



# A Comparative Study of the Prevalence and Severity of Erectile Dysfunction and Lower Urinary Tract Symptoms in Patients With and Without Significant Coronary Artery Disease Undergoing Coronary Angiography at Kowsar Hospital in Shiraz, Iran

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## ABSTRACT

**Background:** Erectile dysfunction, lower urinary tract symptoms (LUTS), and coronary artery disease (CAD) share common risk factors. Atherosclerosis, inflammation, and endothelial dysfunction with decreased nitric oxide synthase activity are the proposed etiologies for these disorders.

**Objective:** This study compared the prevalence and severity of erectile dysfunction and LUTS in patients with and without significant CAD.

**Methods:** This case-control study involved patients undergoing coronary artery angiography at Kowsar Hospital in Shiraz, Iran, between January 2019 and January 2020. Male patients aged 40 or older with or without significant coronary artery lesions diagnosed by coronary angiograms were considered the case and control groups, respectively. Both groups were asked to fill out the International Prostate Symptom Score (IPSS) and International Index of Erectile Function-5 (IIEF-5) questionnaires, which evaluate the severity of LUTS and erectile dysfunction, respectively. The prevalence and severity of erectile dysfunction and LUTS were evaluated and compared between the groups using chi-squared tests and t-tests. Also, logistic regression was performed.

**Results:** A total of 352 male patients participated in this case-control study, and each group included 176 patients. Erectile dysfunction occurred in 109 patients (61.9%) in the case group vs. 63 (35.7%) in the control group ( $P < 0.001$ ). The mean IIEF-5 score was  $17.03 \pm 7.33$  in the case group vs.  $20.56 \pm 6.51$  in the control group ( $P = 0.003$ ). Ninety-five patients (54.0%) in the case group complained of LUTS, vs. 51 (29.0%) in the control group ( $P < 0.001$ ). The mean IPSS score was  $7.70 \pm 9.28$  in the case group and  $3.74 \pm 3.74$  in the control group ( $P < 0.001$ ).

**Conclusion:** Erectile dysfunction, LUTS, and CAD share common risk factors and are highly prevalent among the aging male population. As the extent of CAD increases, the prevalence and severity of erectile dysfunction and LUTS increase. We highly recommend that men older than 40 who complain of erectile dysfunction and LUTS be evaluated for CAD.

## 1. Background

Erectile dysfunction is the inability to initiate or maintain a sustained erection sufficient for complete penetration. The prevalence of erectile dysfunction varies between 5 –

20%, and this wide range is explained by different erectile dysfunction definitions, population age distributions, concomitant comorbid diseases, and cultural differences (1). Proposed etiologies of erectile dysfunction include psychogenic, neurogenic, vasculogenic, iatrogenic, and endocrinologic etiologies; in some patients, the etiology is multifactorial (2). Vasculogenic erectile dysfunction is the

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most common cause of organic erectile dysfunction, caused by endothelial dysfunction in the early stage of the disease and vascular obstruction in the late stage (3).

Benign prostatic hyperplasia (BPH) is one of the most common diseases affecting the male population. BPH is a histologic disease and its prevalence increases with aging and reaches 50% between 50 to 60 years of age and 70% by age 70 (4, 5). Lower urinary tract symptoms (LUTS) are the consequences of various disorders that affect the storage and emptying phases of the urinary bladder. LUTS can occur following prostate enlargement and bladder outlet obstruction in males with BPH (6) and are classified as obstructive or irritative voiding symptoms.

Different studies have shown that erectile dysfunction and coronary artery disease (CAD) share common risk factors, including metabolic syndrome (MetS) (6-8). Vascular damage, chronic ischemia, inflammation, and MetS have been proposed as risk factors for BPH and subsequent LUTS (9, 10). Atherosclerosis, inflammation, and endothelial dysfunction with decreased nitric oxide synthase activity cause a pathophysiological cascade that underlies CAD, erectile dysfunction, and LUTS.

Although the association between CAD, erectile dysfunction, and LUTS has been established, limited studies have evaluated the severity of erectile dysfunction and LUTS in patients with different extents of CAD.

## 2. Objectives

In this study, we compared the prevalence and severity of erectile dysfunction and LUTS in patients with and without significant CAD.

## 3. Patients and Methods

This case-control study involved patients undergoing coronary artery angiography at Kowsar hospital in Shiraz, Iran, between January 2019 and January 2020. This study was approved by the Institutional Review Board of Shiraz University of Medical Sciences (IR.SUMS.MED.REC.1395.S201), and written informed consent was taken from all participants.

Male patients over 40 years of age with cardiac symptoms (chronic stable angina or unstable angina) who were evaluated in the cardiology clinic and were candidates for coronary angiography were considered our study participants. The case group included 176 patients with a significant coronary lesion involving more than 70% of the artery lumen diameter on coronary arteriography, selected through consecutive convenient non-probability sampling. The control group included patients with insignificant lesions involving less than 70% of the diameter. Both groups were matched according to age, body mass index (BMI), and blood sugar levels. Coexistent diseases that might interfere with erectile function and voiding patterns were considered as exclusion criteria; patients with diabetes mellitus, hypothyroidism, androgen deficiency, neurologic diseases, history of prostate or bladder cancer, urinary tract infection (UTI), history of pelvic fracture or pelvic surgery, Peyronie's disease, renal failure, or liver failure were excluded from the study.

All participants were asked to fill out the International

Prostate Symptom Score (IPSS) questionnaire, which evaluates the severity of LUTS, and the International Index of Erectile Function-5 (IIEF-5) questionnaire, which evaluates the severity of erectile dysfunction. The validity and reliability of the questionnaires were proven in previous studies (11-15). Erectile dysfunction was defined as the inability to initiate or maintain a sustained erection for complete penetration. Five questions in the IIEF-5 investigated the domains of erectile function; the severity is classified as severe with a score of 1 – 7, moderate 8 – 11, mild to moderate 12 – 16, mild 17 – 21, and none 22 – 25. LUTS was considered in the presence of irritative or obstructive voiding symptoms, as defined in the IPSS questionnaire. The severity of LUTS was classified using the seven-item IPSS questionnaire score as mild (0 – 7), moderate (8 – 19), or severe (20 – 35).

The IPSS and IIEF scores were compared between the case and control groups. Data analysis was performed using SPSS for windows version 21. Descriptive statistics for variables with normal distribution were shown as mean  $\pm$  standard deviation (SD) and categorical variables as the number of cases and percentage (%). The chi-squared test was used to analyze qualitative variables, and the student t-test was used to analyze quantitative variables.

## 4. Results

After applying exclusion criteria, 352 male patients aged 40 and above participated in the study, with 176 patients allocated to each of the case and control groups. The mean age was 58.50 years in the case and 57.31 years in the control group ( $P > 0.05$ ).

According to the IIEF-5 questionnaire, 109 patients (61.9%) in the case group had erectile dysfunction, while in the control group, 63 patients (35.7%) had erectile dysfunction ( $P < 0.001$ ). The chance of erectile dysfunction was 1.714 times more in patients with significant CAD than those with non-significant CAD (OR = 1.714; CI = 1.367 – 2.150) (Table 1).

According to the IPSS questionnaire, 95 patients (54.0%) in the case group complained of LUTS, vs. 51 patients (29.0%) in the control group ( $P < 0.001$ ). The chance of developing LUTS was 1.737 times more in patients with significant CAD than those with non-significant CAD (OR = 1.73; CI = 1.357 – 2.224) (Table 1).

The mean IPSS score was  $7.70 \pm 9.28$  in the case group and  $3.74 \pm 3.74$  in the control group, and the difference was statistically significant ( $P < 0.001$ ). The mean IIEF-5 score was  $17.03 \pm 7.33$  in the case group and  $20.56 \pm 6.51$  in the control group ( $P = 0.003$ ) (Table 2).

Of 352 participants, 146 (41.5%) had LUTS, and 206 patients (58.5%) lacked LUTS, according to the IPSS questionnaire. Among those with LUTS, 127 patients (72%) had erectile dysfunction, but of those without LUTS, 45 patients (25%) had erectile dysfunction ( $P < 0.001$ ). The frequency of erectile dysfunction was 1.85 times more in those who complained of LUTS (OR = 1.86; CI = 1.42 – 2.43).

Of 172 patients with erectile dysfunction, 127 (73.8%) had LUTS, but of 180 patients without erectile dysfunction, only 19 (10.0%) had LUTS ( $P < 0.001$ ). The frequency of LUTS was 6.00 times more in those who complained of erectile

**Table 1.** Prevalence of Erectile Dysfunction and Lower Urinary Tract Symptoms in the Case and Control Groups

Variable	Coronary Artery Disease		Odds Ratio	Confidence Interval	P-value
	Yes	No			
Erectile dysfunction			1.714	1.367 – 2.150	< 0.001
Yes	109 (62%)	63 (36%)			
No	67 (38%)	113 (64%)			
Lower urinary tract symptoms			1.737	1.357 – 2.224	< 0.001
Yes	95 (54%)	51 (29%)			
No	81 (46%)	125 (71%)			

**Table 2.** The Severity of Erectile Dysfunction and Lower Urinary Tract Symptoms in the Case and Control Groups

		Significant Coronary	Insignificant Coronary	P-value
		Artery Disease	Artery Disease	
Erectile dysfunction	IIEF-5 score, mean ± SD	17.03 ± 7.33	20.56 ± 6.51	< 0.001
	Severe	26 (15%)	12 (7%)	< 0.001
	Moderate	27 (15%)	18 (10%)	
	Mild to moderate	35 (20%)	16 (9%)	
	Mild	21 (12%)	17 (10%)	
	None	67 (38%)	113 (64%)	
Lower urinary tract symptoms	IPSS score, mean ± SD	7.70 ± 9.28	3.74 ± 7.06	< 0.001
	Severe	25 (14%)	9 (5%)	< 0.001
	Moderate	42 (24%)	28 (16%)	
	Mild	28 (16%)	14 (8%)	
	None	81 (46%)	125 (71%)	

Abbreviations: IIEF, International Index of Erectile Function-5; IPSS, International Prostate Symptom Score

dysfunction (OR = 6.00; CI = 3.94 – 9.19).

## 5. Discussion

This study aimed to draw attention to the prevalence and severity of erectile dysfunction and LUTS in patients with and without significant CAD. The prevalence of erectile dysfunction and LUTS were significantly higher in the case group, which had significant lesions involving more than 70% of the diameter of the coronary arteries. The severity of erectile dysfunction and LUTS was also significantly greater in the case group.

Erectile dysfunction, LUTS, and CAD share common risk factors and are highly prevalent among the aging male population. Our results align with previous studies indicating that the prevalence of erectile dysfunction is high (16, 17). Studies have shown that erectile dysfunction and CAD share common risk factors including age, hypertension, insulin resistance, smoking, elevated body mass index (BMI), and hyperlipidemia (18). Low-grade systemic inflammation in patients with metabolic syndrome can induce endothelial dysfunction and prothrombin activation, leading to CAD and vasculogenic erectile dysfunction (19). The cultural and socioeconomic variables that affect the self-report of erectile dysfunction as well as the coexistent comorbidities like diabetes mellitus, hypothyroidism, neurologic and cardiovascular disorders are the main cause for the wide range of erectile dysfunction prevalence rates reported worldwide.

Erectile dysfunction, LUTS/BPH, and CAD are consequents of the aging male population, and their prevalence increases as the man ages (20). These disorders can negatively affect quality of life, while CAD can also threaten the patient's life. Diagnosing and treating

these disorders impose a heavy economic burden on the healthcare system. The adverse effects of these disorders on personal and social lives and their costly management highlight the necessity of conducting thorough research on their epidemiology and pathophysiology (21).

In this study, we evaluated two groups of male patients older than 40 years of age who had significant or insignificant CAD on coronary arteriography and compared the prevalence of erectile dysfunction and LUTS in the mentioned groups using valid questionnaires. Regardless of having significant or insignificant CAD, we also compared the rate of erectile dysfunction in those who had LUTS to those who did not mention LUTS according to the IPSS questionnaire. The prevalence of erectile dysfunction was significantly higher in patients suffering from LUTS, and the frequency of erectile dysfunction was 1.85 times more in those who complained of LUTS than those who lacked LUTS.

Our data support the results of previous studies on higher erectile dysfunction and BPH/LUTS rates in patients with significant CAD. Since we excluded other risk factors for erectile dysfunction and LUTS like neurogenic bladder, bladder stone, UTI, urethral stricture, penile plaques, hypothyroidism, and hypogonadism, the most probable etiology that comes to mind is the vascular compromise.

A recent cross-sectional study on LUTS in Japanese men showed that moderate to severe LUTS were significantly associated with CAD and stroke (22). The results of our study are compatible with Tanaka et al.'s findings, as patients with significant CAD had significantly higher IPSS scores than patients with insignificant CAD. Our study's mean IIEF score in patients with significant CAD was 17.03—significantly lower than in patients with insignificant CAD.



This aligns with the study of Al-Daydamony et al., who showed that patients with an IIEF score of less than 17 had a significantly higher prevalence of left main or three-vessel disease (23). These findings indicate that patients with severe LUTS or erectile dysfunction are at higher risk of developing significant ischemic heart disease.

The arteries that supply the myocardium, penis, and prostate have a relatively similar lumen diameter and are categorized as medium-sized vessels, and the systemic inflammation that causes atherosclerosis may happen simultaneously in the mentioned arteries. This vascular compromise and other risk factors explain this high association between erectile dysfunction and LUTS in patients who have significant CAD.

A limitation of this study was that our study population was taken from different socioeconomic classes of the community with a wide age range and also different cultures; therefore, their understanding of sexual relationships and erectile function would be different, which might have caused a bias in filling the IIEF forms by the participants. Also, the patients suffering from chronic LUTS might have gotten used to the symptoms and had not considered their symptoms abnormal, which might have caused a bias while filling the IPSS forms, resulting in lower IPSS cores.

### 5.1. Conclusion

Erectile dysfunction, LUTS, and CAD share common risk factors and are highly prevalent among the aging male population. As the extent of CAD increases, the prevalence and severity of erectile dysfunction and LUTS increase and vice versa. Erectile dysfunction and LUTS in aging males can be a clue for the evaluation of CAD, leading to a sooner diagnosis of ischemic heart disease and reducing subsequent morbidity and mortality.

### 5.2. Ethical Considerations

This study was approved by the Institutional Review Board of Shiraz University of Medical Sciences (IR.SUMS.MED.REC.1395.S201).

### 5.3. Informed Consent

Informed consents were obtained from all the patients

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There is no acknowledgement.

### Authors' Contribution

RM: Study design and conception, data acquisition and analysis, and manuscript drafting and revision. HN: Study design and conception, data interpretation, and manuscript revision. MY: Study design, data interpretation, and manuscript revision. SS: Study design, data analysis, and manuscript revision.

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