

Association Between Alcohol Use and Female Sexual Dysfunction From the Data Registry on Experiences of Aging, Menopause, and Sexuality (DREAMS)

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ABSTRACT

Introduction: Sexual dysfunction is a common problem in women and the nature of its association with alcohol use remains unclear.

Aim: To explore the association between alcohol use and female sexual dysfunction (FSD).

Methods: Associations between self-reported drinking and sexual function were evaluated in 2,253 women presenting for consultation to a women's health specialty clinic. A short version of the Alcohol Use Disorders Identification Test (AUDIT-C) was used to evaluate alcohol use. Women with an AUDIT-C ≥ 3 were considered at risk for hazardous drinking. Multivariable regression, controlling for depression, anxiety, and abuse (childhood and recent), was used to assess the association between alcohol consumption and FSD (defined as a Female Sexual Function Index [FSFI] ≤ 26.55 and Female Sexual Distress Scale [FSDS] ≥ 11) in sexually active women.

Main Outcome Measure: The main study outcome measure was the presence of FSD as defined by a score ≤ 26.55 on the FSFI and ≥ 11 on the FSDS.

Results: 57% of the 1,649 sexually active women were classified as having FSD; 80% reported any alcohol use and 38% reported drinking patterns with the potential to be hazardous. The women at risk for hazardous drinking had significantly higher FSFI domain scores indicating better sexual function ($P \leq .001$). However, in multivariable analyses, there was no significant difference in the rates of FSD across alcohol use categories in women.

Conclusion: In women presenting for consultation to a women's health specialty clinic, an association between alcohol use and FSFI scores was seen, in which greater risk of hazardous drinking was associated with better sexual function scores. However, when sexual distress was included to define sexual dysfunction, those with FSD were not at higher risk of hazardous drinking. Given the complex nature of FSD, additional study is needed to further clarify these relationships. **Kling JM, Sidhu K, Rullo J, et al. Association Between Alcohol Use and Female Sexual Dysfunction From the Data Registry on Experiences of Aging, Menopause, and Sexuality (DREAMS). Sex Med 2018;XX:XX–XX.**

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Key Words: Alcohol; Female Sexual Dysfunction; Sexual Distress; Hazardous Alcohol Use

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INTRODUCTION

Female sexual dysfunction (FSD) is a common, yet under-diagnosed problem.¹ Many biological factors can impact female sexual function, including, but not limited to, age, body mass index (BMI), physical activity, physical and mental health, substance abuse, and hormonal status.^{2–4} Alcohol intake has been proposed to impact sexual function both positively and negatively through various mechanisms. For example, it is theorized that alcohol has a beneficial effect on sexual functioning by enhancing subjective arousal in women and increasing endogenous estrogens through aromatization of androgens.^{5–8} Previous studies have also linked alcohol consumption with better overall sexual function, desire, and lubrication, and also

with sexual risk-taking.^{9,10} However, rates of male and female sexual dysfunction have also been shown to be higher in those with alcohol dependence compared with healthy controls.¹¹

Most previous studies evaluating sexual complaints and alcohol have not examined the distress associated with sexual health concerns, a critical component in the definition of FSD. This is important to evaluate because the prevalence of distressing sexual problems, that is, those that may require clinical intervention, has been found to be considerably lower than sexual problems not accompanied by distress in women.¹² Furthermore, similar to the distinction between anxiety symptoms and an anxiety disorder in terms of diagnosis, outcomes, and treatment, there is a difference between sexual concerns and FSD. By incorporating distress in the analysis, a more comprehensive view of the complex interplays between hazardous alcohol use and female sexual function can be obtained. It is hypothesized that women with FSD may drink more to manage the distress associated with symptoms, as is seen with stress and anxiety.¹³ Alternatively, alcohol use may contribute to FSD via psychophysiological mechanisms.

The current study aimed to evaluate relationships between alcohol use and FSD in a large cohort of women presenting for consultation to a women's health specialty clinic using validated questionnaires.

METHODS

All women presenting for consultation to our women's health specialty clinic complete a set of validated questionnaires including the Female Sexual Function Index (FSFI), Female Sexual Distress Scale (FSDS), Patient Health Questionnaire (PHQ-9), and Generalized Anxiety Disorder (GAD-7), as well as an intake form that includes demographic information, reproductive and gynecologic history, and personal habits. This information is entered into an electronic database, the Data Registry on Experiences of Aging, Menopause, and Sexuality (DREAMS). Consults seen in women's health include menopause, sexual health, and other (headache, cancer survivorship, and stress management that make up <3% of consults). For this retrospective cross-sectional study, we evaluated data from 2,253 women who presented for consultation from May 2015 through December 2016 and provided consent for use of their medical records for research purposes. Only women who were sexually active (1,649) were included in the analysis. The study was approved by the Institutional Review Board.

The FSFI and FSDS were used to evaluate sexual function as reported over the preceding 4 weeks. The FSFI, a validated 19-item questionnaire with scores ranging from 2.0 to 36.0, is designed to assess female sexual function, with a lower score indicating greater sexual dysfunction.¹⁴ The FSFI is divided into 6 domains: desire, arousal, lubrication, orgasm, satisfaction, and pain.¹⁴ A total FSFI score ≤ 26.55 identifies women with sexual dysfunction.¹⁵ We only included responses from the women who

reported sexual activity in the preceding 4 weeks (using question 11), and we excluded those who responded "no sexual activity." Sexual distress was assessed using the FSDS-R. The FSDS, a 13-item scale, measures sexually related personal distress in women with sexual complaints with high test-retest reliability.¹⁶ Scores range from 0 to 52. A score ≥ 11 indicates clinically significant sexual distress.¹⁶ Therefore, for this study, FSD was defined by end points including both the FSDS-R and the FSFI.

Self-reported alcohol use over the last year was assessed through the Alcohol Use Disorders Identification Test (AUDIT), a validated questionnaire used to assess alcohol consumption and drinking behaviors, and to screen for alcohol use disorders.¹⁷ The AUDIT-C, an abbreviated version of the full questionnaire, consists of the first 3 items of the AUDIT. It asks the following questions about alcohol consumption: How often do you have a drink containing alcohol? How many drinks containing alcohol do you have on a typical day when you are drinking? How often do you have 6 or more drinks on 1 occasion? The AUDIT-C is able to specifically identify hazardous drinking with reliability and internal consistency.^{18–20} The AUDIT-C total score ranges from 0 to 12 with each question scored from 0 to 4 points. For women, the AUDIT-C has been found to perform as well as in men in detecting hazardous drinking when a lower cut point of 3 is used.^{18,20,21} Therefore, our analysis divided the participants into those at risk vs not-at-risk of hazardous drinking (AUDIT ≥ 3 vs < 3), with hazardous drinkers defined as those at risk for psychological and physical harm related to their drinking.¹⁸

Depression, anxiety, and a history of sexual abuse can influence alcohol use patterns as well as sexual function.^{5,22,23} To account for possible confounding, we controlled for depression, anxiety, a history of adverse childhood experiences, and recent sexual abuse. Depression was evaluated using the PHQ-9, a 9-item survey with scores ranging from 0 to 27, and anxiety with the GAD-7, with scores ranging from 0 to 21. For both the PHQ-9 and GAD-7, scores of 5, 10, and 15 indicate mild, moderate, and severe depression and anxiety, respectively.²⁴ We controlled for scores ≥ 5 .

Adverse childhood experiences were evaluated with the Adverse Childhood Experiences (ACE) questionnaire, a 10-item validated questionnaire that measures the cumulative exposure to 10 categories of adverse experiences during childhood and adolescence.²⁴ An ACE score of ≥ 4 was used as a cut-off to assess for adverse childhood experiences because this score has been shown to be predictive of future mental and physical health problems.^{25–27} Recent sexual abuse (in the last year, yes vs no) was obtained from the clinic intake form by the question, "Abuse in the past year yes/no; if yes, verbal/emotional, physical, sexual?" Basic demographic information including age, employment status, education, race/ethnicity, tobacco use, and BMI were also obtained.

Analytic Plan

Descriptive statistics were reported as mean (SD), or number (percentage) as appropriate. FSFI and FSDS scores were

Table 1. Population descriptives (N = 1,649)

| | N (%) |
|------------------------------------|---------------|
| Age | |
| Mean (SD) | 51.8 (11.0) |
| BMI | |
| Mean (SD) | 26.2 (5.7) |
| Smoking status | |
| Never | 1,178 (74.2) |
| Former | 340 (21.4) |
| Current | 69 (4.3) |
| Marital status | |
| Married/Committed relationship | 1,380 (83.6) |
| Single | 146 (8.9) |
| Divorced/ Separated | 91 (5.5) |
| Widowed | 18 (1.1) |
| Race | |
| White | 1,542 (94.5) |
| Non-white | 89 (5.5%) |
| Education | |
| High school graduate/GED or lower | 120 (7.6) |
| Some college or 2-year degree | 445 (28.2) |
| 4-year college graduate | 535 (33.9) |
| Postgraduate studies | 478 (30.3) |
| Employment | |
| Employed | 1,011 (63.5) |
| Full-time homemaker | 221 (13.9) |
| Retired | 219 (13.8) |
| Other | 141 (8.9) |
| Hormone therapy | |
| Missing | 210 |
| Yes | 1,011 (70.3) |
| No | 428 (29.7) |
| Sexual problem (FSFI \leq 26.55) | 1,160 (70.3) |
| Sexual distress (FSDS \geq 11) | 1,042 (63.7) |
| ACE total score, mean (SD) | 1.5 (1.9) |
| ACE | |
| $<$ 4 | 1,319 (85.2%) |
| \geq 4 | 230 (14.8%) |
| Sexual Abuse (ACE) | |
| No | 1,301 (84.9) |
| Yes | 231 (15.1) |
| Abuse in last year | |
| No | 1,608 (97.5) |
| Yes | 41 (2.5) |
| GAD-7 total score | |
| Mean (SD) | 3.7 (4.5) |
| PHQ-9 total score | |

(continued)

compared between women with a self-reported risk of hazardous drinking (AUDIT \geq 3) vs non-hazardous drinking (AUDIT $<$ 3) using logistic regression. Multivariable logistic regression analysis was used to assess whether AUDIT \geq 3 was associated with FSD (using combined endpoints of FSDS-R and FSFI scores) after

Table 1. Continued

| | N (%) |
|-----------|------------|
| Mean (SD) | 4.3 (4.6) |
| AUDIT-C | |
| \geq 3 | 665 (40.3) |
| $<$ 3 | 984 (59.7) |

AUDIT score \geq 3 detects hazardous drinking;¹⁶ GAD-7 and PHQ-9 scores of 5, 10, and 15 indicate mild, moderate, and severe anxiety and depression, respectively.²² FSFI \leq 26.55 indicates sexual dysfunction;⁹ FSDS \geq 11 indicates sexual distress.¹⁰

ACE = adverse childhood experience; AUDIT = Alcohol Use Disorders Identification Test; BMI = body mass index; FSDS = Female Sexual Distress Scale; FSFI = Female Sexual Function Index; GAD-7 = Generalized Anxiety Disorder; PHQ-9 = Personal Health questionnaire.

adjusting for depression, anxiety, appointment type (menopause vs sexual health vs other), history of recent sexual abuse, and self-reported adverse childhood experiences. All statistical tests were 2-sided, and $P < .05$ was considered to be statistically significant. The analysis was performed using SAS version 0.4 (SAS Institute Inc, Cary, NC, USA).

RESULTS

Participants were predominantly white and married, with an average age of 51.8 years (SD 11.0) (range 20.1–85.2 years) (Table 1). Of the 2,253 women, 1,649 reported being sexually active and were included in the analysis. A little over half (56.8%) were classified as having FSD (FSFI \leq 26.55 and FSDS \geq 11). The majority of women (85.2%) had an ACE score $<$ 4. Mean scores for the PHQ-9 and GAD-7 were 4.3 (SD 4.6) and 3.7 (SD 4.5), respectively, demonstrating that on average, women did not have significant depression or anxiety; about one-third of the women (31.1%) had some level of anxiety (mild, moderate, or severe), and 34.3% had depression (mild, moderate, or severe).

A majority of the women reported using alcohol (80.3%), and 40% were found to be at risk for hazardous drinking (AUDIT-C \geq 3). The women at risk for hazardous drinking were older, reported lower education levels, had lower GAD-7 and PHQ-9 scores, and were less likely to report a history of recent sexual abuse when compared with women with AUDIT-C $<$ 3, but did not differ by menopausal status (pre-, peri-, or postmenopausal) or menopausal hormone therapy usage (yes/no), or ACE score from the women at low risk for hazardous drinking (Table 2).

Women at risk for hazardous drinking reported fewer sexual complaints and had better sexual function as demonstrated by higher FSFI scores (both overall and for the specific domains of desire, lubrication, pain, and satisfaction; P values $<$.05). Sexual distress (FSDS \geq 11) was also reported less frequently in women at risk for hazardous drinking compared with those not at risk, but this did not reach statistical significance (40.5% vs 59.5%, $P = .99$).

In multivariate analysis, women at risk of hazardous drinking had lower odds of having an FSFI ≤ 26.55 than women with lower self-reported drinking (AUDIT-C < 3) (odds ratio [OR] 0.75, 95% confidence interval [CI] 0.59–0.95, $P = .016$) (Table 3). Additionally, women at risk for hazardous drinking had higher FSFI domain scores in the desire, lubrication, satisfaction, and pain domains than those who drank less ($P < .05$). There were no statistically significant differences in sexual distress across categories of drinking ($P = .38$), nor were there differences in the composite end point for FSD (combination of FSFI ≤ 26.55 and FSDS ≥ 11) ($P = .20$).

DISCUSSION

In sexually active women presenting to a tertiary care center women's health clinic, an association was seen between potentially hazardous alcohol use and better sexual function. Specifically, associations were seen between hazardous alcohol use and most female sexual function domains of the FSFI, including desire, lubrication, pain, and satisfaction, in which women at risk for hazardous drinking had higher sexual function scores when compared with women who reported lower alcohol consumption. These findings are consistent with previous research demonstrating that moderate wine drinkers have higher overall FSFI scores and less sexual dysfunction.⁹ A population-based sample reported that greater alcohol use was associated with fewer symptoms of sexual dysfunction using the FSFI.¹⁰ In a longitudinal, population-based sample of women in late menopause from the Women's Healthy Aging Project, moderate alcohol use (3–7 drinks per week) was found to be predictive of sexual activity after adjustment for age, depression, and partner availability.²⁸

Previous studies, however, have also demonstrated negative associations of alcohol with sexual function, including decreased physiological arousal and pleasure.^{5,29} Heavy alcohol consumption (blood alcohol concentration = 0.08 mg%), specifically, appears to be associated with increased risk for sexual dysfunction. For example, alcohol has been found to attenuate sexual arousal in young women at higher doses.³⁰ Another study found associations between alcohol dependence and lower total FSFI scores and domain scores, suggesting that clinically diagnosed alcohol dependence may negatively impact female sexual function.³¹ Our study did not evaluate those with diagnosable alcohol disorders or alcohol dependence specifically, which may explain the difference in findings, such that the relationship between potentially hazardous or moderate drinking and sexual function may be different than the relationship between alcohol dependence or heavy alcohol intake and sexual function.

Although an association between sexual function scores by FSFI and alcohol consumption was found, when sexual distress was included, a key component to the diagnosis of FSD, no significant associations were seen, an unexpected finding. Therefore, even though women who drank less had more sexual

complaints, they were not necessarily at a higher risk for sexual dysfunction. This may highlight a difference in the physical and psychological effects of alcohol use in women, or alternatively may reflect a difference in motivation for alcohol consumption as it relates to sexual function. It has been established that acute alcohol intoxication increases women's subjective sexual arousal.^{8,9,32} Women may turn to alcohol to help manage certain factors contributing to their sexual problems, such as decreased arousal, anxiety, or relationship issues, but not to manage distress related to sexual dysfunction. This supports that FSD is distinct from sexual health concerns and should be addressed as such. Nonetheless, women presenting with concerns about their sexual health should be screened for alcohol use and counseled appropriately about the risks of hazardous drinking.

Because our results are observational, the direction of these relationships is unknown, and other confounding variables may explain the relationships seen. It is also possible that some women with sexual problems may be avoiding alcohol with the concern that it could negatively impact their sexual function. However, there does not appear to be an association between FSD and risk of hazardous alcohol use in our cohort of sexually active women. The study does not evaluate possible associations between FSD and alcohol consumption in women who are not sexually active. These findings underscore the complexity of the relationship between female sexual function and alcohol use, and the need for additional study to counsel women appropriately.

Strengths and Limitations

The study strengths include the large cohort size with a broad range of ages (20–85 years of age) and the use of validated instruments to assess sexual function and alcohol use. Our study examines not only the association between sexual concerns and alcohol consumption, but also includes the assessment of sexual distress associated with sexual problems. Further, an AUDIT-C cut-off that has been found to be more sensitive in identifying hazardous drinking in women was used. Most prior studies evaluating sexual function and alcohol in women were done with women in treatment or recovery, or using scale cut-offs validated in men.^{5,11,20}

The limitations of our study include a lack of diversity in the study cohort; the majority of the study population consisted of married, white, educated, employed women presenting for women's health consultation in a tertiary care facility that may limit the ability to generalize our findings to other groups of women with sexual dysfunction. Additionally, lack of information regarding other variables that could influence both alcohol use and sexual function, such as partner variables and chronic illnesses (eg, diabetes) could introduce confounding. Menopausal status is another potential confounder, and we attempted to control for this; however, the menopausal status was unknown in the majority of participants. Because sexual dysfunction is a multidimensional issue that has a multifactorial cause, it is difficult to account for all possible confounding variables. The

Table 2. Participant characteristics by AUDIT-C category

| | AUDIT-C ≥ 3 (N = 665) | AUDIT-C < 3 (N = 984) | P value |
|-----------------------------------|----------------------------|-------------------------|---------|
| Age | | | <.001 |
| Mean (SD) | 53.6 (10.3) | 50.6 (11.3) | |
| Range | (20.1–80.4) | (20.4–85.2) | |
| Marital status, N (%) | | | .98 |
| Married/Committed relationship | 559 (40.5) | 821 (59.5) | |
| Single | 58 (39.7) | 88 (60.3) | |
| Divorced/Separated | 38 (41.8) | 53 (58.2) | |
| Widowed | 8 (44.4) | 10 (55.6) | |
| Education, N (%) | | | .003 |
| High school graduate/GED or lower | 44 (36.7) | 76 (63.3) | |
| Some college or 2-year degree | 150 (33.7) | 295 (66.3) | |
| 4-year college degree | 232 (43.4) | 303 (56.6) | |
| Postgraduate studies | 213 (44.6) | 265 (55.4) | |
| Employment, N (%) | | | <.001 |
| Employed | 413 (40.9) | 598 (59.1) | |
| Full-time homemaker | 90 (40.7) | 131 (59.3) | |
| Retired | 107 (48.9) | 112 (51.1) | |
| Other | 34 (24.1) | 107 (75.9) | |
| Hormone therapy, N (%) | | | .12 |
| Missing | 87 | 123 | |
| No | 393 (38.9) | 618 (61.1) | |
| Yes | 185 (43.2) | 243 (56.8) | |
| Menopause status, N (%) | | | .46 |
| Missing | 480 | 677 | |
| Premenopause | 28 (31.8) | 60 (68.2) | |
| Perimenopause | 22 (37.3) | 37 (62.7) | |
| Postmenopause | 124 (40.0) | 186 (60.0) | |
| Unknown | 11 (31.4) | 24 (68.6) | |
| Childhood sexual abuse, N (%) | | | .009 |
| Missing | 42 | 75 | |
| No | 547 (42.0) | 754 (58.0) | |
| Yes | 76 (32.9) | 155 (67.1) | |
| Abuse in past year, N (%) | | | .035 |
| No | 655 (40.7) | 953 (59.3) | |
| Yes | 10 (24.4) | 31 (75.6) | |
| GAD-7, N (%) | | | .017 |
| <5 | 476 (42.4) | 648 (57.7) | |
| ≥ 5 | 183 (36.1) | 324 (63.9) | |
| PHQ-9, N (%) | | | .004 |
| <5 | 459 (42.8) | 613 (57.2) | |
| ≥ 5 | 198 (35.4) | 362 (65.46) | |
| ACE total score | 1.4 (1.8) | 1.5 (1.9) | .45 |
| ACE, N (%) | | | .078 |
| <4 | 546 (41.4) | 773 (58.6) | |
| ≥ 4 | 81 (35.2) | 149 (64.8) | |

AUDIT score ≥ 3 detects hazardous drinking;¹⁶ GAD-7 and PHQ-9 scores of 5, 10, and 15 indicate mild, moderate, and severe anxiety and depression, respectively.²²

ACE = adverse childhood experience; AUDIT = Alcohol Use Disorders Identification Test; GAD-7 = Generalized Anxiety Disorder; PHQ-9 = Patient Health Questionnaire.

presence of a previous alcohol use disorder or duration of alcohol use was not assessed, so these results represent only a single point in time and, for this and other design reasons, does not provide information about dynamic relationships between alcohol use

and sexual function that may change over time. Although both the sexual dysfunction and alcohol questionnaires ask about habits and behaviors over the last 4 weeks and last year, respectively, there is no way to know if these were occurring at

Table 3. Female sexual dysfunction by AUDIT-C category

| | Univariate analysis | | | Multivariable analysis [‡] | | |
|--|---------------------|---------------|---------|-------------------------------------|---------------|---------|
| | Estimate* | 95% CI | P value | Estimate* | 95% CI | P value |
| Sexual dysfunction by FSFI, N (%) [†] | 0.78 | (0.62, 0.97) | .027 | 0.75 | (0.59, 0.95) | .016 |
| FSFI Total | 1.36 | (0.61, 2.11) | <.001 | 1.34 | (0.64, 2.05) | <.001 |
| FSFI Arousal | 0.14 | (−0.02, 0.30) | .079 | 0.12 | (−0.03, 0.27) | .13 |
| FSFI Desire | 0.14 | (0.01, 0.26) | .033 | 0.13 | (0.00, 0.25) | .046 |
| FSFI Lubrication | 0.26 | (0.08, 0.44) | .004 | 0.34 | (0.17, 0.51) | <.001 |
| FSFI Orgasm | 0.09 | (−0.09, 0.27) | .34 | 0.06 | (−0.11, 0.23) | .47 |
| FSFI Pain | 0.43 | (0.22, 0.64) | <.001 | 0.49 | (0.29, 0.70) | <.001 |
| FSFI Satisfaction | 0.31 | (0.15, 0.47) | <.001 | 0.21 | (0.06, 0.37) | .006 |
| Distress, N (%) [†] | 1.02 | (0.83, 1.27) | .83 | 1.11 | (0.88, 1.39) | .38 |
| Dysfunction and Distress, N (%) [‡] | 0.87 | (0.71, 1.07) | .19 | 0.90 | (0.72, 1.12) | .20 |

FSFI ≤ 26.55 indicates sexual dysfunction;⁹ FSFS ≥ 11 indicates sexual distress.¹⁰

ACE = adverse childhood experience; AUDIT = Alcohol Use Disorders Identification Test; FSFS = Female Sexual Distress Scale; FSFI = Female Sexual Function Index; GAD-7 = Generalized Anxiety Disorder; PHQ-9 = Patient Health Questionnaire.

*Estimates are the difference in score for AUDIT-C ≥ 3 – AUDIT-C < 3 unless otherwise specified.

[†]Estimates for these are odds ratios for AUDIT-C ≥ 3 vs AUDIT-C < 3 .

[‡]Adjusted for age, GAD-7 (≥ 5 vs < 5), PHQ-9 (≥ 5 vs < 5), ACE (≥ 4 vs < 4), and presenting concern (menopause vs sexual health vs other).

the same time. However, we were evaluating associations between sexual dysfunction and risk of hazardous drinking and how these associate, and not the direct impact of concurrent alcohol use on sexual functioning. We relied on self-report for our outcomes and did not assess outcomes beyond questionnaires leading to the possibility of recall bias. Finally, the nature of the topics queried is sensitive and may have been underreported.

CONCLUSION

Our results demonstrate an association between alcohol use and sexual function concerns by FSFI, in which risk of hazardous drinking was associated with higher (better) total sexual function scores, and specifically with higher domain scores in desire, lubrication, satisfaction, and pain. However, when distress was included, there was no association between risk of hazardous drinking and FSD. Given the complexity of female sexual function, additional study is needed to help clarify these relationships.

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