Heart Association cautions people NOT

to start drinking . . . if they do not already drink alcohol."¹⁰ For example, alcohol intake has been associated with an increased risk of hypertension, motor vehicle crashes, certain types of cancer, liver disease, and other problems.¹¹ Recommendations about initiating moderate alcohol consumption in middle age should be made cautiously on a case-by-case basis in consultation with a personal physician, but the strength of such recommendations may be altered if more research supports the idea that initiating moderate alcohol consumption is beneficial.

However, evidence is accumulating to support the cardiovascular benefits of initiating moderate alcohol intake in middle-aged nondrinkers. Beulens et al¹² recently found that moderate alcohol consumption is inversely associated with cardiovascular disease events among men with preexisting hypertension, without an increase in total or cardiovascular mortality. Further, Friesema and colleagues¹³ have demonstrated that the improved cardiovascular outcomes found in moderate drinkers are not explained by baseline differences in health status. In a study of nondrinkers initiating

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moderate alcohol consumption, research using the Physicians Health Study of middle-aged men demonstrated a 29% reduction in cardiovascular disease risk among men consuming <1 drink/week at baseline who increased their alcohol consumption to 1-6 drinks/week ($P = .05$).⁴ The authors concluded that a moderate increase in alcohol consumption may lower cardiovascular risk. In recent research in a cohort of over 8000 men, moderate drinking was associated with 62% lower risk compared with nondrinkers, and was maintained even among men already at low risk on the basis of other healthy lifestyle factors.¹⁴ Replication of these findings in a more diverse population of both sexes would have important implications for healthy lifestyle recommendations.

To further examine the impact of initiating moderate drinking in middle age on subsequent cardiovascular disease, we analyzed participants in the Atherosclerosis Risk in Communities (ARIC) study, a prospective epidemiologic study of men and women aged 45-64 years at enrollment in 4 communities across the United States.

METHODS

Study Population

The ARIC Study is a prospective epidemiologic study of 15,792 men and women aged 45-64 years at enrollment in 4 communities across the United States that was designed to investigate the origin and progression of various atherosclerotic diseases.¹⁵

The first set of interviews and examinations (Visit 1) during which baseline information was collected were conducted from years 1987 to 1989. The full interview and examination methodology can be found on the ARIC website.¹⁶ The public use data set also contains data from annual telephone interviews and 3 visits (Visits 2-4), which followed the cohort through the end of 1998. Follow-up visits every 3 years include an interval medical history, weight, height, diet questionnaire, updated smoking history, and current participation in sports and leisure exercise. Our analysis focused on alcohol use changes during the baseline 6-year observation period assessed at Visit 3 among individuals without cardiovascular disease, and then on subsequent cardiovascular disease during the 4-year follow-up period starting at Visit 3.

Alcohol Use

Daily alcohol consumption was determined from a series of questions asking whether an individual consumed alcoholic beverages and, if so, how many drinks per week of beer,

wine, or spirits. According to the American Heart Association¹⁷ and the American Diabetes Association,¹⁸ moderate alcohol consumption is defined as no more than 1 drink per day for women and 2 drinks per day for men. Thus, we used 1-14 drinks per week for men and 1-7 drinks per week for women as "moderate" drinking for this study. We also evaluated type of alcohol, due to recent research indicating that alcohol type is a factor in development of cardiovascular disease.^{1,19}

Covariates

For assessment of physical activity, the ARIC data set includes information about the top 4 sports and leisure-time activities in which an individual participates. We summed the average minutes per week for these 4 activities. To this sum we added the average number of minutes per week of walking or riding a bicycle to and from work or shopping. Individuals with a total of 150 minutes per week or more were classified as getting sufficient exercise.

This standard is based on the longstanding recommendation of several groups, including the President's Fitness Council and the American College of Sports Medicine.^{20,21}

Body mass index (BMI) was available in the ARIC dataset and calculated from measurements taken during the ARIC examination. Whereas a BMI of 18.5-24.9 kg/m² is considered optimal, too few individuals with BMIs <18.5 precluded our ability to separate them for analysis, thus they are included with all individuals with BMI <25 kg/m². We were able to separately categorize overweight (BMI 25-30 kg/m²) and obese (BMI >30 kg/m²) individuals.

Current smokers were identified by questionnaire during each visit. At each visit, individuals were asked whether they took aspirin during the previous 2 weeks and, if so, for what purpose. Those who mentioned that they had taken aspirin for the purpose of avoiding a heart attack or stroke were considered regular aspirin users.

Demographic Variables

These variables include age, race, sex, and education, all from self-report at Visit 1. Race was defined as black and nonblack according to the categorization used by the ARIC investigators. Education was categorized as less than high school versus more education (high school or trade school graduate, or at least some college education).

History of Disease Variables

Risk factor and cardiovascular disease history was determined for both Visits 1 and 3, as indicated below.

CLINICAL SIGNIFICANCE

- Moderate alcohol consumption is associated with improved cardiovascular health.
- The benefit of adopting moderate alcohol consumption in middle age is not well characterized.
- New adopters of moderate alcohol consumption in middle age experienced a 38% reduction in cardiovascular events after 4 years.
- New drinkers experienced no change in overall mortality.

Disease History. Individuals who have a history of hypertension, diabetes, or hypercholesterolemia were identified. Individuals were considered to have a history of hypertension if their measured systolic blood pressure (SBP) was >139 mm Hg, diastolic blood pressure (DBP) was >89 mm Hg, they reported having been told by a doctor that they had hypertension, or they were taking hypertension medication. Blood pressure was determined in the sitting position after 5 minutes rest and was taken 3 times over the next 10-15 minutes. The average of the second and third measures was used in the study. Mean blood pressure was calculated using the following formula:²²

$$\text{Mean BP} = \text{DBP} + 1/3 * (\text{SBP} - \text{DBP})$$

A history of diabetes came from participant self-report, having a fasting plasma glucose ≥ 126 mg/dL, or if they reported taking medicine for diabetes. Individuals were considered to have a history of high cholesterol if they reported a history of high cholesterol, were taking medicine for high cholesterol, or if their measured total cholesterol exceeded 200 mg/dL or low-density lipoprotein cholesterol exceeded 160 mg/dL.

Cardiovascular Disease. A single variable in the ARIC dataset (PRVCHD05) identified individuals who, before Visit 1, had a history of myocardial infarction (MI), have had heart or arterial surgery (coronary bypass, balloon angioplasty, angioplasty of coronary artery), or were adjudicated to have an MI from the Visit 1 electrocardiogram data. A series of questions about a history of stroke, heart attack, or revascularization were used in annual telephone interviews and in face-to-face interviews for 4 years after Visit 3 to determine the presence of subsequent cardiovascular disease events that occurred after Visit 3. People with a history of cardiovascular disease at Visit 1 or 3 were excluded from analyses.

Outcome Determination

Variables in the ARIC dataset described a participant's status at the end of the year 1998. Patients known to have died, as determined from state death certificates, are identified in the ARIC dataset along with their primary underlying cause of death. For the primary analysis, we identified participants who developed fatal or nonfatal cardiovascular disease from those whose underlying cause of death was coded as cardiovascular disease, or who had an MI, a silent

Table 1 Baseline Characteristics*

Demographics	Total = 15,637	None % n = 9631	Moderate % n = 4717	Heavy % n = 1289	χ^2 P Value
Age (mean)	54.0 years	54.2 years	53.7 years	53.6 years	<.001 [†]
Sex					<.001
Male	43.3	47.8	41.1	11.1	
Female	56.7	71.9	22.0	6.2	
Race					<.001
Nonblack	73.0	56.9	33.8	9.2	
Black	27.0	73.8	20.6	5.7	
Education					<.001
<HS	23.2	74.5	19.0	6.5	
HS or more	76.8	57.5	33.6	8.8	
BMI					<.001
<25	33.6	56.8	32.3	10.9	
25-29.9	39.1	58.0	33.9	8.0	
≥ 30	27.3	72.0	22.5	5.5	
Smoker					<.001
Yes	28.5	50.6	34.6	14.7	
No	71.5	65.8	28.5	5.7	
Exercise					<.001
<2.5 h/wk	46.1	66.1	25.7	8.2	
≥ 2.5 h/wk	53.9	57.5	34.1	8.3	
Disease history [‡]					<.001
Yes	79.7	62.3	29.4	8.3	
No	20.3	57.7	22.6	19.7	

ARIC = Atherosclerosis Risk in Communities; HS = high school; BMI = body mass index.

*Demographic distribution of the ARIC population (percent) with no history of cardiovascular disease by alcohol consumption status at Visit 1 (baseline of the 6-year observation period) for each demographic group.

[†]Analysis of variance.

[‡]Hypertension, diabetes, or hypercholesterolemia.

MI, diagnosed coronary heart disease, a coronary heart disease procedure, or a definite or probable stroke since Visit 3 (1994). We compared new moderate drinkers of alcohol with persistent nondrinkers during the 4-year follow up period.

Statistical Analyses

The demographics of the ARIC population with regards to their alcohol consumption were examined using chi-squared statistics at the baseline of the 6-year observation period. Mean blood pressure and change in cholesterol also were examined, comparing new drinkers to persistent nondrinkers during the 6-year observation period.

The primary outcome of interest was experiencing a cardiovascular event (fatal or nonfatal) during the 4 years subsequent to Visit 3. In unadjusted analyses and adjusted analyses using the control variables described above, we ran logistic regression models to examine the effect of initiation of alcohol consumption between Visit 1 and Visit 3, using persistent nondrinkers as the reference group. Demographic, lifestyle factors, and disease histories at the time of Visit 3 were used as control variables. Results also were stratified to evaluate wine versus non-wine new drinkers.

RESULTS

Alcohol consumption varied among study participants at baseline of the 6-year observation period according to demographic characteristics (Table 1). Women, blacks, individuals with less than a high school education, obese individuals, nonsmokers, people who exercise <2.5 hours/week, and those with a history of hypertension, diabetes, or hypercholesterolemia were among those people who were more likely to be nondrinkers of alcohol.

Of the individuals who did not consume alcohol at the time of Visit 1, 7359 were interviewed at Visit 3 and responded to the questions about alcohol consumption. These individuals were the focus of subsequent analyses during the 4-year follow-up period. Of these people, 93.6% were still not drinking alcohol, 6.0% reported drinking in moderation, and 0.4% reported heavy alcohol use. Greater percentages of males, whites, smokers, and regular exercisers began moderate alcohol consumption (Table 2).

Among the 6075 study participants for whom an outcome could be determined at follow-up at 4 years past Visit 3, a significantly lower percentage of new moderate drinkers (6.9%) suffered a cardiovascular event, compared with nondrinkers (10.7%) (chi-squared $P = .008$).

Comparing new drinkers and nondrinkers at Visit 3, there were no significant differences ($P < .05$) for mean levels of total cholesterol (205.4 vs 208.1 mg/dL). Low-density lipoprotein cholesterol was significantly lower among new drinkers (123.5 vs 127.8 mg/dL), and high-density lipoprotein (HDL) cholesterol was significantly higher among new drinkers than nondrinkers (54.7 vs 51.7 mg/dL, $P < .05$). At Visit 3, mean blood pressure among

Table 2 Characteristics of New Drinkers*

	Percent who Began Drinking Alcohol in Moderation n = 442 [†]	χ^2 P Value [‡]
Visit 3 age (mean)	59.0 years	<.001 [†]
Sex		<.001
Male	8.2	
Female	4.9	
Race		<.001
Nonblack	6.7	
Black	4.2	
Education		<.001
<HS	3.5	
HS or more	6.0	
BMI		.031
<25	3.3	
25-29.9	8.0	
≥30	6.3	
Smoker		.068
Yes	7.3	
No	5.8	
Exercise		<.001
<2.5 h/wk	4.9	
≥2.5 h/wk	7.0	
Disease history ^{‡§}		.006
Yes	5.7	
No	8.1	

HS = high school; BMI = body mass index.

*Demographic and cardiovascular risk characteristics of new, moderate alcohol drinkers who were nondrinkers at Visit 1 (baseline of the 6-year observation period) but who were drinking moderate amounts of alcohol by Visit 3 (start of the cardiovascular follow-up period).

[†]Compared with 6917 individuals who were still nondrinkers at visit 3.

[‡]Test comparison of means.

[§]Hypertension, diabetes, or hypercholesterolemia at visit 3.

new drinkers was significantly lower than among nondrinkers (90.2 vs 91.9 mm Hg, $P < .05$).

New moderate drinkers were 38% less likely than nondrinkers to have a cardiovascular event during the 4-year follow-up period after Visit 3 (odds ratio [OR] 0.62, 95% confidence interval [CI], 0.41-0.94). After adjustment for demographic and cardiovascular risk factors, the association between adoption of moderate alcohol consumption and subsequent cardiovascular event remained significant (OR 0.62, 95% CI, 0.40-0.95) (Table 3). In both unadjusted and adjusted analyses, heavy alcohol drinkers were not significantly more or less likely than nondrinkers of suffering a cardiovascular event during the follow-up period. There were no significant differences between new drinkers and nondrinkers in all-cause mortality at follow-up 4 years after Visit 3 (OR 0.71, 95% CI, 0.31-1.64).

We identified a subset of new drinkers who consumed only wine in moderate amounts (n = 133). We compared nondrinkers with the group of moderate wine-only drinkers, with those who drank other types of alcohol in moderation

Table 3 Development of Cardiovascular Disease in New Drinkers*

	OR	95% CI
Alcohol consumption at Visit 3		
None (ref)	1	1
Moderate	0.62	0.40-0.95
Heavy	1.42	0.41-4.90
Age	1.05	1.03-1.06
Sex (ref: female)		
Male	1.79	1.51-2.13
Race (reference nonblack)		
Black	1.09	0.90-1.32
Education (ref: < HS)		
HS or more	0.87	0.72-1.06
BMI		
<25 (ref)	1	1
25-29.9	1.03	0.82-1.30
≥30	1.55	1.23-1.95
Smoking (ref: nonsmokers)		
Yes	1.92	1.56-2.36
Exercise (ref: <2.5 h/wk)		
≥2.5 h/wk	0.86	0.72-1.02
Cardiovascular disease risk history† (ref: No)		
Yes	1.77	1.36-2.32
Daily aspirin (ref: No)		
Yes	1.78	1.36-2.32

OR = odds ratio; CI = confidence interval; HS = high school.

*Likelihood of developing cardiovascular disease (odds ratio and 95% confidence interval) during the 4-year follow-up after Visit 3 among new drinkers (who were nondrinkers at Visit 1).

†History of hypertension, diabetes, or hypercholesterolemia at Visit 3.

(n = 234), and with those who drank heavily regardless of alcohol type (n = 21). After adjustment for demographic and cardiovascular risk factors, wine-only drinkers were significantly less likely to have had a subsequent cardiovascular event than nondrinkers (OR 0.32, 95% CI, 0.12-0.87). Consumers of moderate amounts of beer/liquor/mixed (which includes some wine) tended to also be less likely to have had a subsequent cardiovascular event than nondrinkers (OR 0.79, 95% CI, 0.49-1.26), but the difference was not significant.

DISCUSSION

In this study, we found that a midlife switch from no alcohol to moderate alcohol consumption resulted in a substantial reduction in cardiovascular events after 4 years. This benefit was independent of age, race, sex, BMI, and cardiovascular risk conditions (hypertension, hypercholesterolemia, diabetes). The study adds supporting evidence to the medical literature about the cardiovascular benefits of moderate alcohol consumption and adds new evidence in a diverse population sample about whether initiating alcohol consumption in middle age is beneficial. Some additional key

findings from the study are that starting moderate alcohol consumption had modest improvement in HDL cholesterol levels. Further, new drinking in middle age had no effect on total mortality after 4 years of follow-up.

The current study's findings are consistent with recent research indicating a benefit from moderate drinking on cardiovascular outcomes.²³⁻²⁶ The current study also adds evidence that moderate drinking of alcohol has a modest beneficial effect on the lipid profile.²⁷ Fortunately, the cardiovascular advantages observed in the current study came without an added detriment of increased mortality or increased hypertension. In addition, individuals who initiated alcohol use in the current study had higher HDL cholesterol at follow-up, consistent with previous studies.²⁸ This study's finding that new wine drinkers experienced a significant reduction in cardiovascular events after 4 years while new drinkers of other alcoholic beverages did not, is consistent with recent studies showing a slight advantage to wine drinkers.^{1,2,11,29} These data support the idea that initiating alcohol use in middle age may have an overall positive impact on cardiovascular health during middle age.

The implications of the current findings must be somewhat tempered due to some limitations. First, the study is limited by a relatively brief follow-up period for observation of events, especially cancer. Recent research has documented an association between alcohol consumption and certain types of cancer.³⁰⁻³³ While the time period of the study was sufficient for a cardiovascular event benefit to become evident in new drinkers, it would likely take a longer period of time to observe detrimental effects of new drinking on cancer rates. In the current study, the reduction in cardiovascular events was not reflected in reduction of overall mortality, which also may be a consequence of a fairly short follow-up period. In addition, initiating alcohol consumption is not currently recommended to anyone with a personal history of problem drinking, cirrhosis, liver disease, depression, gastric or duodenal ulcers, and many other conditions that could be exacerbated by drinking alcohol (American Geriatrics Society Guidelines).³⁴ Further, many medications have interactions with alcohol, including aspirin, which could cause gastrointestinal bleeding or other adverse effects. Also, the possibility of measurement error, especially for self-report of alcohol intake, is possible, and no calibration study is available to correct for this possibility.^{35,36}

CONCLUSIONS

A substantial cardiovascular benefit from adopting moderate alcohol drinking in middle age appears supported by the current study. Any such benefit must be weighed with caution against the known ill consequences of alcohol consumption. While caution is clearly warranted, the current study demonstrated that new moderate drinking lowers the risk of cardiovascular disease without an increase in mortality in a 4-year follow up period. The findings suggest that, for carefully selected individuals, a "heart healthy diet" may

include limited alcohol consumption, even among individuals who have not included alcohol previously. Further research using a prospective design may be warranted.

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