Regular Moderate Intake of Red Wine Is Linked to a Better Women's Sexual Health

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ABSTRACT

Introduction. While some evidence does exist for a positive correlation between moderate wine intake and men's sexual health, there is no study addressing the potential correlation between red wine intake and women's sexual function.

Aim. The aim of our study was to assess whether there is a tie between daily red wine intake and sexual function in a sample of healthy Italian women, living in the Chianti area (Tuscany) not complaining of any sexual disorders.

Methods. We recruited 798 women (age 18–50), living in the Chianti area (Tuscany), not complaining of any sexual disorders. We divided the participants into three groups: daily moderate (one to two glasses) red wine intake (group 1); teetotallers (group 2); and daily intake of more than two glasses of red wine and/or other types of alcoholic drinks (including white wine), as well as of those reporting occasional drinking (group 3).

Main Outcome Measures. All participants completed anonymously the Female Sexual Function Index (FSFI) questionnaire and were asked to report on their amount and type of alcohol consumption.

Results. Group 1 had significantly higher total ($P = 0.001$), as well as desire and lubrication domain ($P = 0.001$ and $P = 0.001$, respectively) FSFI scores than participants in groups 2 and 3. No significant differences between the groups were observed concerning sexual arousal, satisfaction, pain, and orgasm. Univariate analysis showed a significant correlation between age, alcohol consumption ($P = 0.009$), and a better score at questionnaire examination. During multivariate analysis, alcohol consumption was identified as an independent prognostic parameter ($P = 0.002$) in predicting the better score at questionnaire examination.

Conclusions. The finding that regular moderate intake of red wine is associated with higher FSFI scores for both sexual desire, lubrication, and overall sexual function as compared to the teetotaller status is intriguing. While this finding needs to be interpreted with some caution, because of the small sample size, self-reported data, and the lack of support from laboratory exams, it nevertheless suggests a potential relationship between red wine consumption and better sexuality. **Mondaini N, Cai T, Gontero P, Gavazzi A, Lombardi G, Boddi V, and Bartoletti R. Regular moderate intake of red wine is linked to a better women's sexual health. J Sex Med 2009;6:2772–2777.**

Key Words. Female Sexual Function; FSFI; Red Wine; Alcohol; Polyphenols; Endothelium; Mediterranean Diet; Female Sexual Arousal

Introduction

The consumption of a Mediterranean-style diet in women with metabolic syndrome and female sexual dysfunction (FSD) seems to improve sexual function, together with a significant reduction of systemic vascular inflammation. The mechanism by which a Mediterranean-style diet can improve sexual function in women with metabolic syndrome is unclear [1]. Red wine is a fundamental component of the Mediterranean diet (Figure 1). Regular, moderate consumption of red wine is linked to a reduced risk of coronary heart disease and to a lower overall mortality, but the contribution of its components, alcohol and polyphones, to these effects remains unclear [2]. The

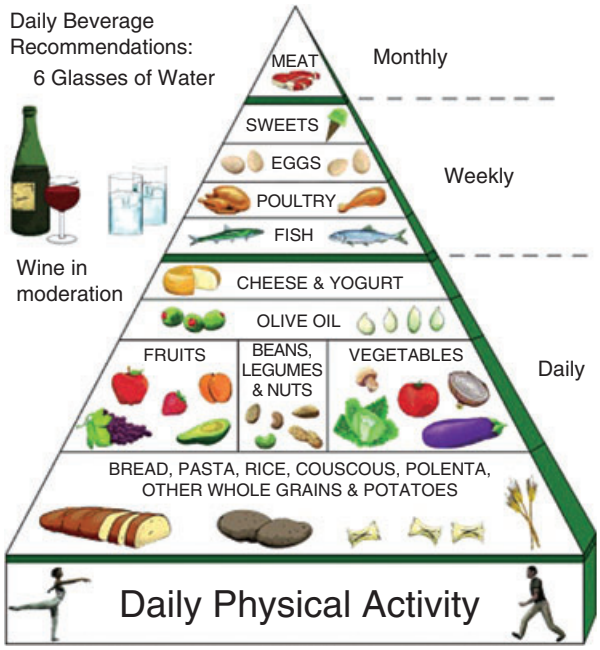

Figure 1 The Mediterranean diet (image taken from the Internet).

endothelium is by far the target where red wine reacts [3,4]. This is well documented in men so that the term ED is equal to endothelial dysfunction and erectile dysfunction [5,6]. In women, this correlation is thought to be important although not yet well understood [7]. The nitric oxide (NO) pathway has been shown to be a key element of female sexuality [8], but the field of FSD is still highly unexplored. Besides, female sexual response cycle has been hypothesized as a more complex mechanism than in men, with a number of contextual and personal psychological factors, including motivation and willingness to become receptive to sexual stimuli, overwhelming biological factors [9]. Nonetheless, this model for female sexuality is still under debate, and, similar to the male counterpart, vasculogenic factors are thought to play an important role in FSDs. An impaired endothelial function may interfere with a number of organic sexual responses including vulvar swelling and vaginal lubrication, accounting for the so-called "genital arousal disorder" based on the recent classification criteria for women's sexual disorders [10]. The central role of endothelial nitric oxide synthase (eNOS) in the protective effect of wine has been documented in the metabolic syndrome [11]. Historically, the aspects regarding wine and sexuality have been well known since the time of ancient Greece, when a legend told of the birth of wine as one of Dionysus's tears. For the Romans, Dionysus became Bacchus, the god of wine and fertility. From the marriage of Bacchus and Venus, Priapus was born [12]. However, to the best of our knowledge, there is no study regarding the potential correlation between red wine intake and women's sexual function. The aim of our study was to assess whether there is a tie between daily red wine intake and sexual function in a sample of healthy Italian women, living in the Chianti area (Tuscany). We hypothesize that red wine, an essential component of the Mediterranean-style diet, could improve vaginal and clitoridal lubrication and engorgement either directly by ameliorating the local NO pathway or indirectly by favoring a healthier cardiovascular system.

Subjects and Methods

Subjects willing to take part in the study were asked to fill in a two-question entry questionnaire to grossly rule out major sexual disorders (question 1: Are you happy with your sexuality?; question 2: Have you ever had a sexual problem?). Women replying "yes" to the first and "no" to the second question could enter the study if they met the following criteria: be premenopausal, in a stable relationship for the last 3 months, with no comorbidity, under no medical treatment, no genital anatomical deformity, no previous genitourinary surgery, and denying a history of substance abuse. Additional exclusion criteria were the use of hormone therapy, pregnancy, or lactation. All participants completed anonymously the Female Sexual Function Index (FSFI) questionnaire [13], and were asked to report on their amount and type of alcohol consumption. The FSFI is a brief, multidimensional, validated scale for assessing sexual function in women that includes 19 questions grouped in six domains (desire, subjective arousal, lubrication, orgasm, satisfaction, and pain) with a total score range between 2 and 36, with higher scores indicating better functions. All patients signed an informed consent form explaining the nature of the study. The women did not receive any compensation for participating in this survey. Based on a detailed history on alcoholic drinking habits, the eligible patients were divided into three groups: daily moderate (one to two glasses) red wine consumers (group 1); teetotallers, women denying any alcohol intake in the last year (group 2); and "occasional drinkers" (group 3), women reporting a sporadic (less than one glass per day) use of all sorts of wine or other alcoholic bever-

ages. Women reporting a daily intake of more than two glasses of red wine and/or one to two glasses or more of other types of alcoholic drinks (including white wine) were excluded.

Statistical Analyses

The analysis of variance (ANOVA) was used to compare FSFI scores between all three groups. Fisher's exact test or *t*-test, when indicated, was used to assess the significance of other statistical analyses. As null hypothesis, we assumed that there was not any difference among the groups in terms of sexual function, obtained by means of the FSFI questionnaire results. The ANOVA was used for univariate analysis, while the multiple analysis of variance for multivariate analysis. Bonferroni adjustment test was also used at the second stage of the ANOVA. The parameters considered for univariate and multivariate analysis were as follows: age, education level, smoking habitus, body mass index (BMI), and alcohol consumption. The independent variables are: age, education level, BMI, smoking habitus, and alcohol consumption. The dependent variables are considered the following parameters: desire, subjective arousal, lubrication, orgasm, satisfaction, and pain. Moreover, as null hypothesis, we assumed that there was not any independent prognostic parameter in predicting better questionnaire scores (FSFI). Statistical significance was achieved if P was <0.05. All reported P values were two sides. All data were recorded, collected, and analyzed using SPSS 11.0 for Apple-Macintosh (SPSS, Inc., Chicago, IL, USA). The study was approved by the Ethical Committee of the University of Florence.

Results

In this study, 841 women of the 1,343 screened met the eligibility requirements. One hundred ninety-four (14.4%) patients stated a sexual disorder at the entry questionnaire, while 308 (22.9%) did not match the other inclusion criteria. Complete data were available for 798 (94.8%) women. Thirty-four could not be fitted in any of the three groups because of excess alcohol intake (spirit taken at the rate of everyday N = 1 [0.1%], one or two glasses of white wine every day N = 5 [0.6%], daily intake of beer N = 2 [0.2%], and more than two glasses of red wine every day N = 26 [3.2%]). Table 1 shows the general characteristics of study participants (N = 764), 89 (11.1%) in group 1, 275 (34.5%) in group 2, and 400 (51.1%) in group 3. All three groups were homogenous for all demographic and clinical characteristics, except age: group 3 was significantly younger than the other two groups ($P < 0.003$). Table 2 reports the FSFI scores. Group 1 had significantly higher total ($P = 0.001$; df 2; F 4.633), as well as desire and lubrication domain ($P = 0.001$; df 2; F 4.633 and $P = 0.001$; df 2; F 4.633, respectively) FSFI scores than participants in groups 2 and 3. No significant differences between the groups were observed concerning sexual arousal, satisfaction, pain, and orgasm (Table 2). A statistically significant correlation was reported between FSFI score and alcohol consumption ($r = 0.78$; $P = 0.003$). A significant correlation between age, alcohol consumption ($r = 0.78$,

Table 1 Demographic characteristics of study participants

	Group 1	Group 2	Group 3
Participants (%)	89 (11.1%)	275 (34.5%)	400 (50.1%)
Age (years) mean and range	41.3 (20–50)	38.5 (21–48)	27 (18–47)
Educational level			
Primary school	29 (32.5%)	91 (33%)	145 (36.25%)
Secondary school	15 (16.8%)	48 (17.4%)	60 (15%)
High school	31 (34.8%)	99 (39%)	141 (35.25%)
University	14 (15.7%)	37 (13.4%)	54 (13.5%)
Current smoker	19 (21.3%)	57 (20.7%)	102 (25.5%)
Former smoker	22 (24.7%)	64 (23.2%)	101 (25.25%)
Never smoker	48 (53.9%)	154 (56%)	197 (49.25%)
BMI mean ± SEM	23.2 ± 1.8	22.9 ± 1.6	22.2 ± 0.9

BMI = body mass index.

Table 2 Reports on the scores of the Female Sexual Function Index (FSFI)

FSFI	Group 1	Group 2	Group 3	P*	df*; F*	P†	df†; F†
Desire	4.6 ± 0.6	3.4 ± 0.8	4.2 ± 0.3	0.001	2; 4.63	0.02	2; 4.20
Arousal	4.5 ± 0.8	4.5 ± 0.3	4.4 ± 0.6	0.23	2; 1.45	0.11	2; 2.29
Lubrication	4.3 ± 0.7	2.7 ± 0.8	3.8 ± 0.9	0.001	2; 4.63	0.02	2; 4.20
Orgasm	4.6 ± 0.8	4.5 ± 0.9	4.4 ± 0.5	0.46	2; 0.78	0.66	2; 0.42
Satisfaction	4.6 ± 0.8	4.5 ± 0.7	4.4 ± 0.9	0.77	2; 0.44	0.46	2; 0.78
Pain	4.7 ± 0.9	4.9 ± 0.9	4.7 ± 0.8	0.81	2; 0.39	0.23	2; 1.45
Total	27.3 ± 1.6	24.4 ± 1.8	25.9 ± 1.08	0.001	2; 4.633	0.001	2; 4.63

*Calculated between groups 2 and 1.
†Calculated between groups 3 and 1.
df = degree of freedom.

$P = 0.004$; $r = 0.71$, $P = 0.009$), and higher questionnaire scores was reported. During multivariate analysis, alcohol consumption ($P = 0.002$) was identified as an independent prognostic parameter in predicting better questionnaire scores.

Discussion

The finding that regular moderate drinking of red wine is associated with higher FSFI scores for both sexual desire, lubrication, and overall sexual function as compared to the teetotaller and the occasional intake of alcohol status is intriguing. While this finding needs to be interpreted with some caution because of the small number of women, self-reported data, and the lack of laboratory tests and any instrument to psychometrically address sexual distress, it nevertheless suggests the presence of a relationship between red wine consumption and a better sexual function. Red wine consumption in our study was an independent parameter of favorable overall sexual function. The observation is even more striking if we consider that moderate red wine consumers were older than the other two groups, because age is usually inversely correlated to sexual function.

The combination of polyphenol (flavorous) components and alcohol could mediate these effects and explain the differences across groups. The higher content of flavonoids in red wine [14] as compared to other types of wines [15,16] may account for the better FSFI scores in group 1 as compared to group 3 of occasional drinkers of "alcoholic beverages" that for the majority did not include red wine. The mechanism of action of flavonoids is not fully understood, but some evidence exists that it could improve endothelial function. The same mechanism has also been hypothesized [1] for the Mediterranean-style diet, known to be rich in antioxidants and recently claimed to ameliorate sexual function in women (evaluated with FSFI) with metabolic syndrome. In that study, red wine consumption was not taken into consideration. The effects of red wines are mediated by the eNOS, a key enzyme regulating endothelial function by promoting NO synthesis [17]. Red wine polyphenols induce endothelium-dependent dilatation of blood vessels through the NO system, by increasing the expression of the eNOS. At the same time, they suppress the synthesis of endothelin-1, a peptide with marked vasoconstrictive effects [18,19]. Improved endothelial function would translate into amelioration of systemic arterial vasodilatatory properties likely to account for the positive effects on both the metabolic syndrome and arterial mediated phases of female sexual function. Red wine alcohol may be another key mediator that exerts its protective effect by increasing the high-density lipoprotein cholesterol or by reducing platelet aggregation and increasing fibrinolysis [20]. The reason why only "lubrication" and "desire" were significantly improved in the moderate red wine drinker group and not other FSFI domains is not clear. Lubrication is a physiological change that follows genital engorgement, the latter mediated by vasodilatation and thus strictly linked to the arousal domain which, in contrast, seemed unaffected by red wine. Because a number of vasodilatatory effects mediate the arousal phase in the female sex cycle, it may be speculated that an impaired NO pathway would sustain the so-called arousal disorder. While the NO pathway has been shown to be a key element of female sexual function [8], it is currently difficult to define its role in the context of the high complexity of the sex response cycle. Similarly, it is difficult to hypothesize a link between an improved endothelial function and a gain in sexual desire. This may simply reflect the multifactorial positive contribution of red wine to female sexuality. In some women, alcohol consumption increases subjective sexual desire, arousal, and pleasure, although it may lower physiological arousal. Despite the general belief that alcohol dys-inhibits female sexual behaviors [21], alcohol leads to changes in sexual behavior only for a minority of women [22]. Avoiding the potential confounding factor of excess alcohol intake in female sexuality was the main reason to identify in "two glasses of red wine" the amount considered "beneficial" for the purpose of the current study. Women reporting a higher daily intake of red wine were excluded from the study.

In conclusion, a thorough comprehension of the mechanisms underlying female sexuality remains difficult. The context in which a woman experiences her sexuality is equally if not more important than the physiological outcome she experiences. Additionally, the robust correlation seen in men between subjective arousal and genital congestion (erection) is not seen in women. Rather, physiological changes of the arousal phase have been demonstrated in women perceiving lack of lubrication and/or swelling response, leading to a distinction between subjective and objective arousal disorders in the most recent classification of FSDs [10]. At the moment, three critical physiological requirements, namely, intact sex steroids,

autonomic/somatic nerves, and arterial inflow/perfusion pressure to women's genital organs seem to play fundamental roles in maintaining women's sexual function [23,24]. The NO/cGMP pathway may be crucial in the local vasodilatory response of female sexual organs, i.e., the vagina and the clitoris, an essential prerequisite for a physiological female sexual response [25]. Moreover, expression of messenger ribonucleic acid encoding for phosphodiesterase isoenzymes in the human clitoris, labia, and vaginal tissue has been shown [26]. This observation has led to speculate that small quantities of alcohol may result in an enhancement of sexual effects. In this respect, our observations seem to support previous research emphasizing the protective cardiovascular effects of red wine and ultimately a positive effect on sexual functioning. At a time in which obesity and metabolic syndrome have become a public health crisis, modification of behavioral risk factors is strongly suggested to halt the progression of the epidemic, and may also be a safe strategy for the ongoing increased sexual problems in the population.

Further epidemiological investigations prospectively evaluating larger cohort populations of women are needed to confirm the precise role of both alcohol and polyphenols in the context of female sexual response.

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Statement of Authorship

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