Null Results in Brief

No Difference Between Red Wine or White Wine Consumption and Breast Cancer Risk

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Introduction

Epidemiologic studies have reported an increased risk of breast cancer among women who drink alcohol, including wine (1, 2) Two meta-analyses estimated a ~10% [95% confidence interval (CI), 5-15%] increased risk of breast cancer with each additional 10 grams (~1 drink) of alcohol/day regardless of beverage type (3, 4). Few studies have evaluated breast cancer risk separately for red and white wine (5-8). There is some evidence of beneficial health effects of red wine from laboratory (9) and epidemiologic studies of heart disease (10) and prostate cancer (11, 12). We evaluated overall alcohol as well as red and white wine consumption to examine beverage-specific effects on breast cancer.

Materials and Methods

The analysis was conducted in a population-based case-control study described fully elsewhere (13). Briefly, the study enrolled breast cancer cases identified from population-based registries in Wisconsin, Massachusetts (excluding metropolitan Boston), and New Hampshire, age 20 to 69 y, with incident invasive breast cancer diagnosed between 1995 and 2000. Controls were frequency matched to cases by 5-y age groups, selected from lists of licensed drivers (<65 y) or a roster of Medicare beneficiaries (≥65 y). Approximately 80% of cases (*n* = 6,327) and 76% of controls (*n* = 7,558) participated in the study; participation was similar in the three states.

Telephone interviews were administered concurrently for case (typically within 1 y of diagnosis) and control participants. Participants were queried on suspected risk factors for breast cancer, including age at menarche and menopause, age at first pregnancy, parity, postmeno-

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pausal hormone use, family history of breast cancer, smoking, education, and body mass index evaluated before the reference date. Alcohol use was evaluated as frequency of beer, red wine, white wine, or liquor (distilled spirits) consumption (number of drinks per day, week, or month) during the year previous to the reference date, defined as the date of diagnosis for cases or approximately the same period for controls. Logistic regression was used to estimate odds ratios (OR) and 95% CIs. Variables were included in the multivariable model if statistically significantly associated with breast cancer ($P \leq 0.05$) in age-adjusted models. Models estimating the effect of wine type on risk were adjusted for all other sources of alcohol. To obtain P_{trend}, we included alcohol both as a continuous and categorical exposure. We tested for interaction by type of alcohol. Analyses were conducted using SAS (Version 9.1; SAS Institute).

Results

Cases tended to have a younger age at menarche, later age at first birth, lower parity, and later age at menopause (data not shown). Current use of postmenopausal hormones, first-degree family history of breast cancer, greater body mass index, and higher education were also associated with increased breast cancer.

Any alcohol consumption in the year before the reference date was reported by similar proportions of cases (82%) and controls (82%). After multivariable adjustment, consumption of 14 or more drinks per week was associated with a 24% increase in breast cancer (95% CI, 3-49%; P_{trend} = 0.003) compared with nondrinkers (Table 1). Menopausal status modified this association, with elevated risk observed only among postmenopausal women ($P_{interaction}$ = 0.05). This effect this was driven by a statistical interaction only among liquor drinkers. Higher intake of all beverage types was suggestive of increased risk; only elevated consumption of liquor was significantly elevated per drink (OR, 1.02; 95% CI, 1.00-1.03). Wine consumption was not associated with risk of breast cancer (OR, 1.01; 95% CI, 0.99-1.02) and no differential was observed between red and white wine ($P_{interaction}$ = 0.6; Table 2).

Discussion

In this large, multicenter, population-based case-control study, alcohol was associated with an elevated risk of breast cancer, primarily because of increased risk in postmenopausal liquor drinkers. Neither red nor white wine was related to breast cancer.

The Women's Health Study, a randomized, chemo-preventive trial of 39,876 health professionals followed for ~10 years, reported similar associations of white (multivariable relative risk, 1.1; 95% CI, 0.9-1.2) and red (multivariable relative risk, 1.0; 95% CI, 0.8-1.2) wine per 10 grams/day increment on risk of breast cancer (6). Furthermore, two other studies conducted in France reported findings that did not support inverse effects of red wine versus white wine. Hirvonen et al. (8) reported no significantly increased risk of breast cancer associated with either red or white wine after a median 6.6 years follow-up in a placebo-controlled antioxidant primary-prevention trial with 95 breast cancer cases. A small

case-control study of premenopausal women ($n = 154$ cases and 154 controls) reported an increase in breast cancer for women who reported consuming >4 liters of red wine per month, or ~1 drink/day (OR, 4.0; 95% CI, 1.6-9.8; $P_{trend} = 0.003$; ref. 5). Whereas over half of the study population consumed red wine, <10% reported consuming white wine (5). This differs from our study where equal proportions of women reported consuming red and white wine. Another case-control study conducted in France reported a lower risk of breast cancer among women consuming 10 to 12 grams/day of wine (OR, 0.51; 95% CI, 0.30-0.97) when compared with nonwine drinkers, but they did not evaluate red and white wine separately (14).

Separate effects of red versus white wine on risk may have biological plausibility. Resveratrol, a polyphenol in grapes, peanuts, and other plant-based foods, has displayed anticarcinogenic properties in mouse mammary cultures (15, 16). Concentrations are greater in red compared with white wine, due to the variable amounts

Table 1. Association of recent alcoholic beverage consumption and breast cancer risk

Drinks per week	All women			Premenopausal women			Postmenopausal women[*],[†]		
	Cases ($n = 6,327$)	Controls ($n = 7,558$)	OR[‡] (95% CI)	Cases ($n = 2,462$)	Controls ($n = 2,925$)	OR[‡] (95% CI)	Cases ($n = 3,449$)	Controls ($n = 4,162$)	OR[‡] (95% CI)
	No. (%)	No. (%)		No. (%)	No. (%)		No. (%)	No. (%)	
All alcohol									
Nondrinkers	1,122 (18)	1,379 (18)	1	351 (14)	424 (15)	1	709 (21)	876 (21)	1
<1	2,129 (34)	2,712 (36)	0.94 (0.85-1.04)	894 (36)	1,045 (36)	1.02 (0.86-1.22)	1,106 (32)	1,480 (36)	0.90 (0.79-1.02)
1-3.4	1,450 (23)	1,731 (23)	0.99 (0.88-1.10)	592 (24)	767 (26)	0.90 (0.75-1.08)	745 (22)	863 (21)	1.03 (0.89-1.19)
3.5-6.9	702 (11)	793 (11)	1.02 (0.90-1.17)	306 (12)	363 (12)	0.96 (0.78-1.19)	345 (10)	384 (9)	1.05 (0.88-1.26)
7-13.9	619 (10)	658 (9)	1.11 (0.97-1.28)	221 (9)	223 (8)	1.17 (0.92-1.48)	355 (10)	395 (10)	1.07 (0.89-1.28)
≥14	305 (5)	285 (4)	1.24 (1.03-1.49)	98 (4)	103 (4)	1.10 (0.80-1.52)	189 (6)	164 (4)	1.37 (1.08-1.73)
P_{trend}			0.003			0.55			0.004
1-drink increase			1.01 (1.00-1.02)			1.00 (0.99-1.01)			1.02 (1.01-1.03)
Wine									
Nondrinkers	1,122 (18)	1,379 (18)	1	351 (14)	424 (15)	1	709 (21)	876 (21)	1
<1	2,455 (39)	2,920 (39)	1.03 (0.94-1.12)	1,021 (42)	1,183 (40)	1.09 (0.95-1.26)	1,283 (37)	1,550 (37)	0.97 (0.86-1.09)
1-3.4	1,048 (17)	1,248 (17)	1.00 (0.89-1.11)	424 (17)	546 (19)	0.98 (0.82-1.17)	538 (16)	634 (15)	0.95 (0.81-1.11)
3.5-6.9	343 (5)	363 (5)	1.13 (0.95-1.34)	134 (5)	149 (5)	1.15 (0.87-1.50)	179 (5)	192 (5)	1.05 (0.83-1.33)
7-13.9	256 (4)	299 (4)	1.07 (0.89-1.29)	90 (4)	86 (3)	1.42 (1.02-1.96)	147 (4)	192 (5)	0.93 (0.73-1.19)
≥14	82 (1)	70 (1)	1.37 (0.98-1.91)	29 (1)	24 (1)	1.58 (0.90-2.79)	47 (1)	43 (1)	1.23 (0.80-1.90)
P_{trend}			0.20			0.12			84
1-drink increase			1.01 (0.99-1.02)			1.00 (0.99-1.02)			1.01 (0.99-1.03)
Beer									
Nondrinkers	1,122 (18)	1,379 (18)	1	351 (14)	424 (15)	1	709 (21)	876 (21)	1
<1	1,756 (28)	2,040 (27)	1.01 (0.93-1.10)	714 (29)	870 (30)	0.92 (0.80-1.05)	916 (27)	1,044 (25)	1.05 (0.94-1.18)
1-3.4	754 (12)	836 (11)	1.06 (0.95-1.20)	359 (15)	444 (15)	0.91 (0.77-1.08)	345 (10)	346 (8)	1.21 (1.02-1.44)
3.5-6.9	163 (3)	210 (3)	0.90 (0.72-1.12)	105 (4)	120 (4)	0.91 (0.69-1.21)	48 (1)	76 (2)	0.81 (0.55-1.17)
7-13.9	129 (2)	139 (2)	1.08 (0.84-1.39)	52 (2)	55 (2)	1.05 (0.71-1.56)	66 (2)	74 (2)	1.08 (0.76-1.52)
≥14	82 (1)	84 (1)	1.12 (0.81-1.53)	32 (1)	39 (1)	0.89 (0.55-1.45)	45 (1)	39 (1)	1.44 (0.92-2.25)
P_{trend}			0.55			0.28			0.11
1-drink increase			1.01 (1.00-1.02)			1.01 (0.99-1.02)			1.01 (1.00-1.03)
Liquor									
Nondrinkers	1,122 (18)	1,379 (18)	1	351 (14)	424 (15)	1	709 (21)	876 (21)	1
<1	2,463 (39)	3,132 (41)	0.90 (0.83-0.98)	1,098 (45)	1,371 (47)	0.90 (0.79-1.02)	1,186 (34)	1,529 (37)	0.93 (0.83-1.04)
1-3.4	940 (15)	1,044 (14)	1.00 (0.90-1.12)	334 (14)	402 (14)	0.92 (0.77-1.11)	541 (16)	582 (14)	1.07 (0.92-1.24)
3.5-6.9	154 (2)	146 (2)	1.14 (0.90-1.44)	55 (2)	61 (2)	0.93 (0.63-1.37)	93 (3)	75 (2)	1.40 (1.02-1.93)
7-13.9	162 (3)	175 (2)	1.00 (0.80-1.26)	37 (2)	38 (1)	1.00 (0.62-1.60)	115 (3)	131 (3)	0.98 (0.75-1.29)
≥14	95 (2)	73 (1)	1.41 (1.03-1.94)	18 (1)	19 (1)	1.10 (0.56-2.13)	74 (2)	50 (1)	1.63 (1.12-2.38)
P_{trend}			0.28			0.37			0.04
1-drink increase			1.02 (1.00-1.03)			0.99 (0.97-1.02)			1.03 (1.01-1.05)

[*]For the test of the interaction between total alcohol consumption (continuous) and menopausal status $P = 0.05$.
[†]For the test of the interaction between alcohol consumption (continuous) and menopausal status: all alcohol, $P = 0.05$; wine, $P = 0.89$; beer, $P = 0.89$; liquor, $P = 0.03$.
[‡]Adjusted for age, state, family history of breast cancer, age at menarche, age at first birth, parity, menopausal status, age at menopause, postmenopausal hormone use, body mass index, education, wine, beer, and liquor consumption.

Table 2. Association of recent red and white wine consumption and breast cancer risk

Wine type	Cases (n = 6,327)	Controls (n = 7,558)	OR (95% CI)*,[†]
Drinks per week	No. (%)	No. (%)	
Red wine			
Nondrinkers	1,122 (18)	1,379 (18)	1
<1	2,145 (34)	2,502 (33)	1.03 (0.94-1.12)
1-3.4	738 (12)	885 (12)	0.94 (0.83-1.06)
3.5-6.9	98 (2)	119 (2)	0.91 (0.69-1.21)
7-13.9	124 (2)	133 (2)	1.17 (0.90-1.51)
≥14	28 (<1)	24 (<1)	1.27 (0.73-2.22)
P_{trend}			0.99
1-drink increase			1.00 (0.98-1.01)
White wine			
Nondrinkers	1,122 (18)	1,379 (18)	1
<1	2,145 (34)	2,587 (34)	0.98 (0.90-1.07)
1-3.4	880 (14)	997 (13)	1.06 (0.94-1.19)
3.5-6.9	161 (3)	143 (2)	1.40 (1.10-1.78)
7-13.9	103 (2)	137 (2)	0.90 (0.69-1.18)
≥14	40 (1)	34 (<1)	1.37 (0.86-2.19)
P_{trend}			0.34
1-drink increase			1.02 (1.00-1.04)

*Adjusted for age, state, family history of breast cancer, age at menarche, age at first birth, parity, menopausal status, age at menopause, postmenopausal hormone use, body mass index, education, and total alcohol consumption (minus red or white wine consumption).
[†] For the test of the interaction wine type (red versus white, continuous) P = 0.60.

of time that red grape skins are present during processing (17). However, resveratrol is metabolized quickly: consistent intake of two glasses of red wine daily would be equivalent to a dose of ∼27 μg/kg body weight for a 70-kg individual, leading to detectable concentrations of derivatives but not free resveratrol (9). Thus, these low levels may not result in bioeffective concentrations.

Limitations should be considered in interpreting our findings. Exposure measurement was limited to recent use, and patterns may have changed over time. Although we were able to control for many confounders, we did not have data on drinking patterns (i.e., moderate versus binge drinking). Self-reported alcohol intake measures are prone to error due to both retrospective reporting and recall bias. However, alcohol intake measured via food frequency is correlated with food records (Spearman r = 0.9; ref. 18) and the reliability of reporting is acceptable (r = 0.8; ref. 19).

Wine consumption has been increasing over the past decade in the United States (20), so future studies may more precisely evaluate the effects red and white wine on incidence of breast cancer.

Disclosure of Potential Conflicts of Interest

No potential conflicts of interest were disclosed.

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Correction

Correction: Article on Wine Consumption and Breast Cancer Risk

In an article on red and white wine consumption and breast cancer risk (1) in the March 2009 issue, an error should be noted.

In Table 1, page 1008: the wine P_{trend} for postmenopausal women, found in the last column, line 15, incorrectly appeared as 84. The correct value is 0.84.

Reference

1. Newcomb PA, Nichols HB, Beasley JM, et al. No difference between red wine or white wine consumption and breast cancer risk. Cancer Epidemiol Biomarkers Prev 2009;18:1007–10.

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