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Gender differences in sexual dysfunctions among individuals with obesity

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Summary. Obesity, defined as a Body Mass Index ≥30, is a growing global epidemic with adverse short and long-term complications impacting subjective well-being, physical health, mental health and sexual function. Sexual disorders have become a feature of growing interest in the obesity field and are critically related to the quality of life. Fat storage and metabolism differ considerably between men and women. Therefore, the relationship between obesity and sexual functioning may be gender-specific. Although there is a link between either obesity and sexual dysfunction or surgical and diet-induced weight loss and improved sexual function, the improvement may not be dependent on the amount of weight loss only. Sexual dysfunction in obese patients may be a consequence of obesity itself, psychiatric and somatic comorbidities, and the use of certain medications such as anti-hypertensive drugs. These issues are also influenced by gender differences. This paper reviews the most common sexual dysfunctions in women and men, citing the possible putative mechanisms. Given that sexual disorders greatly affect quality of life, it is mandatory that clinicians involved in obesity management gain specific knowledge with the aim of detecting gender-specific sexual dysfunctions and planning appropriate therapeutic strategies.

Key words: obesity, gender, sexual dysfunction, psychiatric comorbidities.

Differenze di genere nelle disfunzioni sessuali degli individui con obesità

Riassunto. L'obesità è definita da un Indice di Massa Corporea ≥30. A livello mondiale, la sua prevalenza è diventata un fenomeno talmente diffuso e allarmante da raggiungere le dimensioni di una vera e propria pandemia. Le conseguenze negative nel breve e nel lungo termine hanno un impatto sul benessere soggettivo, sulla salute fisica e mentale e sul funzionamento sessuale. I meccanismi di accumulo e metabolismo lipidico sono diversi tra uomini e donne. È ragionevole quindi ipotizzare che esistano delle differenze sesso-specifiche che mediano la relazione esistente tra l'obesità e i disturbi sessuali. Nonostante sia stata dimostrata un'associazione sia tra l'obesità e le disfunzioni sessuali, sia tra la perdita di peso in eccesso e il miglioramento della funzione sessuale, il peso non è il solo elemento determinante. I cambiamenti ormonali, le comorbilità mediche e psichiatriche dell'obesità differiscono tra uomini e donne e sono tutti fattori implicati nella genesi dei disturbi sessuali. Questo lavoro passa in rassegna i disturbi sessuali più diffusi negli uomini e nelle donne con obesità, elencando i possibili meccanismi eziopatogenetici. Poiché le disfunzioni sessuali compromettono grandemente la qualità della vita, è necessario, per chi si occupa di obesità, acquisire le conoscenze specifiche e utilizzare gli strumenti più idonei per individuare questi disturbi e pianificare un trattamento, tenendo conto delle differenze tra i due sessi.

Parole chiave: obesità, genere, disturbi sessuali, comorbilità psichiatriche.

Obesity and sexual dysfunctions

In the European Union, 50.1% of the adult population is overweight or obese. The worldwide prevalence of obesity has almost doubled from 6.4% in 1980 to 12.0% in 2008. Half of this rise has occurred in the last fifteen years[1]. It is estimated that almost 1.5 billion individuals were overweight in 2015[2].

Obesity is an increasing global epidemic with adverse short and long-term complications impacting subjective well-being, physical health, mental health and sexual function. Sexual disorders have become a feature of growing interest in the obesity field and are critically related to quality of life.

Fat storage and metabolism differ considerably between men and women[3]. Moreover, it has been demonstrated that gender is a determinant of weight loss after bariatric surgery and non-surgical weight-loss programs[4,5]. Therefore, the relationship between obesity and sexual function may be gender-specific.

The World Health Organization (WHO) debated the definition of "sexual dysfunction," declaring that it is a problematic term[6]. The International Classification of Diseases describes human sexual dysfunction as "the various ways in which an individual is unable to participate in a sexual relationship as he or she would wish." Masters and Johnson proposed a framework leading to the concept that sexual disorders were referred to the four phases of human sexual response: excitement, plateau, orgasm, and resolution[7]. Afterwards, Kaplan included the notion of "desire" and restricted the phases of sexual response to three: desire, arousal and orgasm[8]. According to these theoretical constructs the past Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) classified sexual dysfunctions on the basis of each of these phases. This model gave the assumption that sexual response is linear, but it was argued that the sexuality of women is more complex and nonlinear[9].

Therefore, in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013) sexual disorder diagnostic criteria were revised (Table 1).

Sexual dysfunction in obese patients may be a consequence of obesity itself (e.g., hormonal changes), psychiatric and somatic comorbidities, and the use of some medications such as anti-hypertensive drugs. These entire issues are also influenced by gender differences.

Among individuals with obesity (Body Mass Index ≥30 kg/m^2) sexual dysfunctions have been reported with a prevalence of 7-22% in women and 5-21% in men[10].

The actual diffusion of sexual disorders could even be higher given that clinicians often do not ask and underestimate their prevalence as much as the repercussions on the patient's quality of life. Sexuality is often a disregarded issue by mental health practitioners, and some psychiatrists may not know enough about this topic or feel embarrassed. In contrast, most patients, when asked, are encouraged to discuss sexual problems.

The assessment of sexual function is complicated by the different topics that are relevant to each gender. Indeed, the several psychometric instruments that are used for diagnosis were developed for both genders. The most widely used validated instruments that are gender-specific are the Female Sexual Function Index (FSFI), Sexual Quality of Life-Female questionnaire (SQOL-F), Brief Sexual Function Inventory (BSFI), and International Index of Erectile Function (Table 2).

Finally, gender is one of the characteristics involved in the doctor-patient relationship, including in the framework of weight loss counseling[11]. Patients may experience different feelings and barriers according to the gender of clinicians. Physicians seem to be more likely to encourage weight loss and make specific reference to weight problems during the interaction with women than with men, with a similar body mass index[12].

Table 1. Sexual dysfunctions in DSM-5.

Sexual dysfunctions
• Delayed ejaculation • Erectile disorder • Female orgasmic disorder • Female sexual interest/arousal disorder
• Genito-pelvic pain/penetration disorder • Male hypoactive sexual desire disorder • Premature (early) ejaculation
• Substance/medication induced sexual dysfunction • Other specified sexual dysfunction • Unspecified sexual dysfunction

Sexual dysfunctions in women with obesity

Among women with obesity sexual pain, arousal problems, and low desire have often been reported. Although some researchers have demonstrated that obese women were less sexually active than those with normal weight[13], it has been shown that obese women were more likely to report ever having male sexual intercourse ($P < 0.001$), regardless of age[14]. Moreover, a European survey reported that obese women had a higher number of unintended pregnancies[15]. Studies examining the relationships between sexual function and obesity in women are scarce, and their results are questionable. Divergent results of the research studies could be due to a number of factors, among which the heterogeneity of instruments used to assess sexual function. Hormonal profiles including the increase of androgens determined by excess body fat, polycystic ovary syndrome, urinary

Table 2. Self-report questionnaires assessing sexual dysfunctions.

FSFI *(Rosen et al., 2000)*	The Female Sexual Function Index (FSFI) is a 19-item self-report questionnaire that assesses sexual functioning in the past six months across six domains: sexual desire, sexual arousal, lubrication, orgasm, satisfaction, and pain during sexual intercourse.
SQoL-F *(Symonds et al.,2005)*	The Sexual Quality of Life-Female questionnaire (SQoL-F) is an 18-item self-report questionnaire assessesing the impact of sexual dysfunction on a woman's sexual quality of life. Each question is scored on a six-point scale ranging from completely agree to completely disagree. A higher total score reflects a better sexual quality of life.
BSFI *(O'Leary et al., 1995)*	The Brief Sexual Function Inventory (BSFI) is an 11 items self-report questionnaire that measures sexual function in males covering five aspects: sexual drive, erection, ejaculation, perception of problems with sexual function in each of these areas, and overall satisfaction.
IIEF *(Rosen et al., 1997)*	The International Index of Erectile Function (IIEF) is a 15 items self-report questionnaire assessing erectile dysfunctions exploring five domains: erectile function, orgasmic function, sexual desire, intercourse satisfaction, and overall satisfaction.

incontinences, menopause, psychiatric disorders such as major depression, binge eating disorders or other feeding disorders associated with body image disturbances, and a history of trauma have been explored as putative mechanisms. It has been shown that female obese patients had poorer sexual function than normal weight women, with a more serious psychological impairment in those with binge eating disorder[16,17].

Emotional eating is a type of maladaptive eating behavior that is more frequent in women than in men[18]. Emotional eating has been defined as "the tendency to eat in response to emotional distress (described as a range of negative, and for some authors positive, emotions) and during stressful life situations." It is a psychological underlying construct that is related to binge eating, and other maladaptive eating patterns like grazing, nibbling, and "uncontrolled" eating which are prevalent among obese individuals[19]. Emotional eating shares with sexuality neurobiological pathways involving the endogenous opioid system[20]. It has been documented that emotional eating was a primary psychological determinant of sexual dysfunctions in obese women, resulting in impaired sexual desire, arousal, lubrication, orgasm, and satisfaction[21].

Major depression is a common disorder among individuals with obesity. It is well known that the prevalence of depression is almost double in women compared with men.

Depressive symptoms and drugs used in their treatment are frequently associated with sexual dysfunctions[22].

Body image is a multidimensional theoretical construct, which indicates the subjective mental representation of one's own body. Body image includes: the mental perception of one's own shape of the body; the cognition and emotional state related to the body, which is an attitudinal skill; and the behavioral component, which refers to a person's involvement in behaviors related to body shape, such as nutrition, fitness, or not wearing tight-fitting clothing.

Body dissatisfaction can be considered as the discrepancy between one's current and stated ideal weight. Numerous studies have found that women have less body esteem than men[23]. Since adolescence, women display a cognitive vulnerability in the body image domain that may facilitate the development of negative psychological consequences[24].

Body image disorders are prevalent across eating disorders and obesity.

Up to 74% of patients with obesity have body shape concerns and a distorted view of their body image. Moreover, body image is poorer among female bariatric surgery candidates compared to those participating in weight loss programs, and non-obese controls[25]. A survey including both men and women found that body dissatisfaction was greater in women who perceived themselves as being overweight with men easily evaluating themselves as strong rather than fat[26].

Body shape dissatisfaction can inhibit sexual intercourse that is a situation particularly involving the own body. In obese women, greater body image satisfaction has been related with more frequent and pleasant sexual experiences, pursuit of a wider range of sexual activities, not avoiding being seen naked, and feeling of being sexually desirable[27].

Sexual dysfunctions in men with obesity

Among men, erectile dysfunction, hypoactive sexual desire disorder and premature ejaculation are prevalent.

Males with obesity often report detrimental changes in sexual function and impaired sexual satisfaction. Epidemiological studies suggest that erectile dysfunction is the most common sexual dysfunction. According to the hypothesis of a cause-and-effect mechanism, prospective studies have suggested an association between obesity and subsequent occurrence of erectile dysfunction, with an increased risk of 70-95% compared to normal-weight individuals[28]. Cross-sectional studies from various countries, with large population samples of men, showed that erectile dysfunction developed more often in men with obesity than in normal weight men[29].

Several pathogenic mechanisms linking obesity and erectile dysfunction have been reported. Concentrations of testosterone and its carrier protein, sex hormone-binding globulin (SHBG), decrease with increasing BMI, with a stronger association in men with abdominal obesity[30]. Prevalence of low testosterone levels in obese men range from 20 to 64% depending on the characteristics of the population, age and on whether total or free circulating testosterone was measured[31].

Testosterone is the leading sex hormone in men, and it plays a crucial role either in libido or in sexual function. Lower testosterone levels can cause low sexual desire. Androgen deficiency can directly affect erectile dysfunction. Despite the clear association between lower testosterone and obesity, the causal directionality of this observed link is still uncertain.

Low testosterone levels in obese men have been associated with increased estrogen production by the adipose tissue, insulin resistance, and low-grade systemic inflammatory process (C-reactive protein values). Leptin levels are higher in obese individuals, negatively correlating with testosterone values. Sleep apnea, which is a common comorbidity of obesity, has been associated with decreased testosterone levels[32]. Despite the demonstrated decrease of testosterone level, in these subjects the actual efficacy of testosterone replacement treatment for erectile dysfunction is controversial. Lifestyle interven-

tions aimed at eliminating the multiple metabolic risk factors seem to be the most favorable approach.

Individuals with obesity showed higher levels of pro-inflammatory cytokines (interleukin-6, interleukin-8, and interleukin-18) and markers of inflammation such as the C-reactive protein. A large body of evidence indicates that obesity is an inflammatory state that influences endothelial function, and it may contribute to the increased risk of thrombotic accidents. It is widely accepted that erectile dysfunction shares a common vascular mechanism with atherosclerosis. Indeed, a diagnosis of erectile dysfunction may be an alarming signal of a developing coronary heart disease.

Indirectly, obesity contributes to erectile dysfunction through the presence of medical comorbidities, namely: high blood pressure, diabetes, and high cholesterol. Atherosclerotic damage on penile arteries induced by lipid disorders and hypertension can reduce blood flow in and out of the penis, compromising the beginning and maintenance of an erection[33].

Moreover, obese individuals are often insulin-resistant and therefore endothelial response to insulin is altered leading to vasoconstriction, which can possibly contribute to impaired erection[34]. The use of antihypertensive drugs and antidiabetic agents, such as metformin and thiazolidinediones, can induce sexual dysfunction[35,36].

Compared to women, men are more likely to engage in problem drinking, and to develop alcohol-related disorders. It has been reported that almost one third of patients pursuing weight loss surgery had a lifetime history of any substance use disorder, including alcohol abuse[37]. In addition, after bariatric surgery an increasing use of alcohol[38] has been observed.

Among sexually active men, high alcohol consumption was previously associated with various sexual dysfunctions, including erectile dysfunction[39]. Alcohol use disorder was found to be more prevalent in obese individuals with binge eating disorder[40].

In a study of bariatric surgery candidates, men with dysfunctional sexual behavior showed lower impairment of psychosocial function and quality of life than women[41].

Furthermore, a recent review clearly showed that men with sexual disorders are less predisposed to ask for help than women[42]. Accordingly, women's sexual difficulties are more prevalent in clinical studies compared to population studies where men reported higher sexual dysfunctions.

Conclusions

The relationship between obesity and sexual function is a multifactorial interplay. Sexuality in obese people may be jeopardized by weight-related comorbidities, as well as by reproductive hormones, many environmental factors and psychiatric influences.

For instance, the same phases of sexual behavior are comparable to eating behavior. Indeed, the refractory period after ejaculation may correspond to satiety after a meal, and the rhythmicity of vaginal thrusting is similar to chewing food.

Many studies have explored the link of eating disorders and sexual dysfunction, whereas the literature of gender differences in sexual dysfunction among obese patients is lacking.

The papers that we have reviewed point to hormonal, metabolic, and psychiatric characteristics differentiating men and women with obesity and sexual disorders. In particular, in women sexual dysfunctions seem to be related to the motivational interface of sexuality, the so-called libido, with studies reporting a higher rate of psychiatric issues in women than men, such as body image concerns, history of trauma, depression, and eating disorders. On the other hand, one of the most common sexual dysfunctions in obese men is erectile dysfunction, which is essential for coitus, representing the consummatory part of sexuality. Among obese men, erectile dysfunction has been more frequently linked to vascular impairment and androgen deficiency.

In conclusion, sexual dysfunctions are prevalent and complex disorders among subjects with obesity, which can result in considerable personal distress and adversely affect individual's health and quality of life.

Although a link has been found between either obesity and sexual dysfunction or surgical and diet-induced weight loss and improved sexual function, the improvement may not be dependent on the amount of weight loss[43]. Nevertheless, highlighting the advantages of weight loss, some people may be encouraged to lose their weight in excess.

Further research is needed to explore whether medical and psychological factors, including body image disorders and depression, play a mediating role in the amelioration of sexual dysfunction after weight loss.

In particular, in obese women, sexual function is an understudied issue. We believe that sexuality must be fully addressed by clinicians by asking open and targeted questions in the initial screening and during counseling provided with weight loss programs.

Given the multidisciplinary approach to obesity, it is mandatory that general practitioners, endocrinologists, nutritionists, surgeons as well as psychiatrists detect and evaluate sexual disorders with the aim of addressing the possible causes and therapeutic options.

Finally, sexual life is a determinant of subjective well-being and mental health, overcoming the reproductive instinct and determining "a significant individual distress" (according to DSM-5 criteria). Researchers should further address the impact of sexual dysfunctions on the quality of life, clarifying the differences between women and men.

Key messages

- Sexual dysfunctions are prevalent and gender specific among individuals with obesity.
- Excess weight is not the only determinant of sexual dysfunction.
- In women major depression, eating disorders, and body image disturbances are the most common leading factors.
- Men often display androgen deficiency and medical comorbidities.
- Sexual function is an understudied issue that clinicians must address in the course of obesity medical management.

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