

The Relationship between Erectile Dysfunction and Lower Urinary Tract Symptoms in Subjects with Moderate-to-Severe Symptoms as Predictive Signs of Benign Prostatic Hyperplasia

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Abstract

Background: In the current work, a specific cohort of benign prostatic hyperplasia (BPH) cases with symptoms of moderate-to-severe BPH who were scheduled for either an open or transurethral prostatectomy were examined for associations between lower urinary tract symptoms (LUTS), various diagnostic factors of erectile dysfunction (ED), and BPH. **Materials and Methods:** The study was performed at Al-Ramadi Teaching Hospital between 2021 and 2023 and involved a total of 453 patients. Using recognized symptom-scoring approaches, LUTS and ED were assessed. All patients had their postvoid residual urine volumes (PVRU) and maximum and typical urine flow rates were measured. Ultrasonography was used to determine the prostate volumes. **Results:** Age-related increases in the incidence of ED and LUTS were significant ($P < 0.001$). The results indicated that the frequency of ED was 36% in males who experienced mild LUTS and 94% in cases who suffered severe LUTS. There was an odds ratio of 28.7 for ED in males with severe LUTS. LUTS represents a substantial risk factor for ED regardless of age, according to an analysis of age, "International Prostate Symptom Score," and "International Index of Erectile Function" (IIEF) scores ($P < 0.001$). The average urine flow rate and the maximum urine flow rate were found to positively correlate ($P < 0.001$) with IIEF scores ($r = 0.441$, and $r = 0.326$), respectively. On the contrary, there was a strong negative association ($P < 0.001$) found between IIEF scores and PVRU ($r = -0.486$) and prostate volume ($r = -0.299$). **Conclusion:** Symptoms of LUT, specifically severe form, are considered an independent risk factor for ED. It is essential to evaluate ED patients preoperatively to avoid misdiagnosing postoperative ED as a preexisting problem.

Keywords: Benign prostatic hyperplasia, erectile dysfunction, lower urinary tract, LUTI, urine flow rate

INTRODUCTION

A significant number of problems that affect older male's quality of life are erectile dysfunction (ED)^[1] and lower urinary tract symptoms (LUTS) brought on by benign prostatic hyperplasia (BPH).^[2-4] As they age, 75% of all males experience obstructive urinary symptoms, and over 50% of males over 40 years suffer from ED.^[4,5]

In addition to the well-known reasons for ED, which include age, coronary heart disease, diabetes, dyslipidemia, smoking,^[6] and medicines, the prevalence of ED has been related to the existence and severity of LUTS.^[3-5,7,8] Only 24.8% of males who had no LUTS reported having ED in the Multinational Survey of

the Aging Male (MSAM-7) study, according to current research, whereas around 43% of men with mild, 65.8% with moderate, and 82.5% with severe LUTS, reported having erection issues.^[3]

Males with LUTS also assert that their sexual abilities are undesirably impacted by their urine manifestations.^[9]

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However, these cross-sectional studies have restrictions in assessing the etiology of the illness, for instance not being able to establish whether LUTS triggers ED or whether a third aspect causes both. The consensus is that LUT remains a risk factor for aging men's ED rather than the opposite.^[3,7,9]

The current investigation evaluated the association between LUTS, BPH diagnostic markers (urine flow rate, post-voiding residual urinary volume, and the prostatic volume indicated by sonography), and ED in a preselected subset of males with moderate-to-severe manifestations who were scheduled for open or transurethral prostatectomy.

MATERIALS AND METHODS

Patients and study design

Males with moderate-to-severe LUT associated with BPH who underwent open or transurethral prostatectomy between 2022 and 2024 were counted in this study. Surgery was necessary for every patient with intractable urinary retention, recurring urinary tract infections, frequent hematuria, kidney impairment from BPH, manifestations that were not treated by medication, or in cases with medical therapy failure.

Subjects with a history of prostate malignancy, those who had undergone prior prostatic surgery, and cases who had been using indwelling urine catheters for more than 4 weeks were not included in this study. The "International Prostate Symptom Score" (IPSS) and the "International Index of Erectile Function" (IIEF), which have been culturally and linguistically validated, were utilized to assess the frequency and severity of LUTS and ED.^[10-12]

IIEF's Erectile Function Domain (IIEF-EF domain) consists of six specific questions (1–5 and 15):

- What is the frequency of your erections?
- How frequently are erections sufficiently strong to penetrate?
- How frequently can you get through?
- How often after penetration were you able to maintain an erection?
- How challenging is it to maintain an erection throughout sexual activity?
- How confident are you that you can get and maintain an erection?

By asking these questions, it is possible to determine whether or not a man has ED and, if so, to what degree. A score of 26–30 is considered to indicate "no ED," a score of 17–25 indicates "mild ED," a score of 11–16 indicates "moderate ED," and a score of 6–10 indicates "severe ED."^[13] The IIEF-EF/C26 is one of six questions in the IIEF-EF domain, which is used to classify the severity of ED and to simplify the interpretation of erectile function.^[14]

Using uroflowmetry, the same technician in our clinic determined each patient's average urine flow rate (Q_{ave}) and maximum urine flow rate (Q_{max}). Bladder scan devices were then used to determine the post-voiding residual urinary volume (PVRU). The radiologist performed ultrasonography in our clinic to determine the prostate volumes of each patient.

Two groups of LUTS were identified: moderate (that revealed IPSS of 8–19) and severe (that revealed IPSS ≥ 20). The study grouped ED patients into four groups: none (IIEF scores between 26 and 30), mild ED (IIEF scores between 17 and 25), moderate ED (between 11 and 16 IIEF scores), and severe ED (11 or below IIEF scores). By age decade, the patients were split into four groups: over 80, 70–79, 60–69, and 50–59 years.

Statistical analysis

Spearman's correlation coefficient, Chi-square analyses, and Mann–Whitney *U* test, in addition to logistic regression analysis, were employed as needed. A significance level of 0.01 was used. Statistical Package for Social Sciences software for Windows, version 27 (SPSS Inc., Chicago, IL, USA) was used for statistical investigations.

Ethical approval

The study was conducted following the ethical principles originating from the Declaration of Helsinki. The study protocol, the subject information, and the consent form were reviewed and approved by a local ethics committee according to document number 412 on January 11, 2024.

RESULTS

Overall, 453 male cases were participating in the present study. The average age was 66.5 years with a range of 50–89 years. There were 102 (23%), 159 (35%), 174 (38%), and 18 (4%), in the age groups of 50–59, 60–69, 70–79, and above 80 years, respectively. Of the total included patients, 124 (27%) and 329 (73%), respectively, had moderate or severe LUTS. It was found that IPSS increased as the years went by $P < 0.001$ [Figure 1].

Based on the previously mentioned classification of ED, 154 patients (34%) had severe form, 86 patients (19%) had mild form, and 99 patients (21.9%) had no dysfunction at all. When the ages and the IIEF score were compared in people with moderate and severe LUTS, there was an additional significant ($P < 0.001$) correlation [Figure 2]; whereas Table 1 displays the distribution of sexual dysfunction based on the severity of symptoms.

ED was described by 36% of males with moderate type of LUTS and 94% of those with severe form of LUTS ($P < 0.001$). When comparing LUTS results between males with and without dysfunction, there was a

statistically substantial difference ($P < 0.001$) in IIEF scoring and IPSS.

To inspect the age-dependent relationship between the IIEF and the IPSS, the logistic regression study was employed. Those with severe urinary symptoms (IPSS = 20–35) had a 28.7-fold higher likelihood ($P < 0.001$) of having ED compared to those with moderate symptoms (IPSS = 12–19). Age, ED, and LUTS are associated, as seen in Figure 3.

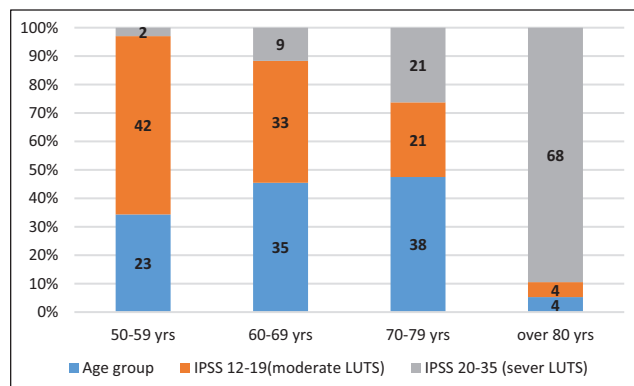


Figure 1: International Prostate Symptom Score of the studied patients according to their age classes

Data on BPH, ED, and LUTS diagnostic markers for the participating groups are shown in Table 2. The mean age was 58 years for males without ED and 68 years for those with ED. Individuals with ED showed a mean IPSS of 26.5, which was greater than 17.7 for those without ED. The average IIEF score for those without ED was 27.9, whereas those with ED had a lower mean score of 11.9. Compared to individuals without ED (52.9 mL), those with ED had a mean prostate volume of 69.3 mL. Q_{\max} was lesser in ED participants (8.5 mL/s) than in non-ED participants (12.3 mL/s). A comparable pattern was also seen in Q_{ave} , where individuals with ED had lower scores. The mean PVRU volume of participants with ED was higher—210 mL—than the mean PVRU volume of participants without ED (85.3 mL).

The association between the ED and urine flow rate is shown in Table 3, in which the males were classified based on the cut-off value of the Q_{\max} . On the other hand, males with ED were shown to have lower urine flow rates, larger prostates, and postvoid residual pee amounts. Patients with and without ED showed significant variations ($P < 0.001$) in prostatic volume, Q_{ave} , Q_{\max} , and PVRU when comparing diagnostic indicator data.

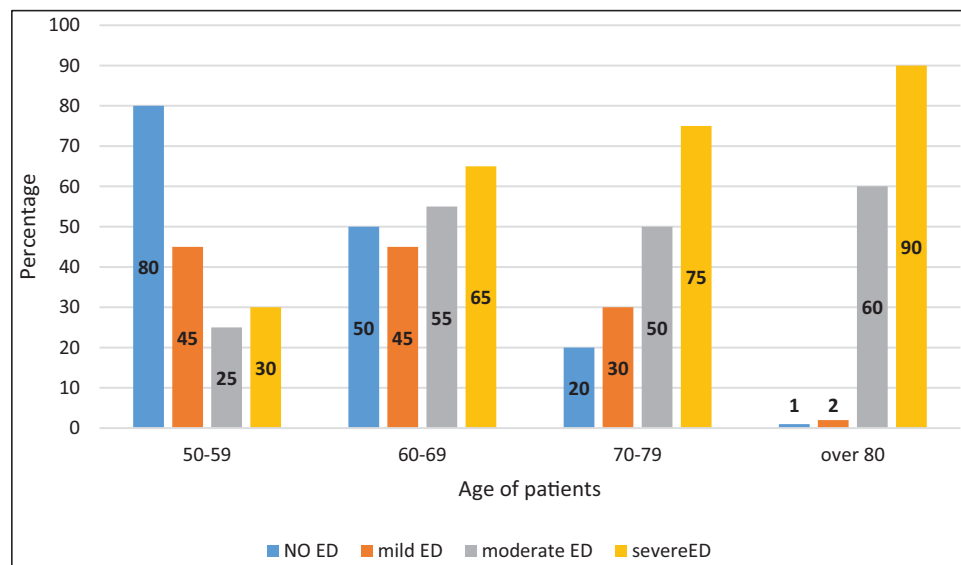


Figure 2: Distribution of the International Index of Erectile Function according to the ages of the studied participants

Table 1: The distribution of the severity of erectile dysfunction in male patients with moderate-to-severe lower urinary tract symptoms

IIEF	Severity of LUTS	Mild ED	Moderate ED	Severe ED	No ED	P value
LUTS no. (%)	Severe IPSS (20–35)	64 (19.5)	104 (31.5)	14 (42.9)	20 (6.7)	<0.001
	Moderate IPSS (12–19)	22 (17.1)	10 (8.1)	13 (10.5)	79 (63.1)	

ED: erectile dysfunction, IIEF: International Index of Erectile Function, LUTS: lower urinary tract symptoms, IPSS: International Prostate Symptom Score

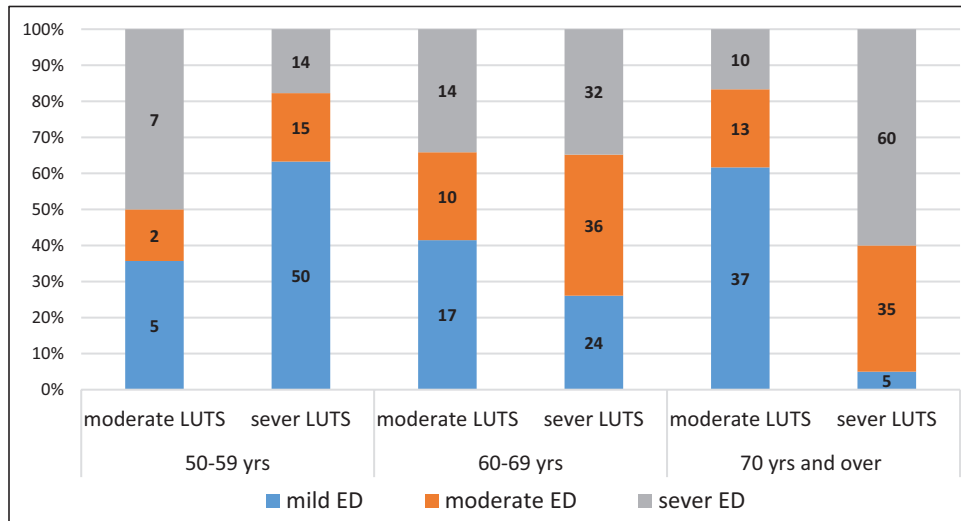


Figure 3: The age-independent relationship between the International Prostate Symptom Score and the International Index of Erectile Function

Table 2: Age and diagnostic indicator of lower urinary tract symptoms, erectile dysfunction, and benign prostatic hypertrophy of the participants

Variables (M ± SD)	No ED (IIEF-EF/C26)	ED (IIEF-EF/C26)
Age (years)	58 (50–78) ± 6.9	68 (50–89) ± 7.8
IPSS	17.7 (12–30) ± 3.9	26.5 (12–35) ± 5.5
IIEF-EF	27.9 (26–30) ± 1.3	11.9 (1–25) ± 6.9
Q_{max} (mL/s)	12.3 (3.8–20) ± 3.6	8.5 (2.2–17) ± 2.6
Q_{ave} (mL/s)	5.6 (2–11) ± 2	4.1 (1–9) ± 1.6
Prostate volume (mL)	52.9 (15–111) ± 21.7	69.3 (17–182) ± 29.9
PVRU volume (mL)	85.3 (0–476) ± 94.6	210 (0–704) ± 135.3

SD: standard deviation, Q_{max} : maximum urine flow rate, Q_{ave} : average urine flow rate, PVRU: postvoid residual urine, ED: erectile dysfunction, IIEF: International Index of Erectile Function, LUTS: lower urinary tract symptoms, IPSS: International Prostate Symptom Score, IIEF-EF: International Index of Erectile Function-Erectile Function Domain Scores

Table 3: Association between erectile dysfunction and urinary flow rate among the subjects when grouped according to the cut-off value of maximum urine flow rate (Q_{max})

International Index of Erectile Function	Flow rates	Erectile dysfunction (ED)	No ED	P value
N (%)				
Q_{max} (mL/s)	>10	241 (89.3)	29 (10.7)	$P < 0.001$
	<10	113 (61.7)	70 (38.3)	

Table 4 presents correlations between different variables [International Index of Erectile Function (IIEF), IPSS, Q_{max} , prostate volume, and PVRU volume] along with their corresponding correlation coefficients^[13] and *P* value. IPSS exhibits a moderately strong negative correlation with IIEF. Q_{max} demonstrates a moderate negative correlation with IIEF. The prostate volume shows a weaker negative correlation with IIEF. PVRU volume displays a moderate negative correlation with IIEF.

Table 4: Correlations between different study variables [International Index of Erectile Function (IIEF), International Prostate Symptom Score (IPSS), maximum urine flow rate (Q_{max}), prostate volume, and postvoid residual urine (PVRU) volume]

Variables	Correlations	IIEF
IIEF	<i>r</i>	–
	<i>P</i> value	–
Prostate volume (mL)	<i>r</i>	–0.299
	<i>P</i> value	0.001
PVRU volume (mL)	<i>r</i>	–0.486
	<i>P</i> value	0.001
IPSS	<i>r</i>	–0.621
	<i>P</i> value	0.001
Q_{max} (mL/s)	<i>r</i>	–0.441
	<i>P</i> value	0.001

DISCUSSION

Males in their later years are especially susceptible to BPH and ED. Researchers investigated the severity of these two disorders in this study, which were diagnosed using objective diagnosis and commonly used questionnaires. The indicators are then correlated with one another.

Previous research has shown a statistically significant link between ED and LUTS,^[3,7-9,15] which has led to an increased awareness of the connection between LUTS and sexual ability.^[16] Age was significantly correlated in our study with the IIEF scores used to identify ED as well as the IPSS-measured severity of LUTS, as has been shown in numerous other studies.^[3,7-9,15]

Nonetheless, the primary finding of this investigation was the independent association between LUTS, as defined by IPSS, and ED. A small number of researchers^[3,17] investigated whether adjusting for these variables

eliminates the correlation between ED and LUTS and whether they were effective in adjusting for age and additional morbidities in community studies. The aging process or additional prevalent risk factors, including diabetes mellitus^[18] or coronary heart disease,^[19] may be to blame for this link.

The current study showed that the relationship between LUTS and ED persisted in each instance, especially regarding the non-age-related link between LUTS and ED. Higher IPSS scores were observed in patients with more severe cases of ED. Matsuda *et al.* found that the only sub-score associated with ED was the obstructive sub-score, not the irritative sub-score.^[12] The irritative and obstructive components of the IPSS were not distinguished in our study.

Much research has demonstrated an association between ED and LUTS; however, these have mostly used questionnaires and symptomatology scoring. Only a little investigation has been done on the relationship between various prognostic markers of urinary obstruction, such as prostate volume, ED, Q_{max} , and PVUV. They revealed that males with LUTS had a significantly higher odds ratio of getting ED compared with males without urinary signs in their analysis of a sample of men with LUTS.^[9]

Overall, it was found that while there was a link between LUTS and ED, there was none between urine flow rate and ED.

In another study, no link was found between the values of prostate volume, peak urine flow rate, and ED; however, the only component that was shown to be significantly correlated with these variables was age.^[20] Nonetheless, there is a strong inverse relationship between urine flow rate, the American Urological Association (AUA) symptom score index, and all five of the sexual function subscales that were looked at.^[21]

During the study, we found a positive correlation between urine flow rates and IIEF scores. Subsequent investigation showed that the postvoid residual urinary volume (PVRU), prostatic volume, and IIEF score were negatively correlated. Therefore, males with ED were revealed to have higher prostate sizes, lower Q_{max} , and greater PVRUs. Nevertheless, it is crucial to be aware that objective measurements of BPH typically do not correspond with the symptoms of LUT. Hence, urodynamic and/or transrectal ultrasound evaluations may also not be very likely to predict ED.^[21]

The two most recent instances of larger and well-designed studies with results published in the literature are the multi-center research on elderly males (MSAM-7),^[3,7] which involved over 10,000 people. The males who were enrolled in our experiment, notwithstanding the lower number of patients, were a carefully selected group of men

who were hospitalized for BPH surgery in a urology clinic and had moderate-to-severe LUTS. Since every patient was a candidate for surgery, we did not have a group of patients with “minimal” symptoms.

The question of whether LUTS and ED are causally related remains unanswered. Many males claim that LUTS have harmfully impacted their sexual lives. In the community and a clinic, they discovered that males with urinary incontinence or dysuria were more likely to experience ED and find it uncomfortable; additionally, they were more likely to attribute their ED's worsening to their LUT symptoms. Research on the medical management of both illnesses and the impact of each treatment modality on the comorbidity further supports the link between BPH and ED.^[9]

Sexual function scores and the baseline IPSS were considerably improved by sildenafil therapy.^[22] Although alpha-blockers are known to have a low incidence of sexual dysfunction as an adverse effect when taken to treat BPH, both more recent and older research indicate that alpha-blockers have a positive impact on sexual activity.^[21,22] An animal model provides more convincing evidence of a pathological connection of LUTS with ED. When the penis was removed 3–6 weeks later, ultra-structural analysis of the corpora cavernosa exposed higher collagen deposition, loss of endothelin-1 stains, and loss of smooth muscles, supporting a relation between LUTS and ED that was independent of age or other comorbidities. They had tied the rope to the proximal urethras of mature male rabbits to partially restrict the exit of the bladder.^[23]

It has been demonstrated that the majority of phosphodiesterase (PDE) enzymes found in different lower urinary tract locations belong to PDE families. PDE-5 inhibitors, such as tadalafil and sildenafil, have shown encouraging clinical results, suggesting they may benefit LUTS.^[24] Hopps and Mulhall examined the effect of sildenafil on LUTS among males who requested treatment for sexual dysfunction.^[25]

Males who were eligible for a PDE-5 inhibitor (sildenafil) and decided to take it answered both the IIEF and IPSS surveys. With sildenafil therapy, IPSS improved in 60% of the cases, and the researchers found that sildenafil is helpful for those with mild-to-moderate LUTS with ED. When PDE-5 inhibitors were studied for the treatment of LUTS in various randomized studies, comparable outcomes were seen.^[26]

Recently, Kaplan *et al.* published a finding of their pilot study to evaluate the efficacy and safety of sildenafil and the $\alpha 1$ -blocker alfuzosin in combination for the treatment of ED and LUTS.^[27] Alfuzosin, sildenafil, or a combination of the two medications were randomly allocated to treat 62 men with LUTS and ED who had not had prior treatment for 12 weeks. The men were 63.4 years old on average, with ages ranging from 50 to 76 years.

Effectiveness was evaluated by comparing variations at week 12 from baseline in the means of IPSS, maximum urinary flow rate, the IIEF's erectile function domain, and the amount of PVRU. For all three groups, but especially for the combined group, IPSS alterations maximal after 12 weeks IIEF, urine flow rate, nocturia, frequency, and nocturnal urination were statistically significant. Researchers found that using alpha 1-blockers and PDE-5 inhibitors to treat males with LUTS and ED was a safe and effective way to improve voiding and sexual function.

It has been thoroughly studied how different surgical BPH therapies affect sexual function, and it seems questionable how frequently ED recurrences.^[7] Even with its well-known side effects, TURP remains the most successful surgical technique for BPH. Several early studies estimated the prevalence of ED to be between 4% and 40%, although it has since been established that this estimate was inflated.^[28]

In the collaborative AUA research, the ED frequency was 13%.^[29] There was no change in the ED rate between the watchful waiting and TURP groups throughout the 3 years of follow-up. It is interesting that this study also revealed that the untreated group's potency decreased by 20% over 3 years.^[30]

Our findings that males with moderate or severe LUTS have decreasing IIEF scores with age are corroborated by these data. Consequently, it is crucial to evaluate the patient's erectile function before undergoing surgical BPH intervention; if this is not done, ED may be misdiagnosed as a postoperative issue that previously existed rather than a consequence of the procedure.

There are a couple more limitations to this study. First, we examined a group of people who were displaying a high number of symptoms. Our results do not apply to subjects suffering less severe LUTS. Second, the ejaculatory difficulties were not further explored in the remaining IIEF questionnaire items, and the obstructive and irritative components of LUTS were not differentiated. These might be the subject of further investigation to bolster the evidence already in existence.

CONCLUSION

The incidence of LUT symptoms, mainly in severe form, can be considered an independent risk factor for ED. To avoid the misconception that ED is a preoperative existent condition rather than a postoperative preexisting one, it may be beneficial to test ED before BPH surgery.

Author contributions

Each author contributed equally to the creation of this manuscript.

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Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Elterman DS, Bhattacharyya SK, Mafilios M, Woodward E, Nitschelm K, Burnett AL. The quality of life and economic burden of erectile dysfunction. *Res Rep Urol* 2021;13:79-86.
2. Miernik A, Gratzke C. Current treatment for benign prostatic hyperplasia. *Dtsch Arztebl Int* 2020;117:843-54.
3. Calogero AE, Burgio G, Condorelli RA, Cannarella R, La Vignera S. Epidemiology and risk factors of lower urinary tract symptoms/benign prostatic hyperplasia and erectile dysfunction. *Aging Male* 2019;22:12-9.
4. Pellegrino F, Sjoberg DD, Tin AL, Benfante NE, Briganti A, Montorsi F, *et al.* Relationship between age, comorbidity, and the prevalence of erectile dysfunction. *Eur Urol Focus* 2023;9:162-7.
5. Miernik A, Roehrborn CG. Benign prostatic hyperplasia treatment on its way to precision medicine: Dream or reality? *Eur Urol Focus* 2022;8:363-4.
6. Khalid, AMM, Musa, DH, Mohammed, SA. Laparoscopic cholecystectomy as a day-case surgery in Azadi Teaching Hospital, Duhok. *Med J Babylon* 2023;20:531-5.
7. Song G, Wang M, Chen B, Long G, Li H, Li R, *et al.* Lower urinary tract symptoms and sexual dysfunction in male: A systematic review and meta-analysis. *Front Med (Lausanne)* 2021;8:653510.
8. Kessler A, Sollie S, Challacombe B, Briggs K, Van Hemelrijck M. The global prevalence of erectile dysfunction: A review. *BJU Int* 2019;124:587-99.
9. De Nunzio C, Roehrborn CG, Andersson KE, McVary KT. Erectile dysfunction and lower urinary tract symptoms. *Eur Urol Focus* 2017;3:352-63.
10. Barry MJ, Fowler FJ, Jr, O'Leary MP, Bruskewitz RC, Holtgrewe HL, Mebust WK, *et al.*; Measurement Committee of the American Urological Association. The American urological association symptom index for benign prostatic hyperplasia. *J Urol* 2017;197:S189-97.
11. Zhang X, Yang B, Li N, Li H. Prevalence and risk factors for erectile dysfunction in Chinese adult males. *J Sex Med* 2017;14:1201-8.
12. Matsuda Y, Kobayashi K, Fukuta F, Takayanagi A, Hashimoto K, Tanaka T, *et al.* Which happens earlier, lower urinary tract symptoms or erectile dysfunction? *Sex Med* 2021;9:100275.
13. Chung HS, Kim GH, Shin M-H, Park K. Physical intimacy is an important part of sexual activities: Korean older adults study. *Sex Med* 2020;8:643-9.
14. Grover S, Shouan, A. Assessment scales for sexual disorders—A review. *J Psychosexual Health* 2020;2:121-38.
15. Liao L, Chuang YC, Liu SP, Lee KS, Yoo TK, Chu R, *et al.* Effect of lower urinary tract symptoms on the quality of life and sexual function of males in China, Taiwan, and South Korea: Subgroup analysis of a cross-sectional, population-based study. *Low Urin Tract Symptoms* 2019;11:O78-84.
16. Al-Bdairi AH, Al-Shalah MAN. Preoperative measures of serum Inhibin B, and FSH levels predict sperms retrieval outcome in non-obstructive azoospermic males. *Clin Schizophrenia Related Psychoses* 2021;15:1-5.
17. Calzo JP, Austin SB, Charlton BM, Missmer SA, Kathrins M, Gaskins AJ, *et al.* Erectile dysfunction in a sample of sexually active young adult men from a U.S. cohort: Demographic, metabolic and mental health Correlates. *J Urol* 2021;205:539-44.
18. Al-Joda BMS, Al-Hindy HA-AM, Mousa MJ. Exploring the role of vitamin D2, parathyroid hormone, and c-peptides as biomarkers in diabetic neuropathy development. *Med J Babylon* 2024;21:438-43.
19. Al-Bdairi AH, Alkhudair SH, Alkadhim KH. Serum and seminal plasma concentrations of inhibin B and FSH: A case-control comparison study between fertile and infertile males. *Hist Med* 2023;8:22-8.
20. Qalawena MM, Al-Shatouri MA, Motawaa MA, El-Sakka AI. Association between prostate zonal volume and erectile

- dysfunction in patients with benign prostatic hyperplasia. *Sex Med* 2020;8:205-13.
21. Cho A, Chughtai B, Te AE. Benign prostatic hyperplasia and male lower urinary tract symptoms: Epidemiology and risk factors. *Curr Bladder Dysfunct Rep* 2020;15:60-5.
22. Liao CH, Kuo HC. Current consensus and controversy on the treatment of male lower urinary tract symptoms/benign prostatic hyperplasia. *Tzu Chi Med J* 2017;29:1-5.
23. Hiramatsu I, Tsujimura A, Soejima M, Yoshiyama A, Nagashima Y, Ishikawa K, *et al.* Tadalafil is sufficiently effective for severe chronic prostatitis/chronic pelvic pain syndrome in patients with benign prostatic hyperplasia. *Int J Urol* 2020;27:53-7.
24. Choi HK, Maity M, Qureshi M, Haider A, Kapadia S, Fuente S, *et al.* Multifaceted impact of the coronavirus disease 2019 (COVID-19) pandemic on ST-elevation myocardial infarction (STEMI): A literature review of incidence, treatment modalities, and outcomes. *Cureus* 2024;16:e57288.
25. Aizawa N, Fujita T. Inhibitory effects of vibegron, a $\beta(3)$ -adrenoceptor agonist, on the myogenic contractile and mechanosensitive afferent activities in an obstructed rat bladder. *Eur J Pharmacol* 2022;933:175272.
26. Goldstein I, Burnett AL, Rosen RC, Park PW, Stecher VJ. The serendipitous story of sildenafil: An unexpected oral therapy for erectile dysfunction. *Sex Med Rev* 2019;7:115-28.
27. Kim DJ, Hawksworth DJ, Hurwitz LM, Cullen J, Rosner IL, Lue TF, *et al.* A prospective, randomized, placebo-controlled trial of on-Demand vs. nightly sildenafil citrate as assessed by Rigiscan and the international index of erectile function. *Andrology* 2016;4:27-32.
28. Kallidonis P, Adamou C, Kotsiris D, Ntasiotis P, Verze P, Athanasopoulos A; Young Academic Urologists of the European Association of Urology-Endourology Working Party. Combination therapy with alpha-blocker and phosphodiesterase-5 inhibitor for improving lower urinary tract symptoms and erectile dysfunction in comparison with monotherapy: A systematic review and meta-analysis. *Eur Urol Focus* 2020;6:537-58.
29. Kedia GT, Ückert S, Tsikas D, Becker AJ, Kuczyk MA, Bannowsky A. The use of vasoactive drugs in the treatment of male erectile dysfunction: Current concepts. *J Clin Med* 2020;9:2987.
30. Dornbier R, Pahouja G, Branch J, McVary KT. The new American Urological Association benign prostatic hyperplasia clinical guidelines: 2019 update. *Curr Urol Rep* 2020;21:32.