Sexual dysfunction and cardiovascular diseases: a systematic review of prevalence

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The aim of this study was to conduct a systematic review of the literature regarding the prevalence of sexual dysfunction in patients with cardiovascular diseases. An article search of the ISI Web of Science and PubMed databases using the search terms "sexual dysfunction'', ''cardiovascular diseases'', ''coronary artery disease", ''myocardial infarct" and ''prevalence'' was performed.

In total, 893 references were found. Non-English-language and repeated references were excluded. After an abstract analysis, 91 references were included for full-text reading, and 24 articles that evaluated sexual function using validated instruments were selected for this review. This research was conducted in October 2012, and no time restrictions were placed on any of the database searches. Reviews and theoretical articles were excluded; only clinical trials and epidemiological studies were selected for this review.

The studies were mostly cross-sectional, observational and case-control in nature; other studies used prospective cohort or randomized clinical designs. In women, all domains of sexual function (desire, arousal, vaginal lubrication, orgasm, sexual dissatisfaction and pain) were affected. The domains prevalent in men included erectile dysfunction and premature ejaculation and orgasm.

Sexual dysfunction was related to the severity of cardiovascular disease. When they resumed sexual activity, patients with heart disease reported significant difficulty, including a lack of interest in sex, sexual dissatisfaction and a decrease in the frequency of sexual activity.

KEYWORDS: Sexual Dysfunction; Cardiovascular Diseases; Prevalence.

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INTRODUCTION

According to the DSM-IV, sexual dysfunction (SD) is characterized by a disturbance in the sexual response cycle or pain associated with sexual intercourse. SD is listed as sexual desire disorder, female sexual arousal dysfunction, male erectile dysfunction (ED), female and male orgasm dysfunction, premature ejaculation and sexual pain (vaginismus and dyspareunia). Sexual disorders are often comorbid, and multiple dysfunctions harm other phases of the sexual cycle (1).

These sexual disorders might have an organic etiology, psychogenic etiology or both underlying the medical conditions (1-2). Cardiovascular diseases (CVDs) represent multiple risk and predictive factors for SDs. A systemic vascular condition, which affects arteries throughout the body, also affects the vaginal and penile arteries (the blood supply of the genital organs); consequently, patients with heart diseases show symptoms of SD (3-7).

Psychological factors due to cardiovascular events greatly affect patients' sexual lives, which contributes to the incidence of SD. Patients who return to sexual activity can present mood instability, and many report a certain degree of difficulty with sexual intercourse and a fear of sudden death during sex due to increased cardiorespiratory frequency, blood pressure and physical exertion (8-10).

The present study systematically reviewed the literature on the prevalence of SD in patients with CVDs.

METHODOLOGY

The ISI Web of Knowledge and PubMed databases were searched using the terms "sexual dysfunction'', ''cardiovascular diseases'', ''coronary artery disease", ''myocardial infarct" and ''prevalence''.

This study was conducted in October 2012, without any temporal restrictions placed on the searches. To meet the inclusion criteria, only complete, original articles written in

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English that assessed sexual function using validated instruments were selected. Articles were excluded if they were written in languages other than English, were duplicates or review articles or were irrelevant to the topic.

RESULTS

Searches of PubMed and the ISI Web of Knowledge identified 468 and 425 references, respectively, for a total of 893 references. Of these articles, 151 were excluded because they were duplicates, and 93 were removed because they were written in languages other than English. Thus, 649 references remained for an abstract analysis. After this analysis, 115 articles were retrieved for full-text reading. The eligibility criteria for the selected articles were based on the themes of the search terms. Thus, 91 articles were deleted, and 24 articles remained for the literature review. Figure 1 shows a flowchart of this process.

All of the 24 articles selected using the inclusion criteria evaluated the prevalence of SD in patients with CVDs.

The results are presented according to the studies' methodologies: 18 cross-sectional, observational studies; 3 case-control studies; 2 prospective studies; and 1 randomized clinical trial (Table 1).

Prospective Cohort Studies

In 1980, Wabrek et al. (11) conducted the first study related to the sexual functioning of men (131 in total) between the ages of 31 and 86 years six weeks after their first myocardial infarction (MI). The researchers' data indicated that ED was present in 64% of men, that 28% showed decreased sexual frequency and that 8% presented with premature ejaculation. In 2012, Lindau et al. (34) investigated the loss of sexual activity one year after MI. Their study recruited 1,274 men and 605 women with mean ages of 61.1 and 58.6 years, respectively, for a total of 1,879 patients. A decreased frequency of sexual activity was reported by 48% of men and 59% of women, and 11% of men and 13% of women did not return to sexual activity. This study concluded that the absence of sexual desire contributed to the reduction in patient sexual activity.

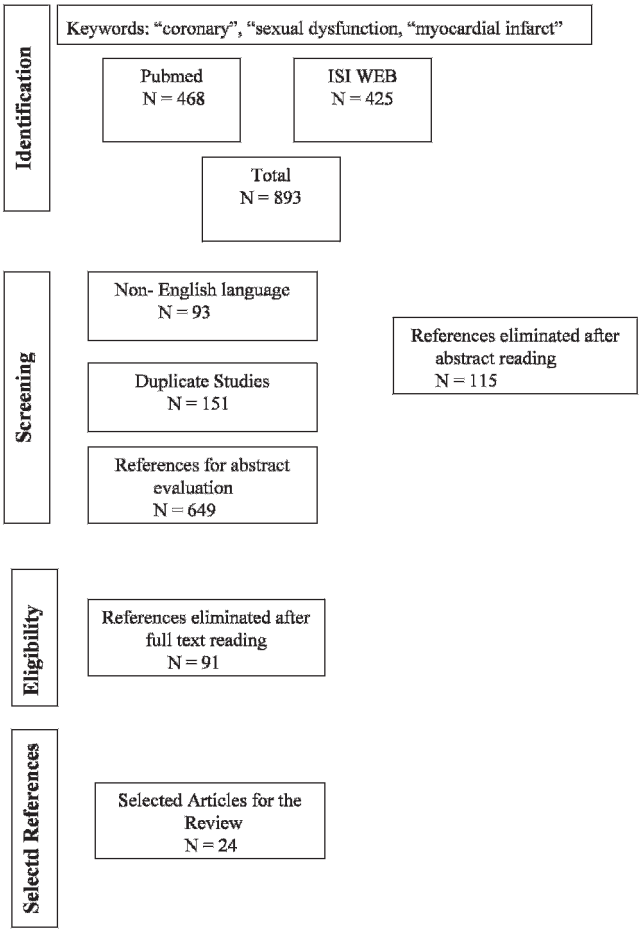

Figure 1 - Study selection.

Cross-Sectional, Observational Studies

In 1996, Jaarsma et al. (12) investigated the sexual functioning of 62 men and 18 women with heart failure and average ages of 52.8 and 53.4 years, respectively, for a total of 80 patients. Forty-five patients (75%) reported a lack of sexual interest, 47 (76%) showed a marked decrease in sexual activity, 30 (32%) reported not engaging in sexual activity, 15 (24%) showed a decrease in sexual frequency, 12 (19%) reported sexual dissatisfaction, and 62 reported minimal or no changes. In 1997, Greenstein et al. (15) examined the effect of coronary artery disease (CAD) on the erectile function of 40 men with documented angiographies and an average age of 56 years. The results revealed that 15 (37.5%) men had an occlusion of one coronary vessel. These men were more likely to have ($p<0.04$) and maintain ($p<0.007$) an erection than the 8 men with two occluded coronary vessels (20%) and the 17 men with three occluded coronary vessels (42.5%). Age, diabetes and hypertension negatively affected the erection quality ($p<0.05$) of all patients. In 1998, Drory et al. (15) examined whether demographics and psychological and medical variables affected the indicators of satisfaction and sexual frequency in 276 men between the ages of 30 and 65 years after their first MI. The results revealed that a change in sexual frequency (32%) was associated with age and education. Age was the only variable that explained variation in patient sexual satisfaction (23%). Medical and psychological variables (i.e., diabetes and depression) were non-significant contributors.

In 2000, Drory et al. (17) examined gender differences in sexual activity and their relationship with demographic and medical variables six months after the first MI. The participants included 462 men and 51 women with average ages of 52 and 56 years, respectively, for a total of 513 patients. The results revealed that women reported reductions in sexual frequency ($p=0.77$) and sexual satisfaction ($p=0.42$). Men showed decreased sexual activity ($p=0.45$) and sexual satisfaction ($p=0.42$). The medical and demographic variables did not predict the sexual activity of either sex. In 2001, Burkhart et al. (18) investigated ED associated with cardiovascular complications in patients with hypertension. This sample was composed of 104 men aged 18-75 years. The results revealed that ED (70.6%) was correlated with cardiovascular complications ($p<0.05$). Of the 22 men with ED, 30.6% showed symptoms of depression. The study concluded that ED is a marker of cardiovascular complications in patients with hypertension. In 2003, Montorsi et al. (19) evaluated the prevalence of ED and its chronological and etiological associations in 300 men with angiography-documented CAD (average age = 62 years). The data

Table 1 - Published studies regarding the prevalence of sexual dysfunction in patients with cardiovascular diseases.

Authors and year	Population	Instrument/Measure	Summary
Wabrek et al., 1980 (11)	Male	IIEF (35)	Six weeks after their first MI, 64% of patients presented with ED, 28% presented with decreased sexual frequency, and 8% presented with premature ejaculation.
Jaarsma et al., 1996 (12)	Male and Female	SAS and PAIS (36)	Heart failure resulted in significant changes in sexual desire and the frequency of sexual activity.
Greenstein et al., 1997 (13)	Male	Questionnaire by O'Leary (37)	The severity of CAD decreased the frequency of erections.
Abramov LA et al., 1997 (14)	Female	Student's *t*-test and X^2 contingency (38)	High prevalence of reduced desire and sexual dissatisfaction among 50 patients (65%) after MI compared with 20 (24%) controls.
Drory et al., 1998 (15)	Male	QSF (39)	After MI, patients showed changes in sexual frequency (32%) associated with age and education. For 23%, sexual dissatisfaction was correlated with age.
Hultgren et al., 1999 (16)	Female	FSFI (40)	Patients with AIOD experienced negative effects on sexual arousal, orgasm and vulvar sensitivity.
Drory et al., 2000 (17)	Male and Female	QSF (39)	The frequency of and satisfaction with sexual activity were similarly reduced for both sexes.
Burchardt et al., 2001 (18)	Male	IIEF (35) and CESD (41)	ED was considered as a marker of cardiovascular complications ($p<0.05$) in 70 patients (70.6%) with hypertension. In total, 22 (30.6%) patients with ED showed signs of depression.
Montorsi et al., 2003 (19)	Male	IIEF (35)	ED occurred 38.8 months before the advent of CAD in 99 patients (67%) men. ED was evident before heart disease in 70% of all cases.
Vacanti et al., 2005 (20)	Male	IIEF (35) and HADS (42)	After MI, patients showed an incidence of 40.5% of ED and depressive symptoms.
Addis et al., 2005 (21)	**Female**	Logistic regression	A total of 1,091 patients had SD, of whom 140 (13%) complained of one sexual problem, and 570 (52%) complained of two or more.
Shi et al., 2006 (22)	Male	IIEF (35)	Patients with CAD in the acute ($p>0.05$) and chronic ($p<0.05$) phases.
Kazemi-Saleh et al., 2007 (23)	Male	HADS (42) and RSS (43)	Twenty-nine patients (33.3%) showed sexual fear, depressive symptoms and a decreased frequency of sexual activity.
Eyada et al., 2007 (24)	Female	ASEX (44)	Pectoral angina had a negative effect on the frequency and sexual satisfaction of patients.
Kaya et al., 2007 (25)	Female	FSFI (40)	All FSFI domain scores, except satisfaction, were lower in patients with CAD compared with healthy individuals ($p<0.05$).
Lunelli et al., 2008 (26)	Male and Female	Mann-Whitney tests (26)	In total, 60% of patients had doubts about their return to sexual activity, and 44% had reduced their sexual frequency.
Cook et al., 2008 (27)	Male	*t*-tests with Bonferroni correction (45)	Patients using BBs reported three times more ED ($p = 0.045$).
Kazemi et al., 2008 (28)	Male and Female	RSS (46) and HADS (42)	Male and female patients with CAD and symptoms of depression had sex less frequently. Male depression was correlated with the couple's fear of sexual intercourse.
Schwarz et al., 2008 (29)	Male and Female	IIEF (35) and FSFI (40)	Male and female patients showed a high prevalence of SD.
Hoffman et al., 2010 (30)	Male	ASEX (44)	ED was associated with greater CVD risk and impaired vascular endothelial function in depressed men.
Lemogne et al., 2010 (31)	Male	IIEF-5 (47), BDI-13 (48), STAI (49) and DS-14 (50)	The prevalence of ED (57.6%) was negatively associated with age and depressed mood.
Kriston et al., 2010 (32)	Male and Female	IIEF (35), FSFI (40) and HADS (42)	ED was found in 20.3% of men, and SD was found in 43.1% of women. Symptoms of moderate depression were found in 16.5% and 14.4% of men and women, respectively.
Foruzan-Nia et al., 2011 (33)	Male	IIEF (35)	SD was prevalent one year after MI.
Lindau et al., 2012 (34)	Male and Female	PHQ-9 (51) and F-12 PCS (52)	A lack of sexual desire contributed to a decrease in sexual frequency among 59% of women and 48% of men.

IIEF = International Index of Erectile Function; SAS = Adjustment Sexual Scale; PAIS = Psychosocial Adjustment to Illness Scale; QSF = Sexual Function Questionnaire; CESD = Center for Epidemiologic Studies, Depression Scale; HADS = Hospital Anxiety and Depression Scale; RSS = Relationship and Sexuality Scale; ASEX = Arizona Sexual Experience Scale; FSFI = Female Sexual Function Index; BDI = Beck Depression Inventory; STAI = State-Trait Anxiety Inventory; DS-14 = Type-D Personality Scale-14; PHQ-9 = 9-Item Patient Health Questionnaire; and SF-12 PCS = 12-Item Short-Form Health Survey, Physical Composite Score.

revealed the presence of ED in 49% of the patients. Specifically, these 147 patients were classified as mild (21; 14%), mild to moderate (31; 21%), moderate (20; 14%) , and severe (75; 51%). ED occurred 38.8 months before the advent of CAD in 99 (67%) men.

In 2005, Vacanti et al. (20) examined changes in sexual activity six months after MI and identified variables possibly associated with ED in 37 men (age range = 18-75 years). The results revealed 15 patients (40.5%) with ED and 9 patients with symptoms of depression. Of the 28 (89%) patients without symptoms of depression, 7 (25%) had ED. This study concluded that patients with MI showed a significantly high incidence of ED. A study by Addis et al. (21) in 2005 investigated the sexual activity of 2,763 postmenopausal women with heart disease (average age = 67 years). SD was prevalent in 1,091 sexually active individuals. In total, 140 (13%) reported at least one sexual complaint (e.g., lack of interest, inability to relax, difficulty achieving arousal or orgasm or sexual discomfort), and 570 (52%) reported two or more sexual problems.

In 2006, Shi et al. (22) investigated the incidence of SD and the changes associated with ED among 467 men with CAD (<70 years old). The data revealed that patients with CAD presented ED during both the acute ($p>0.05$) and chronic ($p<0.05$) phases of the disease. The average frequency of sexual activity declined each month in these patients ($p<0.05$ and $p<0.01$, respectively). Of the total sample, 58% showed a decrease in sexual frequency, 33.8% returned to a normal sexual life, and 8.1% did not return to sexual activity. The average time interval between the beginning of ED and the development of CAD was 33 months. The variables associated with ED included age, diabetes, the occlusion of two or three coronary vessels and smoking. In 2007, Kazemi-Saleh (23) investigated the presence of sexual fear in 87 married men with MI (average age = 59 years). The clinical, demographic and psychological symptoms of individuals with or without sexual fear were investigated. The results revealed sexual fear in 29 (33.3%) men with a lower frequency of sexual activity and symptoms of depression.

In 2007, Eyada et al. (24) investigated the effect of cardiac rehabilitation on the resumption of sexual activity in 35 women with angina pectoris (age range = 34-65 years). The results revealed that 17 (48.7%) women resumed sexual activity; however, 7 (41.2%) reported sexual dissatisfaction. Eighteen (43%) women did not resume sexual activity, 83.3% reported a decreased sex drive, 12 (66.7%) decreased their sexual activity, 72.2% reported symptoms of anxiety, 65% showed symptoms of depression, and 38.9% reported sexual fears. Patients who participated in a rehabilitation program were 3.77-fold more likely to return to sexual activity. The following year, Lunelli et al. (26) examined return to sexual activity after the first MI event in a sample of 96 patients (67 men and 29 women) with an average age of 59 years. The results revealed that 63% of patients had an active sex life, 71% showed an interest in maintaining their sexual activity, 60% doubted their return to sexual activity, and 44% had reduced their sexual frequency. Only 4% were provided information about returning to sexual activity. This study indicated the importance of sexual education in aiding patient return to sexual activity.

In 2008, Cook et al. (27) conducted the first study of ED in 86 young men with congenital heart disease (average age = 34 years). Patients were treated with cardiac medications, including beta-blockers (BBs; 24%), angiotensin-converting enzyme (ACE) inhibitors (8%), calcium-channel blockers (CCBs; 6%) or a combination of BBs and ACE inhibitors (16%). The results revealed ED in 87 (38%) patients. Men who used BBs were three times more likely to have ED ($p = 0.045$). Dyspnea was the cardiovascular symptom reported most often during the sexual activity of 45 (52%) men. In 2008, Schwarz et al. (29) investigated the prevalence of SD among 100 patients (76 men and 24 women) with CVDs during outpatient treatment. The results revealed that 87% of women reported arousal disorders, 84% had decreased vaginal lubrication, 62% had difficulty reaching orgasm, 50% reported moderate to severe sexual pain, and 29% had reduced their sexual activity over six months. Regarding the men, 84% had trouble maintaining an erection after penetration, 76% had reduced sexual desire and excitement, 62% had difficulty reaching orgasm, and 31% had difficulty having an erection for penetration.

In 2010, Lemoge et al. (31) examined the association between ED and depressed mood among 85 men with CAD (average age = 75 years). Significant ED was found in 57.6% of the patients. ED was independently predicted by depressive mood, hypertension, age ($p = 0.007$, $p = 0.017$ and $p = 0.082$) respectively. Kriston et al. (32) investigated the prevalence of sexual disorders and depressive symptoms among 493 patients with CAD (395 men and 98 women) with an age range of 55-69 years. The results revealed the presence of ED in 20.3% of men and SD in 43.1% of women. Moderate depressive symptoms were present in 16.5% of men and 14.4% of women.

In 2011, Foruzan-Nia et al. (33) evaluated the incidence of ED and SD one year before and after MI among 279 men with an age range 25-69 years. Before MI, 6.5% of men reported ED, 4.3% reported premature ejaculation, and 9.3% showed a decrease in or loss of libido. The rates of SD increased to 34.8%, 21.5% and 20.1%, respectively, 12 weeks after MI. Finally, in 2007, Kazemi et al. (28) examined sexual activity and psychiatric symptoms among patients with CAD and the relationships between these variables for each gender in 550 married patients with CAD (397 men and 153 females; average age = 57 years). The data revealed that 45.8% of women with CAD showed anxiety symptoms and that 20.3% suffered from depression. Of the men with CAD, 16.6% reported anxiety symptoms, and 9.6% reported depressive symptoms. A greater decrease in sexual activity correlated with depressive symptoms in both genders. However, fear of sexual relations correlated with depressive symptoms only in men with CAD and their spouses ($r = 0.18$, $p = 0.001$).

Case-Control Studies

In 1997, Abramov (14) examined aspects of the sexual lives of 100 women aged 40-60 years after their first MI over a three-year period compared with 100 women with other diseases (i.e., hypertension, valvular heart disease, respiratory disorder, urinary tract diseases, diabetes mellitus, gastrointestinal disease, joint diseases and allergies). The results revealed that 50 (65%) women in the former group reported underactive desire and sexual dissatisfaction, whereas only 20 (24%) women in the control group did the same. In 1999, Hultgren et al. (16) investigated the sexual functioning of 36 women who suffered from aortoiliac occlusive disease (AIOD). These patients were divided into two groups: 20 women who were interviewed before

starting medical treatment (i.e., the untreated group) and 16 who were surveyed after beginning medical treatment (i.e., the treated group). All participants were under 70 years old and married. The control group was composed of 18 women in treatment for pain or urinary tract infections, and their age and marital status were similar to those of the experimental groups. The results revealed that treated patients with AIOD showed significantly impaired physical wellbeing compared with the other groups ($p<0.001$). Vascular disease had a negative effect on the sexual functioning of 11 (69%) patients in the treated group compared with only 8 (40%) in the untreated group. A lack of vaginal lubrication during sexual intercourse was reported by 7 (64%) women in the untreated group, 5 (45%) in the treated group and 4 (25%) in the control group. Orgasm disorders were found in 6 (43%) women in the untreated group, 4 (31%) in the treated group and 4 (25%) in the control group. Vulvar sensitivity was impaired in 7 (44%) women in the treated group, 2 (11%) women in the untreated group and 4 (22%) control patients. Finally, in 2007, Kaya et al. (25) investigated the sexual functioning of 20 women with CAD (average age = 38 years) and 15 healthy subjects. The patients with CAD and the healthy women were comparable in age, body mass index and education level. The results revealed SD in 12 (60%) women with CAD compared with 15 (33.3%) women in the control group. All Female Sexual Function Index (FSFI) domain scores, except satisfaction, were lower in the group with CAD compared with the healthy participants ($p<0.05$). This preliminary study demonstrated that female patients with CAD had a high prevalence of SD compared with healthy controls.

Randomized Clinical Trials

In 2010, Hoffman et al. (30) investigated the association between CVD risk factors and vascular endothelial function among 46 men (average age = 53 years) with major depressive disorder. The results indicated that ED was not associated with depression severity ($r = 0.00$, $p = 0.09$). In contrast, greater ED was associated with higher CVD risk ($r = 0.42$, $p = 0.004$), and age was strongly associated with ED ($r = 0.43$, $p = 0.003$). ED was associated with greater CVD risk and impaired vascular endothelial function in depressed men.

DISCUSSION

The current review indicates that a high prevalence of SD exists among men and women with CVDs. Physiological changes in sexual satisfaction, such as ED in men and sexual arousal in women, were correlated with CAD severity. In certain studies (11,13,19,22,29), men with severe CAD (i.e., two or more occluded coronary vessels) had the most difficulty attaining and maintaining penile erection compared with men with only one coronary vessel occlusion. In other individuals, SD was related to desire, arousal, orgasm and ejaculation. This dysfunction is due to peripheral artery disease and CAD, for which atherosclerosis is a common risk factor. This disease is responsible for the formation of fatty plaques that narrow the arteries. Hence, an insufficient amount of blood flows to the body, including through the small arteries that irrigate the genital tissues of men and women (5-6). ED affects the muscles of the penis and associated fibrous tissue, which alters sexual arousal and orgasm because of reduced penile rigidity, erection time and ejaculation (53). The literature has demonstrated that ED affects 46% of men with CAD; of these men, 75% present problems achieving erections, and 67% have problems maintaining erections (54).

Similar to male erections, female genital arousal is achieved when the vascular system increases blood flow to the labia via vasodilatation, which is accompanied by vaginal lubrication and clitoral erection (3). Certain studies (16-17,24-25,27,32) have revealed an effect of CVD on women's sexual desire; arousal dysfunction, with decreased sensitivity of the clitoris and vaginal labia; and orgasm. Certain women with heart failure present problems with vaginal lubrication before and during sexual intercourse, and many report moderate to severe sexual pain (29).

In addition, the frequency of ED increases with the use of BBs in men (27). Cardiovascular medications often have sexual side effects that can affect male erections and sexual desire (55). This study did not include a bibliographic review paper concerning the effects of cardiovascular drugs on female SD.

In certain studies (20,31,32), age and depressive symptoms predicted SD in male and female patients. The free testosterone levels of humans decrease almost yearly between the ages of 40 and 70 years, resulting in a serious testosterone decline of 0.4 per year (3). Decreases in testosterone can diminish the erectile response, satisfaction and sexual frequency (17). In women, this process occurs during menopause and can cause various sexual problems (21). Depression is an important risk factor for SD, as this condition may compromise sexual desire, and unsatisfying sexual performance is related to depression (20,23,24,28). In the absence of sexual desire, sexual fantasies are rare or fleeting sexual stimuli and may not occur efficiently, preventing completion of the sexual response cycle (2). Depressive symptoms have different effects on the emergence of SD. Antidepressant drugs affect penile erection, sexual arousal and vaginal lubrication (2). The biological mechanism related to depression can reduce the ability to relax the smooth muscles of erectile tissue. Depressive symptoms might reduce erotic focus and the psychogenic stimulus, thereby impairing the sexual response cycle (8,20).

Importantly, a randomized clinical review study (30) did not find an association between depression severity and ED in men with CVDs. The authors indicated that depression might influence ED but that depression does not contribute to ED.

In certain studies (11,7,20,22,34), patients showed reduced sexual desire, less sexual satisfaction and ED after MI. CVDs can alter sexual desire because the physical and psychological manifestations of a medical illness can decrease sexual interest (10).

One study (20) in this review reported the existence of a literature-based estimate that 58% of patients recovering from CVD have psychological problems. Heart disease and depression are very common, frequently concomitant conditions that were previously speculated by the World Health Organization to be the first and second leading causes, respectively, of disability. Depressive symptoms can occur when individuals remain hospitalized and persist throughout the recovery period in addition to affecting patients' energy levels and the time needed to return to sexual activity (56). One study reported that after a cardiac event, 25% of patients returned to a normal sexual life, 50%

showed a decrease in sexual activity, and 25% did not return to sexual activity (9).

Fear of sexual intercourse, a mental factor in the context of CAD, is comorbid with decreased desire, satisfaction and sexual frequency among male and female patients (23,24,28). After the onset of CVD, SD might be due to apprehension regarding sexual activity. Patients consider the physical exertion of intercourse to be harmful and dangerous to their hearts and fear sudden death during sex. These fears significantly contribute to the decline in sexual frequency and consequently delay the resumption of sexual activity.

CVDs contribute to changes in the sexual response cycles of a patient. Certain studies (24,26,34) indicated the importance of sexual education offered by health professionals for returning patients to sexual activity and possibly reducing the onset of the SD that affects these individuals (33).

In conclusion, CVDs are risk factors for the emergence of SD. The severity of heart disease increases the occurrence of SD. In addition, symptoms of depression associated with CVD and SD, which emerge during the recovery of patients with heart disease, marked by physical and psychological adaptations, contribute to the impairment of sexual responses. Therefore, SD can occur following the development of CVD.

AUTHOR CONTRIBUTIONS

Nascimento ER selected the articles on the web, revised the manuscript and wrote the text about sexual function and heart failure. Maia AC, Pereira V, Soares-Filho G, Nardi AE and Silva AC selected the articles on the web and revised the manuscript.

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