

ORIGINAL ARTICLE

Association between Erectile Dysfunction and Quality of Life in Patients with Coronary Artery Disease

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Abstract

Background: Erectile dysfunction (ED) and coronary artery disease (CAD) share the same risk factors and the associations between ED, quality of life (QoL) and CAD have been the subject of recent studies.

Objective: To evaluate whether ED is associated with worsening QoL in patients with CAD.

Methods: A cross-sectional, multicenter, prospective and analytic study was carried out from EDcember 2014 to April 2016, which recruited 304 men (mean age: 57 ± 9.9 years) with clinical diagnosis of CAD. QoL was assessed using Short Form-36 and ED by the International Erectile Function InEDx. EDscriptive and analytical statistical analyzes were performed, and the Kruskal-Wallis non-parametric test was used to test whether there are significant differences in each quality of life domain when comparing different types of ED. For all tests, $p \leq 0.05$ was considered significant.

Results: The prevalence of ED was 76.3%. The median and percentiles 25 and 75 of each life quality domain according to the absence of ED; mild ED, mild to moderate, moderate and severe ED and severe ED, respectively, were: **Functional capacity:** 85 (63-100), 75 (50 -95), 60 (32-85), 55 (35-75), 50 (30-70), $p < 0.001$; **Physical aspects:** 87 (0-100), 40 (0-100), 0 (0-100), 0 (0-31), 0 (0-12), $p < 0.001$; **Pain:** 72 (51-100), 66 (51-100), 74 (51-100), 62 (51-100), 51 (31-62), $p = 0.001$; **General state of health:** 77 (62-87), 72 (57-77), 67 (55-82), 67 (59-75), 52 (37-68), $p < 0.001$; **Vitality:** 75 (60-85), 65 (50-75), 65 (55-75), 60 (43-75), 50 (32-65), $p < 0.001$; **Social Aspects:** 87 (62-100), 87 (62-100), 87 (68-100), 75 (62-100), 75 (50-93), $p = 0.139$; **Emotional Aspects:** 100 (58-100), 100 (33-100), 100 (33-100), 100 (0-100), 0 (0-100), $p = 0.001$; **Mental health:** 80 (67-89), 72 (60-84), 72 (66-80), 68 (58-80), 56 (50-74), $p < 0.001$.

Conclusions: The prevalence of erectile dysfunction was high. ED was associated with worsening of QoL in patients with CAD. (Int J Cardiovasc Sci. 2017;30(3):219-226)

Keywords: Coronary Artery Disease, Erectile Dysfunction; Life Style, Risk Factors.

Introduction

The associations between erectile dysfunction (ED), quality of life (QoL) and some cardiovascular diseases (CVD) have been the subject of studies in the last years, and some aspects have been specially highlighted.¹⁻³

The prevalence of ED depends on the patient's age group, and it's higher as the patient grows older.⁴ In patients with coronary artery disease (CAD) the prevalence generally ranges from 60-70%¹. In Brazil, considering the general population, this prevalence ranges from 31.9 to 53.9%.^{5,6}

ED and CAD frequently share the same risk factors. Hypertension, diabetes mellitus, smoking, dyslipidemia and obesity are common to both conditions and their impact on endothelial dysfunction has been well documented.⁷ Endothelial dysfunction, characterized among other things by the impairment of nitric oxide bioavailability, precedes the development of atherosclerotic lesions and has been suggested as an important link between ED and CAD.⁸

ED may be present in supposedly healthy men, outpatients and others. Such dysfunction exerts a

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negative influence on patients's QoL because it affects, among others, physical and psychosocial aspects, and the treatment contributes to the improvement of patients's quality of life.⁹⁻¹²

Individuals with CAD are also known to have impaired QoL.^{13,14} It is known that in these patients despite the control of risk factors for CAD, the quality of life remains compromised and this may contribute to a worse prognosis.^{15,16} It is believed that patients with ED and CAD can have even greater impairment of quality of life.^{2,17,18}

In spite of studies on the subject we believe that there is a need for greater knowledge between the associations of QoL and ED in patients with CAD.

Objectives

The primary objective of this study was to assess whether ED is associated with worsening life quality in patients with coronary artery disease.

The secondary objectives were: to describe the prevalence of erectile dysfunction in patients with and without CAD, to characterize the clinical and socioeconomic profiles of the population.

Methods

A cross-sectional, multicenter, prospective, descriptive, and analytical study was conducted from december 2014 to April 2016 in three tertiary hospitals, which recruited 304 men (mean age: 57 ± 9.9 years) with stable coronary artery disease, with diagnostic based in the clinical presentation and in the presence of an ischemic induction test considered to be a high risk of cardiovascular events, submitted and approved by the ethics committee in clinical research. Therefore, the patients in this study had an indication of an invasive strategy (cineangiography).

The sample calculation was based on the prevalence of dysfunction in the Brazilian population (39.5 - 53.9%)^{6,19} and in patients with CAD (49 - 70%).^{20,21} Based on this, the number of patients that should be recruited was between 219 and 224 participants, with a statistical power of the study of 0.99 and an alpha error of 0.05.

Inclusion criteria were: male patients 18 years of age or older, clinical indication of coronary angiography and active sexual life potential, while those for exclusion were: previous history of myocardial or lower limb revascularization, peripheral artery disease or of the aortic artery, treatment for erectile dysfunction or cancer, patients

with severe blood dyscrasia, psychiatric illness, inability to respond to the questionnaires, life expectancy < 1 year, or participation in another study.

The clinical and socioeconomic features were collected through questionnaires. The quality of life was assessed by applying the *Medical Outcomes Study 6-Short Form Health Survey* (SF 36),²² while erectile dysfunction by the International Erectile Function InEDx (IIEF-5).²³

The SF-36 was calculated by transforming the questions into domains, and for each domain there is a different calculation that ranges from zero to one hundred, which corresponds from the worst to the best state of health.²⁴ The result is called Raw Scale because the final value does not have any units of measure. The calculation of each domain is a statistical test, and no other test is required.

The domains evaluated by SF-36 included: Functional Capacity, Physical Aspects, Pain, General Health Status, Vitality, Social Aspects, Emotional Aspects and Mental Health.²⁵

According to IIEF-5, ED is classified into five validated levels of severity, such as: without ED (22 to 25 points), mild (17 to 21 points), mild / moderate (12 to 16 points), moderate (8 To 11 points) and severe (5 to 7 points).²⁶

Visual evaluations of the coronary angiographies were performed and stenosis of 30% or more were considered angiography CAD.

Statistical Package for the Social Sciences (SPSS) was used to analyze the data, and initially was carried out an exploratory data analysis to compare descriptive measures of patient characteristics and QoL domains for each type Of ED, in order to understand and observe trends in the database.

Next, the trends were tested in terms of significance by performing before the normality test. The Shapiro-Wilk normality test was applied to verify the normality of the data, and it concluded that the values of the QoL were not normally distributed (p-value < 0.05).

In this regard, the non-parametric Kruskal-Wallis test was used to try out whether there are significant differences in each quality of life domain when comparing different types of ED in patients (total study population, patients with and without angiographic CAD).

To verify the relationship between clinical variables and quality of life, using quality of life domains, a factor called quality of life was generated by factorial analysis, which is the joint representation of all domains. Then, using the *Multiple Linear Regression Model*, each clinical variable was tested for the significant relation with the quality of life factor, and it was then possible to understand which

variables have a relevant influence on the behavior of the quality of life factor in the patients. With this model it was possible to verify if the clinical variables and whether the ED (IIEF-5) influenced the quality of life of the patients. Through the *Stepwise* method, each variable was tested and included if contributed to explain the behavior of the dependent variable, otherwise it would be excluded, reaching then the final model. For all tests, the 5% level of significance was considered.

Spearman correlation was used between the clinical and socioemographic variables and the values obtained by the IIEF-5 questionnaire, in the groups of patients with and without CAD.

When there was a normal distribution, the numerical variables were presented as mean and standard deviation and when not, as median and percentile 25 and 75. The categorical variables were presented as absolute and percentage values.

Results

Three hundred and four patients were recruited, with average at 57.0 ± 9.9 years. The prevalence of ED was 76.3%, with 37.4% of mild ED, 31.3% of mild / moderate ED, 15.2% of moderate ED and 16.1% of severe ED.

The prevalence of angiographic CAD was 74%, and in those patients with such finding the prevalence of ED was 77.3%, with 37.1% of mild ED; 31% mild to moderate ED; 15.1% of moderate ED and 15.9% of severe ED.

Among the clinical and sociodemographic characteristics was observed: evangelical religion (21%), atheism (2%), income less than 1 minimum wage (MW) (11.8%), income from 1 to 3 MW (63.1%), Income higher than 3 MW (24.9%), illiterate (3.3%), higher education (7.2%), single (7.2%) and widowed (2.3%). Other clinical and sociodemographic characteristics are shown in table 1.

The evaluation of the life quality in 304 patients revealed that the Functional Capacity had an average of 70 (41-90), Physical Aspects 25 (0-100), Pain 72 (51-100), General Health Status 71 (57-82), Vitality 65 (50-80), Social Aspects 81 (62-100), Emotional Aspects 100 (33-100) and Mental Health 72 (60-84).

Table 2 shows the comparative analysis of the 8 domains of QoL according to the absence or presence of ED and its various types.

Table 3 and 4 present comparative analyzes of quality of life according to the degree of ED in patients with and without angiographic CAD, respectively.

In the correlations between IIEF-5 values and the other variables in the groups with CAD and without CAD, it was observed that in the group with CAD, the most advanced age ($r = -0.2242$), low levels of schooling ($r = 0.230$), history of cancer ($r = 0.165$) and EDpression ($r = 0.133$) were associated with low IIEF-5 values. In the group without CAD, the most advanced age ($r = -0.227$), individuals with lower BMI ($r = 0.251$), higher alcohol consumption ($r = 0.259$), hypertensive ($r = 0.271$) correlated with the low IIEF-5 values.

In the analysis of characteristics that had an impact on QoL, after multivariate regression in patients with CAD,

Table 1 – Clinical and sociodemographic characteristics of the study population

Caracteristics	Total population (n = 304)
Elementary /high school, n (%)	272 (89.5)
Married / stable union, n (%)	258 (84.8)
SAH, n (%)	246 (80.9)
Catholic Religion, n (%)	222 (73)
DM, n (%)	97 (31.9)
Alcoholism, n (%)	96 (31.6)
Smoking, n (%)	63 (20.7)
Renal insufficiency, n (%)	26 (8.6)
EDpression *, n (%)	(7.2)

* Diagnosis established through a clinical record with questioning of personal history of the disease; SAH: systemic arterial hypertension; DM: diabetes mellitus.

Table 2 – Quality of life according to the absence of erectile dysfunction or presence of its various types

Characteristics	Without ED (74)	Mild ED (86)	Mild/Mod ED (72)	moderate ED (35)	Severe ED (37)	p
Functional Capacity	85 (63-100)	75 (50-95)	60 (32-85)	55 (35-75)	50 (30-70)	< 0.001
Physical Aspects	87 (0-100)	40 (0-100)	0 (0-100)	0 (0-31)	0 (0-12)	< 0.001
Pain	72 (51-100)	66 (51-100)	74 (51-100)	62 (51-100)	51 (31-62)	0.001
GSH	77 (62-87)	72 (57-77)	67 (55-82)	67 (59-75)	52 (37-68)	< 0.001
Vitality	75 (60-85)	65 (50-75)	65 (55-75)	60 (43-75)	50 (32-65)	< 0.001
Social Aspects	87 (62-100)	87 (62-100)	87 (68-100)	75 (62-100)	75 (50-93)	0.139
Emotional Aspects	100 (58-100)	100 (33-100)	100 (33-100)	100 (0-100)	0 (0-100)	0.001
Mental Health	80 (67-89)	72 (60-84)	72 (66-80)	68 (58-80)	56 (50-74)	< 0.001

Median and 25th and 75th percentiles of domains. ED: erectile dysfunction; Mod: moderate; GSH: general health status. Kruskal-Wallis test.

Table 3 – Quality of life according to absence of erectile dysfunction or presence of its various types in patients with angiographic coronary artery disease (n = 225)

Characteristics	Without ED (53)	Mild ED (67)	Mild/Mod ED (56)	moderate ED (21)	Severe ED (28)	p
Functional Capacity	85 (65-100)	80 (50-95)	65 (40-90)	65 (35-77)	50 (30-65)	0.001
Physical Aspects	100 (0-100)	25 (0-100)	25 (0-100)	0 (0-75)	0 (0-0)	< 0.001
Pain	72 (50-100)	71 (51-100)	74 (51-100)	62 (50-100)	51 (31-74)	0.014
GSH	77 (67-88)	72 (60-80)	67 (56-82)	67 (40-72)	55 (57-82)	< 0.001
Vitality	80 (60-85)	70(55-80)	65 (60-80)	55 (35-75)	55 (35-70)	< 0.001
Social Aspects	87 (62-100)	87 (62-100)	87 (62-100)	87 (56-100)	75 (50-100)	0.168
Emotional Aspects	100 (66-100)	100 (33-100)	100 (33-100)	100 (0-100)	0 (0-100)	0.008
Mental Health	80 (66-92)	76 (64-84)	76 (68-80)	76 (50-84)	60 (52-72)	< 0.001

Median and 25 and 75 percentiles of domains. ED: erectile dysfunction; Mod: moderate; GSH: general health status. Kruskal-Wallis test.

erectile dysfunction ($p < 0.001$), younger subjects ($p = 0.01$), depression ($p = 0.03$) and Systemic Arterial Hypertension ($p = 0.04$) negatively influenced the quality of life, with ED being the factor that most influenced this aspect. In the population of patients without CAD, no variable reached significance to the point of influencing QoL.

In the total study population, the variables age ($p = 0.03$), depression ($p = 0.05$), and catholic religion ($p = 0.05$) presented significant worsening of QoL. Erectile dysfunction did not influence this aspect ($p = 0.09$).

Discussion

In our study, ED was a predictor of worse quality of life in patients with angiographic CAD, but not in those without obstructive stenosis in coronary angiography or in the total population.

The prevalence of ED was high and, when compared to that of the population considered healthy, which according to Dos Reis⁵ was 31.9%, was numerically higher, but similar to another study that evaluated patients with CAD.²¹

Table 4 – Quality of life according to absence of erectile dysfunction or presence of its various types in patients without angiographic coronary artery disease (n = 79)

Characteristics	Without ED (21)	Mild ED (19)	Mild/Mod ED (16)	moderate ED (14)	Severe ED (9)	p
Functional Capacity	95 (52-100)	65 (25-90)	40 (17-72)	50 (32-72)	50 (15-81)	< 0.001
Physical Aspects	50 (0-100)	50 (0-100)	0 (0-0)	0 (0-12)	0 (0-100)	0.013
Pain	100 (56-100)	62 (41-100)	74 (54-84)	74 (51-92)	46 (31-61)	0.002
GSH	72 (57-82)	62 (45-72)	69 (55-80)	66 (61-75)	46 (30-60)	0.001
Vitality	70 (55-82)	65 (30-75)	65 (50-70)	60 (55-70)	50 (23-56)	0.001
Social Aspects	75 (56-100)	87 (37-100)	87 (75-100)	75 (62-81)	68 (46-81)	0.448
Emotional Aspects	100 (0-100)	100 (0-100)	100 (41-100)	100 (50-100)	0 (0-100)	0.076
Mental Health	80 (60-88)	64 (52-80)	70 (45-75)	68 (60-74)	54 (40-59)	< 0.001

Median and 25 and 75 percentiles of domains. ED: erectile dysfunction; Mod: moderate; GSH: general health status. Kruskal-Wallis test.

Rhoden et al.⁶ with the IIEF-5 questionnaire, studying 965 men for outpatient prostate cancer investigation, identified a total prevalence of 53.9% of ED with a more homogeneous distribution among the categories of the disease classification.

Other studies, in healthy populations and using different instruments, found prevalences ranging from 15.0 to 46.2%,^{19,27,28} being the mildest form also the most prevalent.

In the United States, the *Massachusetts Male Aging Study* (MMAS), the leading study of erectile dysfunction ever conducted, found a prevalence of 10% complete dysfunction and more than 50% dysfunction of any degree in the general population aged 40-70 years.²⁹

The high prevalence of ED found in our study may be due to the recruited sample, since they were patients admitted to the hospital hemodynamics sector for invasive CAD investigation. It is known that patients with coronary disease are potentially more likely to develop or already have ED and that, depending on the degree of coronary involvement, this probability may be even greater. Contrary to literature, in our study we had a predominance of milder forms of dysfunction.^{21,30}

We emphasize that in patients with CAD the prevalence is higher than in the general population, which was also described by Kloner and Mullin,³¹ who identified in this group 75% and 67% of patients with difficulty in having or maintaining an adequate erection, respectively.

In another study performed in patients undergoing cardiac catheterization after acute coronary syndrome

(ACS), the ED rate was 49%. The mild form occurred in 14%, mild to moderate in 21%, moderate in 14% and severe in 51%.²⁰ Men with ACS have a theoretically lower atherosclerotic burden than patients with chronic CAD. In contrast to the acute event, patients with chronic conditions usually show a severe and diffuse coronary involvement, with symptoms of long-term angina. Therefore, a more pronounced impairment of the hypogastric / pudendal arteries could also be expected, leading to a more severe picture of ED.³²

The QoL is a good indicator of the functional status and of the well-being of an individual who undergoes medical treatment³³ and becomes important in evaluating the efficacy of this treatment and of the patient's health conditions.³⁴

Studies have evaluated the quality of life in patients with CAD and found, in general, a negative influence on their general health status.^{18,35}

In the study by Boini et al.¹³ the impact of the onset of CAD was compared with controls without CAD. On average 2 and a half years after diagnosis, the authors concluded that most of the physical and mental domains were affected, which did not happen in the control group.

A similar result was found in a study analyzing the effect of age, sex, race and ethnicity on the quality of life of patients with CAD, with worse results in younger, female, black and hispanic individuals.³⁶ In another study, patients with diagnosis of heart failure (HF) after AMI were evaluated, and those with a lower income, female and with a greater number of symptoms, were generally moderately lower in QoL.³⁷

In patients submitted to coronary angiography there seems to be a correlation between the Gensini score,³⁸ the individual's emotional state and quality of life. In patients with more severe and extensive CAD there is more anxiety, depression and worse physical domains than in those without CAD.³⁹

Our study revealed that the severe form of ED was the one that had the worst QoL results, but since most of the sample exhibited total ignorance about ED and had never been informed by the attending physician, they probably did not admit their disease. We believe this may have contributed to the lack of an early identification of the dysfunction.

In the patients with CAD it was observed that, except for the Social Aspects domain, all the others presented significant difference. Severe dysfunction was the one that presented the worst results in comparison to the other degrees of ED and in relation to those without ED. moderate dysfunction presented significant results only in the components Functional Capacity, Physical Aspects and Vitality in relation to participants without ED. These more severe forms of ED therefore interfered in both, physical and mental components of QoL. The milder forms did not show the same association.

ED and its more severe degrees can also have an influence on people's quality of life. A study that evaluated 2476 men with no apparent comorbidities, related the different degrees of ED (diagnosed by IIEF) with the domains of QoL (SF-36) and observed a descendent and significant correlation between these values, with predominance for the physical dimension components related to the mental ones and the Vitality and General Health Status domains presenting the most expressive results.¹⁰

Therefore, ED has a negative impact on quality of life, and the most severe forms seem to be associated with greater negative impact intensity. Our study demonstrated the negative impact of ED on the quality of life of patients with coronary artery disease.

The limitations of the study were: having no ability to determine cause-effect, no evaluation of medications in

use (although more modern beta blockers have not been associated with ED), the recruitment site occurred in a stressful environment which may have generated psychological stress and influenced the response of the patients.

Conclusions

In this study, the presence of ED was associated with worsening QoL in patients with CAD. It was also observed that in the subgroups of patients with and without angiographic CAD, ED was also associated with worsening of QoL and the more severe the dysfunction worse the QoL.

The prevalence of ED was high and the clinical, social and economical profiles revealed that this low-income and low-educated population, is at a high risk for cardiovascular diseases.

Author contributions

Conception and design of the research: Tabosa A, Oliveira DC. Acquisition of data: Tabosa A, Oliveira DC, Stangler VH, Gadelha MI, Nunes V, Araújo H, Oliveira DAGC. Analysis and interpretation of the data: Tabosa A, Oliveira DC. Statistical analysis: Tabosa A, Oliveira DC. Writing of the manuscript: Tabosa A, Oliveira DC, Oliveira DAGC, Tenório E. Critical revision of the manuscript for intellectual content: Oliveira DC, Tenório E.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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