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Mediterranean Diet and Sexual Health

Miriam Longo[1], Paola Caruso[1], Katherine Esposito[1,2]

[1]Department of Advanced Medical and Surgical Sciences, University of Campania "Luigi Vanvitelli", Naples, Italy; [2]Unit of Diabetes, University of Campania "Luigi Vanvitelli", Naples, Italy

Abstract

Sexual health is a fundamental component of human well-being. Any disease threating human well-being may also impair both male and female sexual life. The most common "non-communicable diseases" (NCDs) in the world are strictly associated with sexual dysfunctions as they share most risk factors and pathogenetic mechanisms. Chronic low-grade inflammation, together with oxidative stress and endothelial dysfunction, represents a common predisposing pathological condition for both chronic diseases and sexual dysfunctions. Mediterranean diet, based on high intake of plant-based foods, olive oil as the main source of fat, low-to-moderate intake of fish, dairy products, and poultry, low consumption of red or processed meat, and low to-moderate consumption of wine with meals has showed several beneficial effects on cardio-metabolic and sexual health. The adoption of healthy lifestyles, including Mediterranean dietary pattern and regular physical activity helps reducing inflammation, endothelial dysfunction, and oxidative stress – all of which are desirable target to achieve for a better health and sexual life.

Key Words: Mediterranean Diet, healthy lifestyle, sexual life, sexual dysfunction, female sexual dysfunction, erectile dysfunction

Introducing Member : Francesco Trimarchi

Corresponding Author: Katherine Esposito - katherine.esposito@unicampania.it

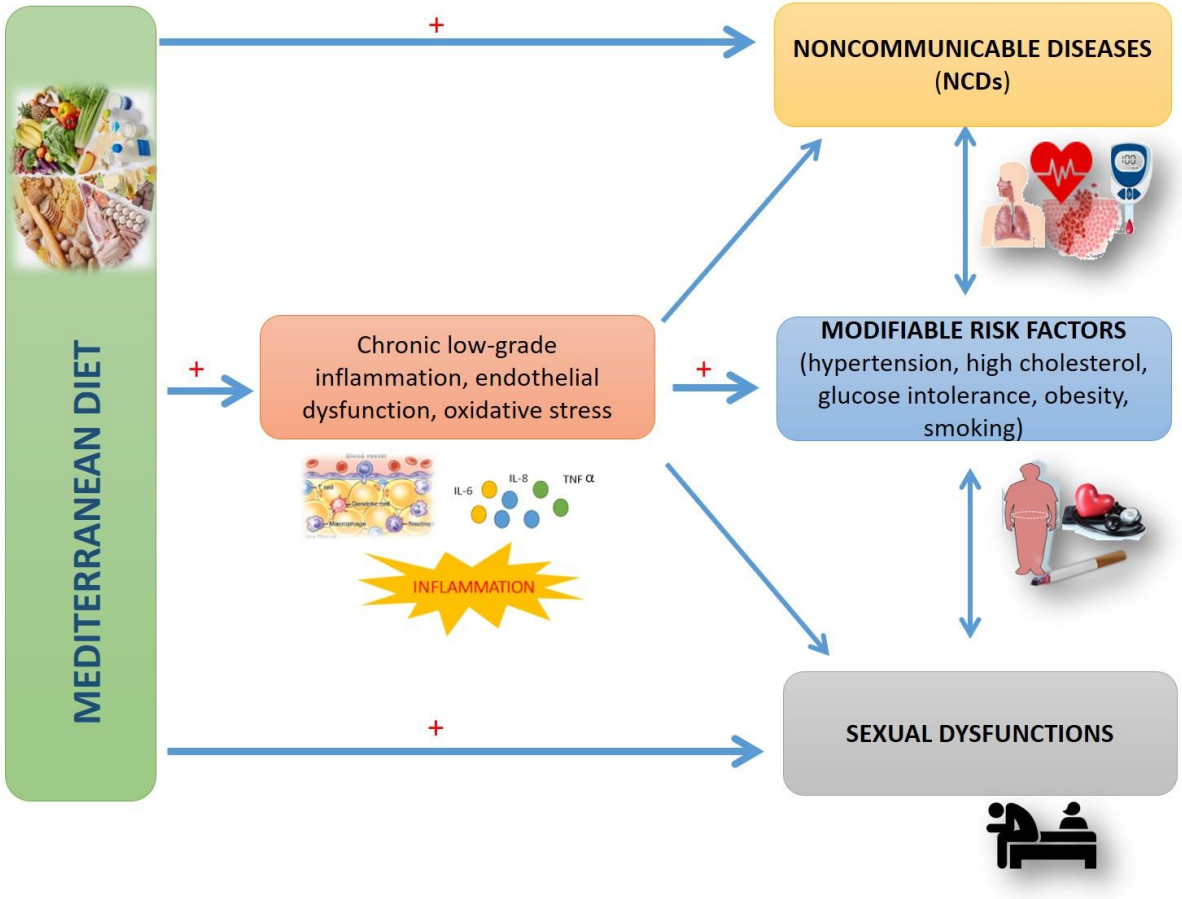
Introduction

The World Health Organization (WHO) defines sexual health as a fundamental component of human well-being (1). A strong and mutual relationship between systemic human health and sexual life exists. Both physical and mental wellness translates into healthy sexuality and good quality of life. A growing body of evidence suggests that any impairment of sexual function may act as a surrogate marker of general health status (2). Indeed, any disease threating human well-being may also impair both male and female sexual life.

According to the World Health Statistics 2020, cardiovascular diseases, cancer, chronic respiratory diseases, and diabetes represent the most common "non-communicable diseases" (NCDs), which are the major causes of morbidity and mortality worldwide (3). All these NCDs are strictly associated with sexual dysfunctions as they share most risk factors and pathogenetic mechanisms (4). Unhealthy diets, physical inactivity, alcohol abuse and cigarette smoking constitute all modifiable behavioral

risk factors common to both NCDs and sexual dysfunctions, leading to increased levels of blood pressure, blood glucose, cholesterol and development of overweight and obesity. Moreover, chronic low-grade inflammation, together with oxidative stress and endothelial dysfunction, represents a common predisposing pathological condition for both chronic diseases and sexual dysfunctions (4). For these reasons, sexual dysfunctions may be a good predictor of healthy life in the general population and a valuable tool to understand and manage NCDs (2,4) (Figure 1).

Fig.1 The direct and indirect effects of Mediterranean diet on noncommunicable diseases (NCDs), modifiable risk factors, sexual dysfunctions and predisposing pathological conditions.



Human wellbeing is highly influenced by dietary patterns and everyday food choices may have an impact also on sexual life. Healthy dietary patterns, as Mediterranean diet is thought to be, associated with regular physical activity have shown many beneficial effects on cardio-metabolic and sexual health. The adoption of healthy lifestyles helps reducing inflammation, endothelial dysfunction, and oxidative stress – all of which are desirable target to achieve for a better health and sexual life.

Mediterranean diet, which represents the traditional eating habits of populations living around the Mediterranean Sea in the 1960s, including Greece and South Italy, has long been indicated as a dietary pattern able to preserving good health. The Mediterranean diet is characterized by the high content in plant-based foods, olive oil as the main source of fat, low-to-moderate intake of fish, dairy products, and poultry, low consumption of red or processed meat, and low to- moderate consumption

of wine with meals. The present paper provides an overview on the role and the effects of Mediterranean diet on both female and male sexual dysfunctions.

Sexual dysfunctions

Sexual dysfunctions are spreading across all ages and races, as they are influenced by both organic and psychosocial factors. Male sexual dysfunctions (MSDs) are defined as physical and/or psychological conditions that do not allow men to achieve sexual satisfaction. Among them, erectile dysfunction (ED), defined as the persistent inability to achieve or maintain penile erection for successful sexual intercourse, is one of the most frequent sexual compliant causing decreased quality of life (6). On the other hand, female sexual dysfunctions (FSDs) comprise a large and heterogeneous group of conditions characterized by impairment of sexual response in women, including disorders of sexual desire, arousal, orgasm, and pain (7). Among FSDs, desire and arousal dysfunctions are the most frequent problems recorded in the female population, despite many women deal with multiple sexual dysfunctions (8).

ED is well-known predictor of future cardiovascular events, as men with type 2 diabetes and ED have a twofold increased risk of cardiovascular morbidity and mortality (9). Conversely, data on the relationship between FSDs and cardiovascular events are more contradictory and less conclusive (10).

Both ED and FSDs can be quickly investigated by using standardized questionnaires on the sexual function over the past 4 weeks, the International Index of Erectile Function-5 (IIEF-5) and the Female Sexual Function Index (FSFI), respectively, in their complete or shortened version (11). An IIEF score ≤ 21 and a FSFI score ≤ 26.55 indicate the presence of sexual dysfunctions.

Mediterranean diet and FSDs

FSDs are becoming frequent conditions, even if the prevalence remain oftentimes underestimated, as most women are reluctant to talk about their sexual life with their physician. Obesity, metabolic syndrome and diabetes represent frequent comorbidities associated with FSDs. There is evidence that lifestyle changes, with healthy eating pattern as Mediterranean-style diet and increased physical activity, are effective in ameliorating sexual function in women affected by these three conditions (12). The Mediterranean dietary pattern rich in vegetables, fruits, wholegrain cereals, nuts, seeds and extra-virgin olive oil was associated with a significant amelioration in the FSFI score (19.7 ± 3.1 vs 26.1 ± 4.1, $P=0.01$) and a reduction of C-reactive protein levels in 31 women with metabolic syndrome, as compared with a control diet (13). Moreover, a greater adherence to Mediterranean diet, assessed by a food-frequency questionnaire, correlated with a lower prevalence of sexual dysfunction as compared with lower adherence (47.6% vs 57.8%, $P = 0.01$), in a cross-sectional study on 595 women affected by type 2 diabetes (14). In the Look AHEAD Sexual Function Ancillary

study of 375 obese women with type 2 diabetes, an intensive lifestyle intervention based on calorie-restricted and fat-restricted diet and increased physical activity for 12 months was associated with a significant weight loss (-7.6 ± 6.7 kg), an improvement in total FSFI scores and in almost all FSFI domains (P<0.05), except satisfaction, and with a higher rate of remission of FSD in women with sexual dysfunction at baseline as compared with the control group (28 vs. 11%; P<0.04) (15). Moreover, in the longest randomized clinical trial [Mediterranean DIet and Type 2 diAbetes (MÉDITA)] assessing the durable effects of Mediterranean diet on patients with newly diagnosed type 2 diabetes, with a follow-up of 8.1 years, women assigned to Mediterranean diet group showed a reduction of 56% of the risk to develop new FSDs and 50% reduced risk of deterioration of preexisting FSDs as compared with those of the control group (16). Although a physiological decrease in FSFI score has been detected in women of both groups across the time, women in the Mediterranean group had a significant lower deterioration of sexual function, associated with a higher weight loss (−0.82 kg) and HbA_{1c} reduction (−0.30%), as compared with the low-fat group (17). Based on these evidence, major health organizations recommend to adopt a healthy lifestyle, that includes a Mediterranean-style diet and regular physical activity, in order to prevent both cardiovascular events and FSDs (10).

Mediterranean diet, erectile dysfunction and reproductive function

ED is a one of the most common sexual disorder and its incidence increases with aging (18). Obesity, diabetes and metabolic syndrome are frequently associated with ED (19), which represents a well-known alarm-bell of future cardiovascular event and, deserving the appellative of “the canary in the coal mine” (20). Healthy behaviors, with prudent dietary pattern, increased physical activity and reduced caloric intake, have shown to ameliorate the burden of ED in the general male population (21). The greater adherence to the Mediterranean diet or to its major components (fruit, vegetables, nuts, olive oil) has been associated with a lower prevalence of ED in both diabetic and nondiabetic men in different cross-sectional studies (22-25). In the first randomized controlled trial specifically designed to evaluate the effects of intensive lifestyle changes in 110 obese men with ED, the reduction of caloric intake and increased physical activity for 2 years in 55 participants led to a significant improvement in IIEF score (from 13.9 ± 4.0 to 17 ± 5, P < 0.001) associated with a decrease in body mass index (BMI), interleukin 6 (IL-6) and C-reactive protein (CRP) levels as compared with the 55 men of the control group (26). In another trial on 65 patients with metabolic syndrome and ED, a regression of ED was recorded in 37% of men assigned to the Mediterranean-style diet group vs only 7% of men in the control group (P = 0.015), with a reduction of inflammatory markers (27). A randomized controlled trial on 209 overweight male subjects showed that the percentage of men with normal erectile function, evaluated by IIEF-5 questionnaire, after 2 years of

follow-up was significantly higher in the Mediterranean group than the control group (56% vs 38%; P = 0.015) (28). In the Look AHEAD trial the overweight/obese men with type 2 diabetes assigned to the intensive lifestyle intervention experienced after 1 year of follow-up a significant improvement of ED evaluated by an increase in IIEF score (from 17.3 ± 7.6 to 18.6 ± 8.1, P = 0.04), with a lower rate of worsening of erectile function as compared with the control group (8% vs 22%) (29). These data have been confirmed in the long-term MÈDITA trial (16). Over the entire follow-up of 8 years, the incidence of ED and the deterioration of erectile function were significantly lower in men with type 2 diabetes following Mediterranean diet than those on low-fat diet (17). Therefore, Mediterranean diet has shown to improve ED in the short term and to prevent deterioration of erectile function in the long term. Furthermore, a healthy dietary pattern based on large intake of fruit and vegetables, fish, chicken, legumes and whole grains proved to be associated with better semen parameters in a cross-sectional study of 118 young men (30). Men who had higher adherence to this type of diet showed a significantly larger rate of progressively motile sperm as compared with those with lower adherence (30). In a case-control study on asthenozoospermic and normozoospermic men, the consumption of fruits, dark green vegetables, skim milk and sea food correlated with a lower risk of asthenozoospermia (31).

The protective effects of Mediterranean diet on sexual function

According to the State of Global Air of 2019 dietary risks are at the top of risk factors for total deaths in the world (32). Unhealthy diets are spreading globally. The Western diet is the leading form of modern unfavorable dietary pattern, based on refined grains, processed and red meats, dairy, sweets and sugary beverages (33). High adherence to this type of diet has been linked to the development of several chronic disease as obesity, metabolic syndrome, diabetes cardiovascular disease, stroke, cancer, chronic kidney disease (34-36) and consequently also for sexual dysfunctions. Indeed, all these comorbidities share a chronic low-grade inflammatory status characterized by high concentrations of inflammatory mediators, excessive oxidative stress and endothelial dysfunction which represent risk factors for both female and male sexual dysfunctions. Conversely, Mediterranean dietary pattern rich in wholegrain cereals, vegetables, fruits, legumes, nuts, monounsaturated fats from olive oil may has shown several anti-inflammatory effects and can improve sexuality mainly through the correction of underlying inflammatory metabolic common-soil. In a randomized controlled trial of 180 patients with metabolic syndrome, the patients following a Mediterranean regimen showed a significant improvement of CRP (P = 0.01), IL-6 (P = 0.04), IL-7 (P = 0.4), and IL-18 (P = 0.3) concentrations, endothelial function (P < 0.001) and insulin resistance (P < 0.001) as compared with control subjects after 2 years of follow-up (37). Moreover, the positive effects of Mediterranean diet on the inflammatory milieu have been confirmed in the longest

MÉDITA trial, where a 37% decrease in CRP levels and a 43% increase in adiponectin was observed in the intervention group without any change in the low-fat group (38,39). Furthermore, there is evidence that improvement of inflammatory mediators induced by Mediterranean-style diet correlate with the increase in IIEF-5 score (26). Hence, the suggested mechanisms by which healthier lifestyle based on Mediterranean pattern, weight loss and physical exercise may prevent and ameliorate both FSDs and ED include the reduction of chronic low-grade inflammation, which in turn reflects in the improvement of endothelial dysfunction, insulin resistance and oxidative stress.

Conclusion

Based on the current literature, there is a strong association between sexual health and human well-being. Any disease impacting global health may influence also sexual like. The major NCDs share many risk factors causing a pro-inflammatory state with sexual dysfunction, i.e. hypertension, hyperlipidemia, metabolic syndrome, overweight and obesity. There is a growing body of evidence that suggests the positive effects of Mediterranean dietary pattern in reducing inflammatory milieu, endothelial dysfunction and oxidative stress, with beneficial repercussions on cardio-metabolic health and sexual wellbeing. Lifestyle changes, including the adoption of a healthy diet as Mediterranean-style diet, regular physical activity, smoking and alcohol withdrawal represent a milestone to prevent and reduce the burden of sexual dysfunctions.

Conflicts of interest: The authors declare no conflict of interest.

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