MÆDICA - a Journal of Clinical Medicine

ORIGINAL PAPER

MAEDICA – a Journal of Clinical Medicine
2026; 21(2): 382-386
https://doi.org/10.26574/maedica.2026.21.2.382

Comorbidities of Diabetes, Hypertension and Cardiovascular Disease and Their Contribution to Erectile Dysfunction Severity in a Lebanese Sample

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ABSTRACT

Background: *Erectile dysfunction (ED) is a common complication of metabolic and vascular diseases, but data from Lebanon remain scarce. Given the high prevalence of diabetes, hypertension and cardiovascular disease (CVD) in the region, understanding their influence on ED severity is clinically important.*

Methods: *A cross-sectional observational study was conducted at Saint George Hospital University Medical Center (SGHUMC), Lebanon. Data were retrospectively collected from 300 male patients aged ≥18 years at risk of metabolic or cardiovascular comorbidities. Erectile dysfunction severity was assessed using the erectile function (EF) domain of the International Index of Erectile Function (IIEF). Chi-square tests, Spearman correlations, Kruskal-Wallis tests and ordinal logistic regression were applied.*

Results: *The mean age was 62.1 years and the mean body mass index (BMI) 28.3. The mean IIEF-EF score was 14.8 (SD = 6.03). Moderate and severe ED were present in 36.0% and 20.3% of participants, respectively. Ordinal logistic regression identified diabetes (OR = 2.78, 95% CI 1.76–4.40, p < 0.001), hypertension (OR = 1.96, 95% CI 1.28–2.99, p = 0.002) and CVD (OR = 2.10, 95% CI 1.35–3.26, p=0.001) as significant independent predictors of ED severity. Comorbidity burden was inversely correlated with IIEF-EF score (rs = −0.319, p < 0.001). Age showed only a borderline association and BMI was not independently significant.*

Conclusions: *Diabetes, hypertension and CVD are significant independent contributors to ED severity in Lebanese men, underscoring the need for integrated comorbidity screening and a multidisciplinary management approach.*

Keywords: erectile dysfunction, diabetes mellitus, hypertension, cardiovascular disease, IIEF, Lebanon, comorbidity burden.

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Article receieved on the 12th of May 2026 and accepted for publication on the 8th of June 2026

INTRODUCTION

Erectile dysfunction (ED) is defined as the consistent or recurrent inability to attain or sustain a penile erection of sufficient quality and duration to permit satisfactory sexual intercourse (1). It is estimated that 34.8% of men aged 40 to 70-year experience moderate to severe ED, a burden directly related to age, health conditions and psychological status (2). In the United States, approximately 18 million men suffer from ED, with a crude prevalence of 51.3% among men with diabetes (3). In the Middle East, the overall prevalence of ED is approximately 45.1%, yet epidemiological studies from Lebanon remain limited (4). Beyond the physical dimension, ED imposes significant psychological challenges on affected individuals and their partners, including frustration, self-doubt and reduced intimacy (5).

Diabetes mellitus, hypertension and atherosclerosis predispose to ED through several pathophysiological mechanisms. Atherosclerotic stenosis reduces corporal arterial perfusion; vasculogenic ED in animal models has been attributed to decreased iliac blood flow and impaired corporal veno-occlusion (6, 7). These changes reduce nitric oxide synthase (NOS) activity and increase thromboxane and prostaglandin formation, impairing cavernosal smooth muscle relaxation (8). Hypertension augments superoxide production and blunts endothelium-dependent relaxation (9). In diabetes, reduced insulin availability decreases L-arginine transport and NOS activity; moreover, overexpression of arginase II competes with NOS for the shared substrate L-arginine (10).

Research on ED in Lebanon is limited by cultural taboos, restricted public health campaigns, narrow clinical databases and competing health priorities. Nevertheless, Lebanon presents a uniquely relevant context for studying ED, given its high tobacco use, rising prevalence of diabetes mellitus, diverse dietary habits, variable alcohol consumption across religious communities and the compounding psychosocial impact of ongoing economic and security crises on mental health.

This study aims to (1) determine the prevalence and severity of ED in a Lebanese sample at risk of metabolic and cardiovascular comorbidities; (2) quantify the independent contributions of diabetes, hypertension and CVD to ED severity through multivariate analysis; and (3) provide a foundation for future public health research and multidisciplinary management strategies in Lebanon. ❑

METHODS

Study design

This cross-sectional, observational study explored the relationship between ED severity and comorbid diseases – diabetes mellitus, hypertension and CVD – in Lebanese men. Data were retrospectively collected from two men's health campaigns held at Saint George Hospital University Medical Center (SGHUMC), Beirut, Lebanon.

Participants

The study population comprised Lebanese men aged 18 years and older who were considered at risk of metabolic or cardiovascular comorbidities. Exclusion criteria included untreated mental illness, recent surgical procedures that could impact sexual performance and severe or unrelated comorbid conditions liable to confound study outcomes.

Variables and data collection

The primary outcome, ED severity, was assessed using the erectile function (EF) domain of the International Index of Erectile Function (IIEF) questionnaire (11). The IIEF-EF domain comprises six items yielding a total score of 0–30, categorized as: severe ED (0–10), moderate ED (11–16), mild ED (17–21) and normal erectile function (>21). Independent variables included age, body mass index (BMI) and the presence of diabetes mellitus, hypertension and CVD. Comorbidity data were retrieved from patients' medical records; BMI and smoking status were obtained through structured clinical documentation review.

Statistical analysis

Descriptive statistics summarized demographic and clinical characteristics. Spearman rank correlations evaluated associations between continuous variables (age, BMI) and IIEF-EF scores. Chi-square tests examined associations between individual comorbidities and ED severity categories. A Kruskal-Wallis test compared IIEF-EF scores across severity groups. Comorbidity burden (0–3 comorbidities) was analyzed against ED severity using chi-square and Spearman correlation.

Ordinal logistic regression identified independent predictors of ED severity, with age, BMI, diabetes, hypertension and CVD entered simultaneously. Results are reported as odds ratios (ORs) with 95% confidence intervals (CIs). Statistical significance was set at $p < 0.05$. ❑

RESULTS

The study included 300 participants, with a mean age of 62.1 years (range 52–75) and a mean BMI of 28.3 (range 20.7–41.0). The mean IIEF-EF domain score was 14.8 (SD = 6.03), indicating a high prevalence of ED across the sample.

Regarding ED severity distribution, 61 participants (20.3%) had severe ED, 108 (36.0%) moderate ED, 86 (28.7%) mild ED and 45 (15.0%) normal erectile function (Table 1).

Chi-square analysis revealed significant associations between diabetes and ED severity ($\chi^2 = 17.18$, $p < 0.001$) and between CVD and ED severity ($\chi^2 = 8.02$, $p = 0.046$). Hypertension showed a borderline univariate association ($\chi^2 = 7.34$, $p = 0.062$) but emerged as a significant independent predictor on ordinal logistic regression (OR = 1.96, $p = 0.002$), underscoring the value of multivariate adjustment. Table 2 presents comorbidity-specific ED severity distributions.

Spearman correlation analysis showed that diabetes ($rs = -0.227$, $p < 0.001$), CVD ($rs = -0.154$, $p = 0.008$) and hypertension ($rs = -0.137$, $p = 0.017$) were all significantly inversely correlated with IIEF-EF score. Age ($rs = -0.090$, $p = 0.121$) and BMI ($rs = -0.065$, $p = 0.265$) did not reach statistical significance. Kruskal-Wallis analysis confirmed significant differences in IIEF-EF scores across ED severity groups ($H = 275.33$, $p < 0.001$), with median scores of 23.0 (normal), 19.0 (mild), 13.0 (moderate) and 6.0 (severe).

A clear dose-response relationship was observed between comorbidity burden and ED severity ($\chi^2 = 36.10$, $p < 0.001$). Patients with no comorbidities (n = 55) had a median IIEF-EF score of 18.0, compared with 16.0 for one comorbidity (n = 133), 12.0 for two comorbidities (n = 101), and 10.0 for three comorbidities (n = 11). Comorbidity burden was inversely correlated with IIEF-EF score ($rs = -0.319$, $p < 0.001$) (Table 3).

Ordinal logistic regression identified diabetes (OR = 2.78, 95% CI 1.76–4.40, $p < 0.001$), hypertension (OR = 1.96, 95% CI 1.28–2.99, $p = 0.002$) and CVD (OR = 2.10, 95% CI 1.35–3.26, $p = 0.001$) as significant independent predictors of ED severity after controlling for all other variables. Age showed a borderline trend (OR = 1.04, 95% CI 1.00–1.08, $p = 0.060$), while

TABLE 1. Participant distribution by ED severity (N = 300)

ED severity	n (%)
Severe ED (IIEF-EF 0–10)	61 (20.3%)
Moderate ED (IIEF-EF 11–16)	108 (36.0%)
Mild ED (IIEF-EF 17–21)	86 (28.7%)
Normal (IIEF-EF >21)	45 (15.0%)

ED: erectile dysfunction; IIEF: International Index of Erectile Function; IIEF-EF: International Index of Erectile Function-Erectile Function

Comorbidity	Mild ED (n)	Moderate ED (n)	Severe ED (n)	Normal (n)	χ^2 (p-value)
Diabetes mellitus	19	38	31	9	17.18 (<0.001)
Hypertension	41	57	42	22	7.34 (0.062)
Cardiovascular disease	28	42	29	10	8.02 (0.046)

TABLE 2. Comorbidity distribution across ED severity categories

ED: erectile dysfunction;

Comorbidity burden	n (%)	Median IIEF-EF score	Predominant ED severity
0 Comorbidities	55 (18.3%)	18.0	Mild
1 Comorbidity	133 (44.3%)	16.0	Mild–moderate
2 Comorbidities	101 (33.7%)	12.0	Moderate
3 Comorbidities	11 (3.7%)	10.0	Moderate–severe

TABLE 3. Comorbidity burden and median IIEF-EF domain score

$\chi^2 = 36.10$, df = 9, $p < 0.001$; burden *vs.* IIEF-EF: $rs = -0.319$, $p < 0.001$.
ED: erectile dysfunction; IIEF-EF: International Index of Erectile Function-Erectile Function

TABLE 4. Ordinal logistic regression – independent predictors of erectile dysfunction severity

Variable	OR	95% CI	p-value
Age (*per* year)	1.04	1.00–1.08	0.060
BMI (*per* unit)	1.02	0.97–1.08	0.354
Diabetes mellitus	2.78	1.76–4.40	<0.001
Hypertension	1.96	1.28–2.99	0.002
Cardiovascular disease	2.10	1.35–3.26	0.001

OR: odds ratio; CI: confidence interval;
BMI: body mass index. Reference: normal erectile function
Adjusted for all variables.

BMI was not independently associated (OR = 1.02, 95% CI 0.97–1.08, p = 0.354) (Table 4). ❑

DISCUSSION

This study provides robust evidence that diabetes mellitus, hypertension, and CVD are each independently and significantly associated with increased ED severity in Lebanese men. Hypertension emerged as a significant independent predictor on ordinal logistic regression (OR = 1.96, 95% CI 1.28–2.99, p = 0.002), despite a borderline chi-square at the univariate level (χ^2 = 7.34, p = 0.062). This discrepancy highlights the confounding influence of co-occurring comorbidities and underscores the indispensability of multivariate adjustment.

Diabetes mellitus demonstrated the strongest association with ED severity: among diabetic patients, 31 presented with severe ED, 38 with moderate ED, 19 with mild ED and only nine subjects maintained normal erectile function (χ^2 = 17.18, p < 0.001; OR = 2.78, 95% CI 1.76–4.40). These findings reaffirm the primacy of metabolic disease as a contributor to sexual dysfunction (12).

Cardiovascular disease also emerged as a significant independent predictor (OR = 2.10, 95% CI 1.35–3.26, p = 0.001), which was consistent with the well-established pathophysiology of atherosclerotic vascular disease impairing corporal arterial perfusion. This finding reinforces the recommendation for routine cardiovascular risk assessment in men presenting with ED.

While age and BMI are frequently cited as ED risk factors (12, 13), neither reached independent significance in the multivariate model. The borderline association of age suggests its effect may be partially mediated through comorbidities such as diabetes and hypertension rather than acting as a direct independent contributor. The observed mean BMI of 28.3 and mean age of 62.1 are consistent with demographic profiles reported in comparable studies.

These findings emphasize the necessity of a holistic approach in ED management. Routine screening for diabetes, hypertension and CVD should be integrated into urology practice, particularly in populations with high comorbidity burdens such as Lebanon. The psychological impact of ED – including reduced self-esteem, relationship difficulties, and diminished quality of life – also warrants attention through a multidisciplinary framework involving endocrinologists, cardiologists, urologists and mental health professionals.

Limitations of the study

Several limitations should be acknowledged. The sample was drawn from a single clinical setting and is of moderate size (N = 300), which may limit generalizability to the broader Lebanese population. Reliance on medical records increases the risk of information bias. The cross-sectional design precludes causal inference. Finally, the OR for CVD (2.10), while statistically significant, may partly reflect a relatively small CVD-specific subgroup; future studies with larger CVD cohorts are warranted. ❑

CONCLUSION

This study supports the substantial and independent contributions of diabetes mellitus, hypertension, and cardiovascular disease to ED severity in Lebanese men. The significant dose-response relationship between comorbidity burden and IIEF-EF scores, confirmed by ordinal logistic regression, underscores the need for integrated comorbidity screening and a multidisciplinary management approach in affected patients. These findings provide a foundation for targeted public health research and clinical practice improvements in the Lebanese context. ❑

Conflicts of interest: none declared.
Financial support: none declared.
Ethics approval and consent to participate: This study utilized anonymized, retrospective

data collected from medical records at SGHUMC. Permission to use these data for research purposes was granted by the medical center. All procedures adhered to the ethical standards of the Declaration of Helsinki. Patient confidentiality was strictly maintained.

Availability of data and materials: The data supporting the findings of this study are available upon reasonable request from the corresponding author.

Authors' contributions: Imad Ghantous – conceptualization, supervision, data provision, manuscript writing and revision; George Maroun – data collection, manuscript review and editing; Hady Kassem – literature review writing, manuscript editing; Alfadel Dib – data collection, discussion editing; Joe Abou Jaoude, Imad El Sayad and Bachar Sleiman – data collection and manuscript review; George Kary – results and discussion writing and editing; Georges Ghantous – data collection and literature review writing; Mohamad Tlais – first draft, second draft editing, data analysis and corresponding author.

Acknowledgments: The authors extend special thanks to Saint George Hospital University Medical Center for providing the data and their continued support, and to Saint George University of Beirut for their ongoing support.

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