



Review Article

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Female Sexual Dysfunction and a Plant-Based Diet

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Abstract

Female Sexual Dysfunction (FSD) is a multi-causal and a multi-dimensional medical problem, comprising anatomical, physiological, psychological as well as social-interpersonal components, that adversely affects physical health and emotional well-being. A meta study showed that 41% of women had some level or form of Female Sexual Dysfunction. FSD is especially prevalent among women with chronic diseases such as metabolic syndrome, type 2 diabetes, hypertension, dyslipidemia and coronary artery disease, Hashimoto's thyroiditis, Graves' disease and Parkinson's disease. A plant-based diet can lower the risk of Female Sexual Dysfunction (FSD) by substantially by lowering the risk of several pathologies that are risk factors for it.

Female sexual function, especially arousal, is significantly affected by genital vascular impairment which can lead to vaginal dryness and impaired genital engorgement mediated arousal. The plant-based diet is a safe and effective prophylaxis and treatment for hypercholesterolemia and atherosclerosis. The Mediterranean diet is a plant-strong diet that results in better female sexual function in a dose-dependent manner, regardless of menopausal and metabolic syndrome status. The plant-based diet has the potential to be at least as good a treatment of FSD. A plant-based diet has the significant advantage of having no contraindications or adverse reactions, and is an affordable prophylaxis for all patients over the long-term.

Keywords: Atherosclerosis; Clitoris; Dyslipidemia; Dyspareunia; Orgasmic disorder; Vaginal atrophy; Vaginismus; Vegan; Vegetarian

Abbreviations: FSD: Female Sexual Dysfunction; MD: Mediterranean Diet; NO: Nitric Oxide

Introduction

A healthy and satisfying experience of sexuality is often an important component of overall well-being for women (defined for the purposes of this article as individuals who have female genitalia), associated with increased life satisfaction, higher perceived and objective health status, and even increased longevity [1-4].

In addition, several significant health benefits have been identified for women related to regular sexual activity. These include postponement of natural menopause (and the subsequent hypoestrogenism) [5], reduced frequency of hot flashes during menopause [6], better vaginal health and less vaginal atrophy in post-menopausal women [7], better cognitive function in older adult women, [8] and a reduced risk of subsequent new severe disabilities in disabled women living with their spouse [9]. Some studies also showed that the thresholds for pain tolerance and pain detection were significantly increased when paired with genital self-stimulation, and considerably more so when achieving

orgasm [10].

Female sexual function is a complex process coordinated by the neurological, vascular and endocrine systems [11]. Female Sexual Dysfunction (FSD) is a multi-causal and a multi-dimensional medical problem, comprising anatomical, psychological, physiological, as well as social-interpersonal components, that adversely affects physical health and emotional well being [12-16]. FSD is a general term comprising several sexual health concerns that can be distressing for patients, including female sexual interest/arousal disorder, female orgasmic disorder, and genito-pelvic pain/penetration disorders, including dyspareunia and vaginismus. [17,18].

Our understanding of female sexuality was only first formally addressed roughly 50 years ago. During this period and even today, the treatment of FSD has primarily focused on psychosocial/cultural therapy, and highlights that our limited knowledge is reflective of the inadequate treatment options available. Due

to the complexity of FSD, a multifaceted approach, addressing neurobiological, vasoactive, hormonal as well as psychosocial/cultural aspects is necessary [19]. This article addresses only the physical etiological factors and symptoms.

Epidemiology

A 2016 systematic review and meta-analysis assessed the prevalence rate of female sexual dysfunction in 215,740 reproductive-age women worldwide and found the 41% of these women report some form of female sexual dysfunction [20]. Dysfunction is especially prevalent in women with chronic health problems, including metabolic syndrome, hypertension, dyslipidemia, coronary heart disease, diabetes, overweight and obese body mass indices (BMIs), anxiety, and depression [3,21-28]. In patients with overt cardiovascular disease, FSD is even more prevalent [29]. Studies have shown a positive association between cardiovascular diseases and sexual dysfunction in females [30]. Diabetes, heart disease, urinary tract disorders, and chronic illness are also significant risk factors for female sexual dysfunction [31].

Pathophysiology

The first phase of the female sexual response, associated with neurotransmitter-mediated vascular smooth muscle relaxation, results in increased vaginal lubrication, wall engorgement and luminal diameter as well as increased clitoral length and diameter. Physiologically, healthy pelvic blood flow is necessary for vaginal lubrication. Normal blood pressure pushes a transudative fluid through capillaries, which ultimately coalesces at the vaginal surface epithelium [32,33]. This process relies on vessels being both patent and able to dilate effectively. Therefore, low atherosclerotic burden and sufficient nitric oxide (NO) activity are protective against sexual dysfunction [33].

Evidence shows that female sexual function, especially arousal, is significantly affected by genital vascular impairment, which can lead to FSD. Specific physiologic impairments of vasculogenic female sexual dysfunction include vaginal engorgement and clitoral erectile insufficiency. Orgasmic female sexual dysfunction may be related in part to vasculogenic impairment of the hypogastric-vaginal/clitoral arterial bed [34]. These syndromes exist when during sexual stimulation, abnormal arterial circulation into the vagina or clitoris, usually from atherosclerotic vascular disease, interferes with normal vascular physiologic processes [35]. Clinical symptoms may include delayed vaginal engorgement, diminished vaginal lubrication, dyspareunia, diminished vaginal sensation, diminished vaginal orgasm, diminished clitoral sensation or diminished clitoral orgasm [35].

Some chronic illnesses, such as vascular disease, diabetes mellitus, neurologic disease, and malignancy, can directly or indirectly impact sexual function [36,37]. Type 2 diabetes, hypertension, dyslipidemia, chronic kidney disease, atherosclerosis, and traumatic injury are associated with

diminished vaginal and clitoral blood flow and impaired sexual functioning [38,39]. For many cardiometabolic risk factors and diseases, such as hypertension, diabetes, dyslipidemia and metabolic syndrome, an adverse impact on women's endothelial function, as well as an association with FSD, has been recognized [40].

A doppler ultrasound study found that the Clitoral Pulsatility Index - an index of vascular resistance in the clitoris - was positively correlated with body mass index, waist circumference, insulin, triglycerides, total cholesterol, and low density lipoprotein cholesterol [41]. Women who have neurologic diseases such as Parkinson's disease or multiple sclerosis may also have FSD [42]. Chronic diseases affecting multiple systems, such as thyroid disease, may also have an impact upon the female sexual function [42].

Nutrition

Nutrition plays a significant role in cardiometabolic disease, suggesting one pathway through which diet influences sexual health in females in the form of vaginal dryness and impaired genital engorgement-mediated arousal [43,44]. Atherosclerotic risk is minimized with a nutrient-dense diet whose foundation is plant-based foods [45]. Meanwhile, nitric oxide (NO) can function best when inflammation is minimal [33]. [46]. A high-quality diet can be a source of antioxidants, and nitrate-rich foods can directly increase NO stores [47,48]. Diet can also indirectly support NO availability through preventing and ameliorating conditions associated with inflammatory and pro-oxidant activity, such as metabolic syndrome, obesity, and atherosclerosis [33,48,49].

A plant-based diet can help prevent and treat diseases such as type II diabetes and cardiovascular disease, and can be very efficacious [50,51]. For instance in one study, a plant-based diet was found to be twice as efficacious in treating type 2 diabetes as Metformin [52]. A plant-based diet can also lower cholesterol as much as lovastatin [53]. In addition, a plant-based diet can reduce the risk of other chronic diseases that have been shown to promote FSD, such as Graves' disease and Hashimoto's disease, rheumatoid arthritis, chronic kidney disease, and Parkinson's disease [54-57].

With regards to specific foods, consumption of soy is associated with increased vaginal blood flow, lubrication, and vaginal collagen content and decreased dyspareunia [58-60]. Fruits such as apples, watermelon, and cacao have been linked to enhanced vascular and sexual health. Daily apple consumption is associated with improved vaginal lubrication and general sexual function [61]. Apples are high in polyphenols, other antioxidants, and phytoestrogens, which together support an anti-inflammatory and anti-atherosclerogenic environment. It can be expected that other fruits would perform similarly, though further research is needed to confirm this. Watermelon in particular supports vascular health via an additional distinct mechanism. It is a rich source of citrulline, which the body readily converts to

the NO precursor, arginine [62-64]. Chocolate, derived from the cacao bean, is rich in flavonoids and has been found to increase NO-mediated vasodilation, with promise for supporting sexual function [65,66]. Although more research is needed, these findings on individual foods offer support and further insight into how a plant-based dietary pattern can benefit female sexual health.

Intervention Studies

The Mediterranean diet (MD) is the most widely studied dietary pattern in this context. The Mediterranean diet is characterized by a high intake of plant foods, a high intake of olive oil, a moderate intake of dairy products, zero to four eggs a week, with fish and poultry consumed in low to moderate amounts and red meat consumed in low amounts [15]. Multiple randomized controlled trials and cross-sectional studies have analyzed the long-term effect of the MD on reported sexual function. They find that adherence to this diet results in better sexual function in a dose-dependent manner, regardless of menopausal and metabolic syndrome status [67-69].

Other lifestyle changes may help improve sexual function. These modifications include physical activity, nutrition counseling, and adequate sleep, in addition to a healthy plant-based diet. [70].

Clinical Considerations

Based on cultural norms and biases, conversations about sex are sometimes thought of as taboo in American society and in many other cultures worldwide. This is especially true for women, and particularly when sex is for pleasure rather than reproductive purposes. Failure to have informative discussions about sex often leads to misperceptions about sex and sexuality, including a sense that pain or lack of interest in sexual activity is inevitable and nonmodifiable, which can also lead to women not seeking the care they need. In addition, women sometimes assume that older people do not, or should not, engage in sexual activity [71].

Several U.S. and international surveys of women recently found that the majority of women surveyed did not discuss their sexual health-related symptoms with their health care provider, and discomfort and/or embarrassment with having this discussion was often cited as a reason for avoiding the conversation [72-75]. This finding was consistent for women across different demographics, including age, sexual orientation, race/ethnicity, educational level, and relationship status [76]. Given this situation, physicians need to develop clinical strategies when approaching their patient. For instance, a physician treating a female patient with type 2 diabetes should inquire as to her sexual function since their patient might not raise the issue. One study showed that 54% of women with type 2 diabetes had FSD [77]. Identification of concurrent comorbidities and implementation of lifestyle changes will help improve overall health and may improve sexual function [78,79].

A plant-based diet has the significant advantage of having no contraindications or adverse reactions, and is an affordable prophylaxis for all patients over the long-term. When treating a patient with a plant-based diet it is important to titrate relevant medications, for pathologies such as hypertension and type II diabetes in particular, as the effects of the diet become evident. Patient compliance on plant-based diets has been good in almost all studies. The degree of compliance has often been very high. For instance, one study obtained a 99% compliance [39]. In a 22-week study 94% of subjects on a vegan diet were compliant [40]. In a somewhat longer study, 84% of the participants in each group completed all 24 weeks [41]. In studies of patients placed on plant-based diets for coronary artery disease, high compliance has been noted even over several years. For instance, one study of patients placed on a plant-based diet showed 89% compliance for 3.7 years [42].

Evidence suggests that vitamin D and iron deficiencies are risk factors for sexual dysfunction, and resolution of these deficiencies may well be therapeutic [80-83]. Vitamin D receptors exist on the uterus and ovaries, where they can influence steroidogenesis and testosterone aromatization, with consequent effects on sex hormone levels [84-86]. In iron-deficiency anemia, fatigue is thought to mediate the relationship between deficiency and sexual dysfunction [82]. Testing for vitamin D and iron deficiency may be considered as a relatively simple and low-cost addition to the workup for female sexual dysfunction.

Discussion

Quality of life has become a large concern of patients with a wide variety of diseases. Patients with diseases ranging from several forms of cancer to rheumatoid arthritis want a satisfying sex life. Patient and nonprofit organizations are offering patients general advice on how they can have sex while they are being treated. While many patients may be reluctant to ask their physician about FSD, they may well be appreciative of the physician asking them about it.

While a plant-based diet can't treat aspects of FSD such as psychological and social factors, it does deserve a place in its treatment. It can be used as a monotherapy in some cases, or as an adjunct to other treatments. It may be especially helpful in treating vascular causes of FSD. It can also help prevent and can efficaciously treat several risk factors for FSD including atherosclerosis, metabolic syndrome, type 2 diabetes, dyslipidemia and chronic kidney disease. It has no adverse reactions or contraindications and is affordable. This becomes even more important considering that many patients with FSD have comorbidities.

A plant-based diet, and specifically manufactured plant-based foods, are now considered mainstream and several studies have shown good patient compliance. Increasing numbers of physicians are prescribing a plant-based diet for their patients in

order to prevent and treat disease. Asking a patient about their diet, and prescribing a plant-based diet, should be considered a new standard of care for FSD.

Conflict of Interest Statement

The authors state that they have no conflicts of interest.

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