ORIGINAL ARTICLE

# Alcohol intake and risk of rosacea in US women

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***Background:*** The epidemiologic association between alcohol and rosacea is unclear and inconsistent based on the previous cross-sectional or case-control studies.

***Objective:*** We conducted a cohort study to determine the association between alcohol intake and the risk of rosacea in women.

***Methods:*** A total of 82,737 women were included from the Nurses' Health Study II (1991-2005). Information on alcohol intake was collected every 4 years during follow-up. Information on history of clinician-diagnosed rosacea and year of diagnosis was collected in 2005.

***Results:*** Over 14 years of follow-up, we identified 4945 cases of rosacea. Compared with never drinkers, increased alcohol intake was associated with a significantly increased risk of rosacea ($P_{trend}$ <.0001). The multivariate-adjusted hazard ratios (HRs) and confidence intervals (CIs) were 1.12 (95% CI 1.05-1.20) for alcohol intake of 1-4 g/day and 1.53 (1.26-1.84) for ≥30 g/day. The associations remained consistent across categories of smoking status. Further examination of types of alcoholic beverage consumed revealed that white wine ($P_{trend}$ <.0001) and liquor intake ($P_{trend}$ = .0006) were significantly associated with a higher risk of rosacea.

***Limitations:*** This was an epidemiologic study without examination into etiologic mechanisms.

***Conclusions:*** Alcohol intake was significantly associated with an increased risk of rosacea in women. (J Am Acad Dermatol http://dx.doi.org/10.1016/j.jaad.2017.02.040.)

***Key words:*** alcohol intake; cohort studies; dose-response relationship; epidemiology; rosacea; smoking.

Rosacea is a chronic inflammatory skin disorder, which affects approximately 16 million people in the United States.[1-3] Dysfunction in the innate and adaptive immune response, dysregulation of the vascular and nervous systems, and their interplay with the inflammatory response have been implicated in the development of rosacea.[1-4]

Alcohol impairs the vasomotor center of the brain, inducing peripheral vasodilatation, and is known to have a profound effect on the immune system.[5,6] It has been suggested that resultant cutaneous vasodilatation and proinflammatory effects contribute to the hallmark redness and flushing, exacerbating rosacea.[5,7-10]

*Abbreviations used:*

| | |
|---|---|
| CI: | confidence interval |
| HR: | hazard ratio |
| NHS II: | Nurses' Health Study II |

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Conflicts of interest: Dr Drucker has received honoraria from Astellas Canada for speaking and serves as an investigator (with no financial compensation) for Sanofi and Regeneron. The other authors declare no conflicts of interest.

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The epidemiologic association between alcohol and rosacea is unclear and inconsistent based on previous studies.[11-14] Several case-control studies or case series did not find significant associations between alcohol and rosacea.[11-13] Recently, though, a large case-control study reported an elevated risk of rosacea by increasing alcohol intake.[14] No prospective studies have investigated the association between alcohol intake and the risk for incident rosacea.

In the present study, we investigated the association between alcohol intake and the risk of incident rosacea in a total of 82,737 women from the Nurses' Health Study II (NHS II).

**CAPSULE SUMMARY**

- The association between alcohol intake and rosacea is unclear.
- In the current study, alcohol intake, particularly white wine and liquor, was associated with an increased risk of rosacea in women.
- These findings contribute to our understanding of the etiology of rosacea and might assist in the treatment of affected patients.

## SUBJECTS AND METHODS

### Study population

The details of NHS II, a cohort of women, have been described previously.[15,16] This study was approved by the Institutional Review Board of Brigham and Women's Hospital. The participants' completion and return of the self-administered questionnaires were considered as informed consent. Information on alcohol use was collected in 1991, 1995, 1999, and 2003. Women in NHS II were asked how often on average they had consumed regular beer, light beer (12 oz), red wine, white wine (4 oz), or liquor (1 standard drink) during the past year. Intake of each beverage was ascertained in 9 categories (number of drinks): none or <1/month, 1-3/month, 1/week, 2-4/week, 5-6/week, 1/day, 2-3/day, 4-5/day, and ≥6/day. Total alcohol intake was calculated as the sum of the alcohol intake from beer, wine, and liquor, as detailed previously.[17] In 2005, nurses were asked whether they ever had clinician-diagnosed rosacea, and if so, their diagnosis year in time intervals (before 1991, 1991-1994, 1995-1998, 1999-2002, or 2003-2005). Among women who responded to the 2005 questionnaire (n = 97,476), we excluded rosacea cases that occurred before 1991, with missing diagnosis year (n = 1158), and with missing total alcohol intake information (n = 13,581). A total of 82,737 women remained in the analysis.

### Statistical analysis

We calculated person-years from the return date of the 1991 questionnaire to the date of diagnosis of rosacea or the end of follow-up (June 2005), whichever came first.

We conducted Cox proportional hazards analysis stratified by age and 2-year intervals to estimate age- and multivariate-adjusted (for collection of covariates, see the Supplementary Appendix; available at http://www.jaad.org) hazard ratios (HR) and 95% confidence intervals (CIs) for the risk of incident rosacea associated with total alcohol intake and each individual alcoholic beverage. Information on the exposure was updated in 4-year questionnaire cycles, whenever available. Trend tests for total alcohol intake and each individual alcoholic beverage were carried out using continuous measures of these variables by assigning the median to each category. Adjusted Cox proportional hazard models was fitted by using a restricted cubic spline regression analysis to examine the shape of the dose-response relations between alcohol intake and risk for incident rosacea.[18]

We examined the association between alcohol intake and risk of rosacea stratified by smoking status.[19] To address the concern of reverse-causation bias, a 4-year lag analysis was conducted by excluding rosacea cases documented within the first 4 years of each updated assessment of alcohol intake.

All statistical analyses were conducted using SAS, version 9.4 (SAS Institute, Inc, Cary, North Carolina). All statistical tests were 2-tailed, and the significance level was set at $P < .05$.

## RESULTS

Table I shows the characteristics of the women in 1991 by total alcohol intake; 42.3% of the women never had alcohol intake, 38.8% had alcohol intake of 1-4 g/day, and 1.1% had alcohol intake of >30 g/day. Women with high alcohol intake were more likely to smoke and use oral contraceptives.

During 1,120,050 person-years of follow-up, we identified 4945 incident cases of rosacea. Compared with never drinkers, increased alcohol intake was associated with an elevated risk of rosacea ($P_{trend}$ <.0001). The multivariate-adjusted HRs (95% CIs) were 1.12 (95% CI 1.05-1.20) for alcohol intd with an elevated risk for incident rosacea ($P_{trend}$ <.0001). The multivariate-adjusted HRs (95% CIs) were 1.12 (95% CI 1.05-1.20) for alcohol intake of 1-4 g/day,