

Is Alcohol Consumption Related to Breast Cancer? Results From the Framingham Heart Study

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We studied the relation between alcohol consumption and breast cancer among women in the Framingham Heart Study cohort. A total of 2,636 women aged 31-64 years provided information on alcohol consumption at the second biennial examination. They were followed for up to 32 years; during this period, breast cancer was diagnosed in 143 of these women. Alcohol intake was also assessed at 10 and 20 years of follow-up and every 2 years thereafter. In analyses using only baseline alcohol intake, the multiple risk factor-adjusted relative risk (RR) estimate of breast cancer for any drinking, compared with nondrinking, was 0.8 [95% confidence interval (CI), 0.5-1.1]. For three levels of alcohol intake (0.1-1.4 g/day, 1.5-4.9 g/day, and ≥ 5.0 g/day), the baseline analyses yielded RRs (vs. nondrinking) of 1.0 (CI, 0.6-1.5), 0.7 (CI, 0.4-1.1), and 0.6 (CI, 0.4-1.0), respectively. In analyses incorporating repeated measures of alcohol, the comparable RRs were 0.9 (CI, 0.6-1.2) for any drinking (vs. nondrinking) and 0.7 (CI, 0.4-1.4), 1.1 (CI, 0.7-1.8), and 0.8 (CI, 0.5-1.2), respectively, for the three levels of intake (vs. nondrinking). Alcohol consumption was not associated with an increased risk of breast cancer in this cohort. [J Natl Cancer Inst 1989;81:31-35]

The reported association between moderate consumption of alcohol and breast cancer in women has attracted considerable attention. The majority of case-control studies (1-12) and all five cohort studies to date on this issue (13-17) have shown a direct alcohol-breast cancer relation, with relative risks (RRs) in the range of 1.5-2.0. Since reported alcohol consumption in cohort studies is not influenced by subsequent disease, the consistency of findings from these studies has been especially compelling. An alcohol-breast cancer link is biologically plausible, although precise pathobiologic mechanisms are speculative at present (12,15). Given the large proportion of women who consume alcoholic beverages (18), even a small elevation in risk has major public health implications.

We report here results from an investigation of the relation between alcohol consumption and breast cancer in the longitudinal Framingham Heart Study.

Methods

The Cohort

The Framingham Heart Study, an ongoing population-based cohort study of risk factors for cardiovascular disease, was initiated in 1948 (19). The original cohort consisted of 2,873 women (with 2,336 men), aged 29-62 years at the first examination. Biennial examinations consisted of a medical history, a physical examination, and a series of laboratory tests. Only 3% of the cohort was lost to follow-up over 32 years of observation.

Measurement of Alcohol Intake and Other Covariates

Alcoholic beverage consumption was assessed by a physician during the medical history interview at examinations 2, 7 (10 yr after examination 2), and 12 (20 yr after examination 2) and at each subsequent biennial examination. At examinations 2 and 7, women were asked how many 2-ounce cocktails, 8-ounce glasses (or cans) of beer, and 4-ounce glasses of wine they consumed in a month. Because of changes over time in standard sizes of containers, women were queried at examination 12 and subsequent examinations about the number of 1½-ounce cocktails, 12-ounce glasses (or cans) of beer, and 5-ounce glasses of wine they consumed in a week. These data were converted into total and beverage-specific grams of ethanol consumed daily. This conversion took into account a small decline over the

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follow-up period in the average ethanol content of wine (reflecting in part a shift from fortified to unfortified wines) and distilled spirits (20).

Information on education, parity, and cigarette smoking was available at examination 1. Weight and height were assessed at examination 2. Menopausal status (which could have changed over the course of follow-up) was determined at each biennial examination.

Identification of Cases

All cohort records with any mention of cancer were reviewed in detail. After examination 2, 151 cases of breast cancer (International Classification of Diseases for Oncology code 174) had occurred. All cases were confirmed histologically, with the exception of two cases that were diagnosed on the basis of clinical criteria.

Population for Analysis

Twenty-one women with breast cancer diagnosed at some time in their lives prior to examination 2 were not considered in the analyses. In a total of 216 subjects (including eight women who subsequently developed breast cancer), information on alcohol consumption was missing at examination 2; these women were excluded from those analyses that considered this examination as baseline.

The analytic cohort for analyses using examination 2 as baseline consisted of 2,636 women, among whom 143 were diagnosed with breast cancer. The median follow-up for this group of women was 26 years.

Analytic Procedures

We calculated the crude incidence rates for a specific category of alcohol intake by dividing the number of breast cancer cases occurring in that category by the total number of person-years contributed by all women in that category. The number of person-years contributed by an individual woman was calculated from the baseline examination for a given analysis to the date of breast cancer diagnosis, death, or examination 18, whichever came first. (Information on end points was not available after examination 18.) Age-adjusted incidence rates were calculated by the direct method (21), with the age distribution of the analytic cohort used as the standard.

We used Cox's proportional hazards regression (22) to evaluate the simultaneous relationship of alcohol intake, age, and other variables to the incidence of breast cancer in the cohort. These analyses were carried out with the PROC PHGLM procedure available in the SAS statistical package. The proportionality assumption for breast cancer hazards was confirmed graphically and with the Z:PH test statistic in the PROC PHGLM SAS procedure (23).

To take into account serial measures of alcohol consumption and menopausal status, we carried out proportional hazards analyses with time-dependent covariates, using software written by one of the authors (S. B. Green) for the DEC System-10 computer. This procedure linked the most recent value for each of these variables to breast cancer risk. In these time-dependent covariate analyses, the total number of subjects providing alcohol consumption data at one or more

of the examinations was 2,784, among whom 147 had breast cancer (10 premenopausal women and 137 postmenopausal women at the time of diagnosis).

Results

At examination 2, 27% of the women in the analytic cohort were <40 years of age, and 21% were ≥ 55 years old (with a maximum age of 64 yr). Forty percent of these women did not graduate from high school, 28% received some formal education beyond high school, and only 9% graduated from college.

Table 1 shows the distribution of reported alcohol consumption in the cohort at baseline and at 10, 20, and 26 years of follow-up. Alcohol intake increased through examination 12 and then dropped off somewhat. The proportion of women who drank ≥ 5 g of ethanol daily (equivalent to about three drinks/wk) increased from 26% to 36% at 20 years of follow-up and then dropped to 30% 6 years later. At baseline, only 13% of the cohort reported consuming one or more drinks per day, a figure that increased to 22% at 20 years and declined to 17% at 26 years of observation. The same general pattern occurred when alcohol consumption over time was examined in only those women ($n = 1,573$) who were alive and provided alcohol information at examination 15.

The data in table 2 indicate the relationship at baseline between alcohol consumption and several demographic, reproductive, and behavioral factors. The frequency of drinking ≥ 5 g of ethanol daily was higher among women who were younger, more educated, leaner, and taller and who smoked more. Alcohol consumption was not associated with parity or menopausal status in this group.

The overall age-adjusted breast cancer incidence rate in this Massachusetts cohort was similar to that observed for the population in the nearby State of Connecticut. The ratio of observed-to-expected cases (based on age-, sex-, and race-adjusted incidence rates from the Connecticut Tumor Registry) was 0.97 [95% confidence interval (CI), 0.82-1.15].

Table 1. Distribution of alcohol consumption over time*

	Examination No.			
	2	7	12	15
Total No. of women	2,636	2,373	1,867	1,573
Mean ethanol (g/day)†	5.67	8.23	8.61	7.0
% within specified alcohol category‡				
Nondrinking	41	36	34	50
0.1-4.9 g/day	33	31	31	21
≥ 5.0 g/day	26	33	36	30
5.0-14.9 g/day	13	13	14	13
≥ 15.0 g/day	13	20	22	17

*Distribution over time was similar when only those with alcohol information at examination 15 ($n = 1,573$) are analyzed.

† ≥ 5.0 g/day is approximately equal to three or more drinks/wk; ≥ 15.0 g/day is approximately equal to one or more drinks/day.

‡Sums differ from 100% due to rounding error.

Table 2. Relation of alcohol consumption and potential breast cancer risk factors*

Risk factor	% drinking (≥ 5.0 g/day)†
Age (yr)	
≤38	32
39-44	32
45-50	25
51-55	20
≥56	18
Education (yr)	
≤8	21
9-11	20
12	27
13-15 (some college)	33
≥16 (graduated from college)	38
Parity	
0	26
1	24
2	29
3	29
≥4	24
Menopausal status	
Premenopausal	29
Postmenopausal	28
Smoking (cigarettes/day)	
0	17
1-9	34
10-19	44
≥20	44
Body mass index (kg/m ²)	
≤21.7	32
21.8-23.6	31
23.7-25.6	29
25.7-28.7	20
≥28.8	19
Height (inches)	
≤60.4	21
60.5-61.9	25
62.0-63.0	24
63.1-64.7	28
≥64.8	35

*These are baseline characteristics.

†Each number is the total person-time contributed by drinkers within a given risk factor category as a percentage of the total amount of person-time contributed by all women (drinkers + nondrinkers) within that risk factor category. All percentages, except those for age, have been age-adjusted by the direct method (21), according to the distribution of age-specific person-times in the analytic cohort.

RRs for breast cancer in relation to several potential risk factors for breast cancer are displayed in table 3. Increasing age was a strong risk factor in this data set (test for trend, $P < .0001$). Parity was inversely related to breast cancer, with nulliparous women at approximately two and one-half times the risk of women with four or more live births (test for trend, $P = .002$). Premenopausal status (compared with postmenopausal status) at baseline was associated with an age-adjusted excess in breast cancer risk. In the time-dependent covariate analyses that took into account changes in menopausal status over the follow-up period, menopausal status at the time of diagnosis was not associated with breast cancer (though only 10 cases occurred among premenopausal women); in addition, age at menopause (<50 yr vs. ≥ 50 yr or <45 yr vs. ≥ 45 yr) was not associated with breast cancer. For all women combined, we found a small

inverse (and nonsignificant) association between body mass index and breast cancer risk (test for trend, $P = .19$). Neither education, height, nor smoking (each assessed at baseline) was associated with subsequent breast cancer development.

Table 4 shows age-adjusted breast cancer incidence rates by level of alcohol consumption. A small inverse association between alcohol consumption and breast cancer was observed in these rates.

Age-adjusted and multiple risk factor-adjusted RRs for alcohol consumption in relation to breast cancer are presented in table 5. In both the age-adjusted and multiple risk factor-adjusted analyses using baseline data, there was a small inverse trend in breast cancer risk in relation to alcohol. There was no consistent association in both the age-adjusted

Table 3. RRs for potential breast cancer risk factors*

Risk factor	No. of cases†	RR‡	95% CI
Age (yr)			
≤38	27	(1.0)	
39-44	31	1.5	0.9-7.5
45-50	31	2.2	1.3-3.9
51-55	26	3.5	1.7-7.2
≥56	28	4.3	2.3-9.0
Parity			
0	50	2.4	1.4-4.0
1	18	1.3	0.7-2.5
2	29	1.6	0.9-2.8
3	24	1.5	0.8-2.6
≥4	20	(1.0)	
Menopausal status			
Premenopausal§	74	1.8	1.1-3.1
Postmenopausal	67	(1.0)	
Education (yr)			
≤8	31	(1.0)	
9-11	12	0.8	0.4-1.5
12	57	1.6	1.0-2.5
13-15	30	1.2	0.7-2.0
≥16	11	0.9	0.4-1.8
Body mass index (kg/m ²)			
≤21.7	33	(1.0)	
21.8-23.6	29	0.9	0.5-1.4
23.7-25.6	30	0.7	0.4-1.2
25.7-28.7	30	0.8	0.5-1.4
≥28.8	21	0.6	0.4-1.1
Height (inches)			
≤60.4	22	(1.0)	
60.5-61.9	32	1.3	0.7-2.3
62-63	33	1.1	0.7-2.0
63.1-64.7	29	1.1	0.6-2.0
≥64.8	27	1.0	0.5-1.7
Smoking (cigarettes/day)			
0	89	(1.0)	
1-9	20	1.0	0.6-1.6
10-19	17	1.1	0.7-2.0
≥20	17	1.0	0.6-1.7

*Risk factor values here were determined at baseline. RR estimates were derived from multivariate proportional hazards models including all of these risk factors and alcohol.

†For some of the risk factors, the total number of cases is <143 because of missing risk factor data.

‡Values in parentheses indicate reference group.

§In the time-dependent covariate analyses, there was no association between menopausal status and breast cancer (but there were only 10 cases among premenopausal women).

Table 4. Age-adjusted breast cancer incidence rates by level of alcohol intake

Alcohol intake*	No. of women	Person-years	No. of cases	Age-adjusted rate†
None	1,077	27,619	66	230
Any	1,559	41,709	77	190
0.1-1.4 (g/day)	493	12,970	31	240
1.5-4.9 (g/day)	372	10,220	17	170
≥5.0 (g/day)	694	18,519	29	160

* Alcohol intake was assessed at examination 2.

† Per 100,000 population. Crude rates were initially calculated by dividing the number of cases by the number of person-years within each category of alcohol intake. Rates were age-adjusted by the direct method (21).

and multiple risk factor-adjusted, time-dependent covariate analyses. No alcohol-breast cancer association was found in similar analyses that considered alcohol per kilogram of body weight.

There was no excess risk of breast cancer among those women consuming 15 g (approximately one drink) per day (13 cases for alcohol assessed at examination 2 and 19 cases in the time-dependent covariate analyses). The RR estimate in the time-dependent covariate analysis for consumption of 15 g per day, relative to nondrinking, was 0.7 (CI, 0.4-1.2).

Table 5. RRs for breast cancer according to level of alcohol intake

Alcohol level	Age-adjusted*			Multiple risk factor-adjusted†		
	No. of cases	RR‡	95% CI	No. of cases	RR‡	95% CI
Baseline models						
None	66	(1.0)		66	(1.0)	
Any	77	0.8	0.6-1.2	77	0.8	0.5-1.1
0.1-1.4 (g/day)	31	1.1	0.7-1.6	31	1.0	0.6-1.5
1.5-4.9 (g/day)	17	0.7	0.4-1.2	17	0.7	0.4-1.1
≥5.0 (g/day)	29	0.7	0.5-1.1	29	0.6	0.4-1.0
<i>P</i> for trend		.08			.03	
Alcohol level	Age-adjusted§			Multiple risk factor-adjusted¶		
	No. of cases	RR‡	95% CI	No. of cases	RR‡	95% CI
Time-dependent covariate models						
None	64	(1.0)		63	(1.0)	
Any	83	0.9	0.7-1.3	78	0.9	0.6-1.2
0.1-1.4 (g/day)	13	0.8	0.4-1.4	12	0.7	0.4-1.4
1.5-4.9 (g/day)	32	1.2	0.8-1.8	31	1.1	0.7-1.8
≥5.0 (g/day)	38	0.9	0.6-1.3	35	0.8	0.5-1.2
<i>P</i> for trend		.71			.41	

* Model included alcohol and age.

† Model included variables for age, education, menopausal status, parity, body mass index, height, and smoking. Indicator terms for missing covariate data were used.

‡ Values in parentheses indicate reference group.

§ Alcohol was included as a time-dependent covariate.

¶ Alcohol and menopausal status were included as time-dependent covariates. Model also included variables for age, parity, and body mass index. The number of cases adds up to only 141, since indicator terms for missing covariate data were not used.

Analyses confined to the first 10 years of follow-up after examination 2 yielded an RR estimate for any drinking, compared with nondrinking, of 0.6 (CI, 0.3-1.2), but these analyses were based on only 34 cases.

We carried out analyses that simultaneously included indicator terms for the different types of beverages (beer, wine, and cocktails) (16) assessed at one examination (examination 2) or at repeated examinations. There was no significant association between any of the beverage types and breast cancer. The RR estimates from the time-dependent covariate analyses for any cocktails, any beer, and any wine (reference for each beverage type being nonconsumption of that beverage) were 0.8 (CI, 0.7-1.2), 1.3 (CI, 0.8-2.1), and 0.9 (CI, 0.6-1.3), respectively.

To determine if there might be an association between alcohol and breast cancer confined to women with specific risk factor characteristics, we calculated score statistics for two-way interactions in the Cox model between alcohol and other variables. We also carried out analyses within baseline strata of each of several potential breast cancer risk factors. The data suggested that alcohol was associated with a decrease in risk among women who were postmenopausal at baseline, but not in women who were premenopausal. The *P* values associated with the corresponding multiplicative interaction terms were .01 (alcohol modeled as a linear trend variable across four categories) and .16 (alcohol modeled as a yes/no variable). In an analysis restricted to women who were postmenopausal at baseline, the RR for any drinking, compared with nondrinking, was 0.6 (CI, 0.4-1.0); no alcohol-breast cancer association was evident among premenopausal women. There was no suggestion of modification effect for any of the other risk factors, including age, body mass index, education, and parity.

Discussion

Alcohol consumption was not associated with an increased risk of breast cancer in this Framingham Heart Study cohort. Given that previous cohort studies have shown a direct association, possible biases in this study need to be considered.

Alcohol consumption is undoubtedly measured with some error. Although misclassification of an exposure variable (alcohol) can reduce a positive RR toward 1.0 (no association) (24), this is not a likely explanation for the findings here. Willett et al. (16) showed that alcohol consumption, in contrast to the intake of a variety of nutrients, is assessed with a high degree of validity. There is no reason to believe that the assessment of alcohol intake in the Framingham Heart Study was qualitatively inferior to the determinations made in the other published cohort studies that did find an alcohol-breast cancer association. Moreover, earlier analyses of data from the Framingham Heart Study have shown the expected direct relationships between reported alcohol intake and other physiological parameters, including blood pressure (25) and serum high-density lipoprotein-cholesterol (26).

One feature of this study that distinguishes it from the other cohort studies of alcohol and breast cancer is the extremely long follow-up. It could be argued that after the death of a substantial proportion of the original cohort, the remaining

women would tend to be "resistant survivors." However, there was no alcohol-breast cancer association in analyses confined to the first 10 years of follow-up, though these analyses had limited power.

Information on age at first full-term pregnancy was not available, but the inverse parity-breast cancer association may have partially captured the expected association of age at first live birth with breast cancer risk. Since data on age at menarche, history of benign breast disease, family history of breast cancer, and diet were not available, multivariate adjustments for these potentially confounding factors could not be done. In other published cohort studies, however, controlling for these factors did not materially affect the observed alcohol-breast cancer associations (14-16).

It has been suggested that drinking during a woman's early, as opposed to later, life might enhance breast carcinogenesis (12). If so, then one would expect the alcohol-breast cancer association to be diminished in a cohort of older women, since drinking early in life would be reflected less accurately in reports of current alcohol consumption from older compared with younger women. However, when the women in the Framingham Heart Study reported their alcohol intake for the baseline analyses, they were not substantially older than women in those cohorts showing the direct alcohol-breast cancer association (14-17). Moreover, while other studies have shown a stronger relation between alcohol and breast cancer among younger, as opposed to older, women (15,16), analyses restricted to younger women in the Framingham Heart Study revealed no direct alcohol-breast cancer association.

We found no alcohol-breast cancer association for consumption of one or more drinks per day. Since a relatively small proportion of women in this cohort consumed more than one drink per day, we could not rule out an excess breast cancer risk among these more heavily drinking women.

In summary, there is no readily apparent source of bias to explain the discrepancy in findings (at least for one drink/day or less) between this study and previously published cohort studies on alcohol and breast cancer.

Results from any one study should be considered in context. A recent meta-analysis of all published studies on this issue showed a positive association between alcohol consumption and breast cancer (27). That overall conclusion held even after inclusion of the findings from the present study (Longnecker M: personal communication). Clearly, the alcohol-breast cancer question should be pursued further.

References

1. WILLIAMS RR, HORM JW. Association of cancer sites with tobacco and alcohol consumption and socioeconomic status of patients: inter-

- view study from the Third National Cancer Survey. *J Natl Cancer Inst* 1977;58:525-547.
2. WYNDER EL, BROSS IJ, HIRAYAMA T. A study of the epidemiology of cancer of the breast. *Cancer* 1960;13:559-601.
3. BEGG CB, WALKER AM, WESSEN B, et al. Alcohol consumption and breast cancer [letter]. *Lancet* 1983;1:293-294.
4. BYERS T, FUNCH DP. Alcohol and breast cancer [letter]. *Lancet* 1982;1:799-800.
5. PAGANINI-HILL A, ROSS RK. Breast cancer and alcohol consumption. *Lancet* 1983;2:626-627.
6. WEBSTER LA, LAYDE PM, WINGO PA, et al. Alcohol consumption and risk of breast cancer. *Lancet* 1983;2:724-726.
7. ROSENBERG L, STONE D, SHAPIRO S, et al. Breast cancer and alcoholic-beverage consumption. *Lancet* 1982;1:267-271.
8. TALAMINI R, LA VECCHIA C, DECARLI A, et al. Social factors, diet and breast cancer in a northern Italian population. *Br J Cancer* 1984;49:723-729.
9. LA VECCHIA C, DECARLI A, FRANCESCHI S, et al. Alcohol consumption and the risk of breast cancer in women. *JNCI* 1985;75:61-65.
10. LÊ MG, MOULTON LH, HILL C, et al. Consumption of dairy produce and alcohol in a case-control study of breast cancer. *JNCI* 1986;77:633-636.
11. O'CONNELL DL, HULKA BS, CHAMBLESS LE, et al. Cigarette smoking, alcohol consumption, and breast cancer risk. *JNCI* 1987;78:229-234.
12. HARVEY EB, SCHAIRER C, BRINTON LA, et al. Alcohol consumption and breast cancer. *JNCI* 1987;78:657-661.
13. SEIDMAN H, STELLMAN SD, MUSHINSKI MH. A different perspective on breast cancer risk factors: some implications of the attributable risk. *CA* 1982;32:301-313.
14. HIATT RA, BAWOL RD. Alcoholic beverage consumption and breast cancer incidence. *Am J Epidemiol* 1984;12:676-683.
15. SCHATZKIN A, JONES DY, HOOVER RN, et al. Alcohol consumption and breast cancer in the Epidemiologic Follow-up Study of the first National Health and Nutrition Examination Survey. *N Engl J Med* 1987;316:1169-1173.
16. WILLETT WC, STAMPFER MJ, COLDITZ GA, et al. Moderate alcohol consumption and the risk of breast cancer. *N Engl J Med* 1987; 316:1174-1180.
17. HIATT RA, KLATSKY AL, ARMSTRONG MA. Alcohol consumption and the risk of breast cancer in a pre-paid health plan. *Cancer Res* 1988;48:2284-2287.
18. National Center for Health Statistics, SCHOENBORN CA, COHEN BH. Trends in smoking, alcohol consumption, and other health practices among U.S. adults, 1977 and 1983. Advance data from vital and health statistics, No. 118. Hyattsville, MD: Public Health Service, June 30, 1986 [DHHS publication No. (PHS)86-1250].
19. DAWBER TR, MEADORS GF, MOORE FE. Epidemiological approaches to heart disease: the Framingham Study. *Am J Public Health* 1951;41:279-286.
20. LAFORGE R, STINSON FS, FREEL CG, et al. Alcohol epidemiologic data system. Surveillance report #7: apparent per capita consumption: national, state, and regional trends, 1977-85. Rockville, MD: Division of Biometry and Epidemiology, National Institute on Alcohol Abuse and Alcoholism, Sept 1987.
21. FLEISS JL. Statistical methods for rates and proportions, 2nd ed. New York: Wiley, 1981.
22. COX DR, OAKES DO. Analysis of survival data. London: Chapman & Hall, 1984.
23. SAS Institute Inc. SUGI supplemental library user's guide, 1986 ed. Cary, NC: SAS Institute, 1986.
24. ROTHMAN K. Modern epidemiology. Boston: Little, Brown & Co., 1986.
25. GORDON T, KANNEL WB. Drinking and its relation to smoking, BP, blood lipids, and uric acid. *Arch Intern Med* 1983;143:1366-1374.
26. CASTELLI WP, DOYLE JT, GORDON T, et al. Alcohol and blood lipids: the Cooperative Lipoprotein Phenotyping Study. *Lancet* 1977;2:153-155.
27. LONGNECKER MP, BERLIN JA, ORZA M, et al. A meta-analysis of alcohol consumption in relation to risk of breast cancer. *JAMA* 1988;260:652-656.