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ORIGINAL RESEARCH

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Analysis of frailty status and associated factors in elderly patients with benign prostatic hyperplasia

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Abstract

Background: To explore the current status of frailty in elderly patients with benign prostatic hyperplasia (BPH) and analyze the influencing factors. **Methods**: This study used a cross-sectional design, in which we selected 220 inpatients aged >60 years who were admitted to the Departments of Geriatrics and Urology and diagnosed with BPH. Participants were categorized into a non-frail (normal) group (n = 83) and a frail group (n = 137) according to the Tilburg Frailty Indicator (TFI). General characteristics were collected, and the Mini Nutritional Assessment-Short Form (MNA-SF), Montreal Cognitive Assessment (MoCA), and a reverse questionnaire survey were administered. Univariate analysis, correlation analysis, and binary logistic regression were conducted to identify factors associated with frailty in elderly BPH patients. **Results**: Univariate analysis showed that the main factors influencing frailty in elderly BPH patients were age, International Prostate Symptom Score (IPSS), disease duration, alcohol consumption, body mass index (BMI), personal monthly income, number of chronic diseases, MNA-SF score, and MoCA score (all $p < 0.05$). The total TFI score was negatively correlated with both MNA-SF ($r = -0.297$) and MoCA ($r = -0.209$), and these correlations were statistically significant ($p < 0.05$). In the binary logistic regression analysis, IPSS score, disease duration, alcohol consumption, number of chronic diseases, and MNA-SF score emerged as the main factors associated with frailty ($p < 0.05$). **Conclusions**: Older adults with BPH often have a long disease course, may consume alcohol, and frequently present with multiple chronic conditions. For them, higher IPSS scores and lower MNA-SF scores are associated with a greater likelihood of frailty, indicating that nutritional status and symptom burden warrant particular attention. Thus, targeted assessment and interventions could be implemented to reduce frailty risk in this population.

Keywords

Benign prostatic hyperplasia; Frailty influencing factors; Elderly patients

1. Introduction

Benign Prostatic Hyperplasia (BPH) is a common urological disease among middle-aged and elderly men. It is mainly caused by the benign proliferation of prostate tissue, leading to an increase in prostate volume and subsequent urethral compression, thereby producing a series of lower urinary tract symptoms. The incidence of BPH gradually increases with age [1]. Frequent urination, urgency, and urinary incontinence are the most common symptoms, with nocturia being particularly prominent. In the early stages, patients may need to wake 1–2 times per night; however, as the condition progresses, nocturia may increase to 3–5 times or even more. This pattern is largely attributable to bladder outlet obstruction caused by prostate enlargement, reduced effective bladder capacity, and instability of the detrusor muscle. Frequent nocturia severely disrupts sleep, and long-term sleep deprivation can cause physical fatigue and mental sluggishness, ultimately affecting normal metabolism and physiological functions and increasing the risk of frailty [2].

Severe BPH may lead to urinary retention, where urine cannot be normally excreted. On one hand, the continuous increase in bladder pressure may cause hydronephrosis in the upper urinary tract and impair renal function. Once renal function is affected, metabolic waste cannot be excreted effectively, toxins accumulate, and various organ systems may be compromised, resulting in physical weakness. On the other hand, long-term urinary retention predisposes patients to urinary tract infections. Inflammatory stimulation places the body in a state of stress, consumes large amounts of energy, and impairs immune function, thereby making patients more prone to frailty [3]. Elderly BPH patients with frailty often have reduced liver and kidney function and a decreased ability to metabolize and excrete drugs. During pharmacological

treatment for BPH, they may, therefore, experience adverse reactions more readily. For example, 5α-reductase inhibitors may lead to decreased libido and erectile dysfunction. Since frail elderly patients have weaker physical and psychological tolerance, such adverse reactions may have a more substantial impact on their quality of life and functional status, further aggravating frailty [4].

In addition, elderly BPH patients with frailty have poorer tolerance to surgery and anesthesia, and are more prone to postoperative complications, including postoperative mortality. As frailty is a dynamic process that is reversible and preventable, and early interventions such as exercise and nutritional support have been shown to effectively reverse or mitigate frailty status [5]; therefore, early identification of frailty in elderly BPH patients, clarification of its influencing factors, and timely intervention are crucial for improving adverse outcomes, enhancing overall quality of life, and potentially prolonging life expectancy.

2. Materials and methods

2.1 General information

A cross-sectional study was adopted to select elderly patients with BPH who were hospitalized in the Department of Geriatrics and Urology of our hospital from January to December 2023 as the research subjects. The study included cases who: ① met the diagnostic criteria for BPH as stipulated in the "Chinese Guidelines for the Diagnosis and Treatment of Urological and Andrological Diseases" (2022 Edition); ② were aged $\geq$60 years old; ③ had certain expression abilities; and ④ provided informed consent (patients and their families). Exclusion criteria were: ① diagnosed with prostate cancer; ② complicated by cognitive dysfunction; and ③ complicated by other types of malignant tumors or organ dysfunction. This study was approved by the hospital's ethics committee.

2.2 Methods

2.2.1 Research methods

This study employed a cross-sectional design. All patients underwent systematic physical examinations, routine blood biochemical tests, and imaging examinations. The research questionnaire was independently completed by the researchers. Before the survey, the specific content and purpose of this questionnaire survey were explained to the patients and their family members, and their consent was obtained before distributing the questionnaire for one-on-one investigation. The elderly BPH patients filled out the questionnaire themselves. After completing the questionnaire, the patients would confirm it. For individual items with doubts, the researchers provided timely clarification, and the questionnaire was promptly collected on-site after completion. The formula for calculating the sample size is as follows. This sample represents a population from a single center (Eqn. 1).

$$n \geq \frac{8\left(1 - R^2_{full}\right)}{R^2_{full}} \cdot \frac{\sigma^2_Y}{\delta^2} \tag{1}$$

2.2.2 Research tools

(1) General Information Questionnaire. Based on the objectives of this study, a general information questionnaire was independently developed through a literature review and expert consultation. It included age, disease duration, marital status, medical insurance status, alcohol consumption, smoking status, body mass index (BMI), personal monthly income, educational level, prostate volume, presence of urinary retention, presence of an indwelling urinary catheter, number of chronic diseases, serum albumin, and other variables.

(2) Tilburg Frailty Indicator (TFI). The TFI comprises three dimensions with a total score of 15 points. A score of $\geq$5 indicates frailty, and higher scores indicate greater frailty severity [6]. The scale was administered by trained personnel, and Cronbach's α was 0.665.

(3) International Prostate Symptom Score (IPSS). The IPSS includes seven items with a total score of 35 points. Scores of 1–7 indicate mild symptoms, 8–19 indicate moderate symptoms, and 20–35 indicate severe symptoms; higher scores reflect more severe lower urinary tract symptoms [7]. The scale was administered by trained personnel, and Cronbach's α was 0.712.

(4) Mini Nutritional Assessment-Short Form (MNA-SF). The MNA-SF contains six items and is used to assess nutritional status, with a total score of 14 points. Scores of 12–14 indicate normal nutritional status, 8–11 indicate risk of malnutrition, and 0–7 indicate malnutrition [8]. The scale was administered by trained personnel, and Cronbach's α was 0.810.

(5) Montreal Cognitive Assessment (MoCA). The MoCA covers eight cognitive domains with a total score of 30 points; higher scores indicate better cognitive function. A total score of $\geq$26 indicates normal cognition, whereas a score of $<$26 suggests cognitive impairment. As educational level may influence performance, one additional point was added for participants with $<$12 years of education following the scale instructions [9]. The scale was administered by trained personnel, and Cronbach's α was 0.732.

2.3 Statistical methods

Data were analyzed using the SPSS 22.0 software (IBM, Armonk, NY, USA). Outliers were excluded, and missing values were imputed using median imputation. Normally distributed continuous variables are presented as mean $\pm$ standard deviation ($\bar{x} \pm s$) and compared using Student's *t*-test. Categorical variables are presented as frequencies and percentages and compared using the χ^2 test. Variables that were significant in univariate analyses were entered into a binary logistic regression model to identify factors associated with frailty in older patients with BPH. The assumptions for logistic regression were assessed. Where multiple group comparisons were performed, the least significant difference (LSD) method was used for *post-hoc* comparisons. Non-normally distributed continuous variables were analyzed using non-parametric tests. For continuous predictors exhibiting a non-linear relationship with the dependent variable, a non-linear modeling approach was applied to improve model fit. Multivariable regression analyses were conducted to control for potential confounding

factors. Missing data were considered missing at random; therefore, median imputation was used to preserve the distributional characteristics of the dataset and to avoid loss of sample size due to case-wise deletion. A p-value of < 0.05 was considered statistically significant.

3. Results

3.1 Demographic characteristics

This study included 220 older patients with BPH, all of whom completed the questionnaire. The mean age was 69.40 ± 7.59 years, and the mean IPSS was 27.05 ± 5.12.

3.2 TFI scores in patients with BPH

Among the 220 patients, the mean total Tilburg Frailty Indicator (TFI) score was 6.73 ± 4.18. Overall, 62.27% (137/220) met the frailty criterion, and frailty severity varied across individuals. Scores in the physical and psychological frailty domains were relatively high. 23.64% of the patients had poor health conditions, 30.45% had difficulty in moving, 7.27% experienced a decline in grip strength, 10.45% felt tired easily, 75.91% were unable to maintain balance, 39.55% had hearing problems, and 36.82% had vision problems. Most elderly patients reported memory decline, which affected their daily lives to varying degrees. A few elderly patients felt depressed or anxious in their daily lives. 40.45% of the patients lacked social support (Table 1).

3.3 Univariate analysis of factors affecting patient frailty

Univariate analysis showed that age, IPSS score, disease duration, alcohol consumption, BMI, personal monthly income, number of chronic diseases, MNA-SF score, and MoCA score were the main factors associated with frailty in elderly patients with BPH, and were statistically different between the frail and non-frail groups ($p < 0.05$), as shown in Table 2.

3.4 Correlation analysis of factors associated with frailty in elderly BPH patients

The total TFI score in elderly BPH patients was negatively correlated with the MNA-SF score ($r = -0.297$) and was also negatively correlated with the MoCA score ($r = -0.209$). Both correlations were statistically significant ($p < 0.05$), as shown in Table 3.

3.5 Logistic regression analysis of factors associated with frailty in elderly patients with BPH

Frailty status was used as the dependent variable (1 = frail, 0 = non-frail), and potential influencing factors were used as independent variables. After the univariate analysis, variables with statistical significance were entered into a binary logistic regression model. The results showed that IPSS score, disease duration, alcohol consumption, number of chronic diseases, and MNA-SF score were the main factors associated with frailty ($p < 0.05$), whereas the other variables were not significantly associated with frailty ($p > 0.05$), as shown in Table 4.

TABLE 1. Analysis of TFI scale scores for BPH patients.

Variables	True	False
Physical weakness (range: 0–8 points)		
Poor physical condition	52 (23.64)	168 (76.36)
Natural weight loss	67 (30.45)	153 (69.55)
Difficulty in walking	54 (24.55)	166 (75.45)
Decline in grip strength	16 (7.27)	204 (92.73)
Tired easily	23 (10.45)	197 (89.55)
Can maintain balance	53 (24.09)	167 (75.91)
Existence of hearing problems	87 (39.55)	133 (60.45)
Existence of vision problems	81 (36.82)	139 (63.18)
Psychological weakness (range: 0–4 points)		
Existence of memory problems	109 (49.55)	111 (50.45)
Whether feeling depressed recently	58 (26.36)	162 (73.64)
Whether feeling tense and anxious recently	66 (30.00)	154 (70.00)
Whether able to cope well with encountered problems	82 (37.27)	138 (62.73)
Social weakness (range: 0–3 points)		
Whether living alone	79 (35.91)	141 (64.09)
Social relationships	21 (9.55)	199 (90.45)
Social support	131 (59.55)	89 (40.45)

TABLE 2. Univariate analysis of factors affecting frailty in patients with BPH.

Variables	Category	n	Normal Group (n = 83)	Weakness Group (n = 137)	χ^2/t	p
Age (yr)			66.73 ± 7.28	71.01 ± 7.34	17.684	<0.001
IPSS score (points)			25.43 ± 5.72	28.04 ± 4.46	14.277	<0.001
Duration (yr)			1.41 ± 0.26	2.42 ± 1.06	72.500	<0.001
Marital status (cases)						
	With partner	214	81	133	0.050	0.823
	Without partner	6	2	4		
Medical insurance						
	Yes	209	79	130	0.009	0.924
	No	11	4	7		
Alcohol consumption (cases)						
	Yes	59	15	55	19.192	<0.001
	No	161	68	82		
Smoking (cases)						
	Yes	89	17	72	24.310	<0.001
	No	131	66	65		
BMI (kg/m^2)			23.26 ± 4.02	24.75 ± 3.82	7.497	0.007
Personal monthly income (yuan)						
	≤3000	90	54	36	37.324	<0.001
	>3000	130	29	101		
Educational level (cases)						
	Illiterate	31	11	20	0.077	0.782
	Non-literate	189	82	107		
Prostate volume (mm^3)			103.87 ± 36.31	110.16 ± 34.68	1.637	0.202
Urinary retention (cases)						
	Yes	116	45	71	0.118	0.732
	No	104	38	66		
Indwelling urinary catheter (cases)						
	Yes	108	43	65	0.391	0.533
	No	112	40	72		
Number of chronic diseases			1.58 ± 0.61	3.10 ± 0.84	206.337	<0.001
Serum albumin (g/L)			61.32 ± 7.61	60.10 ± 8.68	1.113	0.293
MNA-SF (points)			11.36 ± 1.53	9.45 ± 3.00	29.197	<0.001
MoCA (points)			21.41 ± 4.60	19.19 ± 4.26	13.216	<0.001

IPSS: International Prostate Symptom Score; BMI: body mass index; MNA-SF: Mini Nutritional Assessment-Short Form; MoCA: Montreal Cognitive Assessment.

TABLE 3. Correlation analysis of TFI scores with MNA-SF and MoCA in patients with BPH (r).

Item	TFI	MNA-SF	MoCA
TFI	1.000		
MNA-SF	−0.297**	1.000	
MoCA	−0.209**	0.052	1.000

***, $p < 0.01$, two-tailed. TFI: Tilburg Frailty Indicator; MNA-SF: Mini Nutritional Assessment-Short Form; MoCA: Montreal Cognitive Assessment.*

TABLE 4. Logistic regression analysis of factors associated with frailty in elderly patients with benign prostatic hyperplasia.

Item	B	SE	Wald χ^2	p	Exp(B)	95% CI
Age	0.069	0.053	1.672	0.196	1.071	0.965–1.188
IPSS score	0.161	0.070	5.209	0.022	1.174	1.023–1.348
Duration	3.171	0.855	13.749	<0.001	23.825	4.458–127.324
BMI	0.063	0.094	0.447	0.504	1.065	0.886–1.280
Alcohol consumption	2.183	1.099	3.945	0.047	8.876	1.029–76.531
Smoking	1.294	0.827	2.446	0.118	3.646	0.721–18.44
Personal monthly income	−1.299	0.776	2.802	0.094	0.273	0.060–1.249
Number of chronic diseases	3.183	0.607	27.498	<0.001	24.119	7.340–79.258
MNA-SF	−0.465	0.155	8.967	0.003	0.628	0.463–0.852
MoCA	−0.121	0.082	2.168	0.141	0.886	0.753–1.041

IPSS: International Prostate Symptom Score; BMI: body mass index; MNA-SF: Mini Nutritional Assessment-Short Form; MoCA: Montreal Cognitive Assessment; B: Regression Coefficient; SE: Standard Error; Wald χ^2: Wald Chi-square; Exp(B): Exponentiated coefficient; CI: Confidence Interval.

4. Discussion

In elderly patients with benign prostatic hyperplasia (BPH), frailty not only involves a decline in physical function, but also interacts with various factors such as disease-related symptoms and psychological status. Studies have shown that the incidence of frailty in elderly BPH patients is relatively high. Mildly frail patients may exhibit only some symptoms of frailty, such as a slight reduction in physical activity or a mild sense of fatigue, but their daily lives are generally not severely restricted. Moderately frail patients may have physical function and quality of life affected to some extent and may experience aggravated urinary-related symptoms, along with decreased grip strength and slower walking speed [10]. Severely frail patients face a higher risk of adverse health events, such as falls, hospitalizations, and disability, and may require more medical care and support. Frail patients have poor reserve capacity and reduced tolerance to BPH treatment. For example, during surgical treatment, the incidence of postoperative complications is higher in frail patients, and recovery time is prolonged, which may affect treatment outcomes and prognosis [11]. Moreover, frailty may also lead to decreased compliance with drug treatment, thereby further affecting disease control.

In this study, the univariate analysis showed that frailty in elderly patients with BPH was significantly associated with age, IPSS score, disease duration, alcohol consumption, BMI, personal monthly income, number of chronic diseases, MNA-SF score, and MoCA score ($p < 0.05$). After these statistically significant variables were entered into a binary logistic regression model, IPSS score, disease duration, alcohol consumption, number of chronic diseases, and MNA-SF score remained independently associated with frailty ($p < 0.05$).

From a mechanistic perspective, lower urinary tract obstruction caused by BPH increases bladder outlet resistance, requiring the detrusor muscle to generate higher contractile force to overcome the obstruction. Persistent excessive detrusor activity may lead to detrusor hypertrophy and, over time, to impaired detrusor function [12]. As IPSS scores increase, the severity and persistence of lower urinary tract symptoms may be accompanied by repeated or chronic inflammatory stimulation of the urinary system and, in some patients, secondary renal functional impairment. These pathophysiological changes can disrupt systemic metabolic balance and internal environment stability, thereby leading to a decline in physiological functions and an increased risk of frailty. In addition, elderly patients with BPH may restrict their water intake to reduce urinary frequency and nocturia, which can increase the risk of dehydration and adversely affect nutrient transport and metabolism. For patients with higher IPSS scores, symptoms tend to be more severe, and dehydration and malnutrition may, therefore, be more prominent, preventing the body from obtaining sufficient energy and nutritional supply and contributing to reductions in muscle mass and strength, which are key features associated with frailty. Moreover, patients with an IPSS score >7 have a risk of acute urinary retention that is approximately four times that of patients with a score ≤7. Obstruction-related poor urine drainage can also facilitate bacterial proliferation and contribute to chronic inflammation of the urinary system. With increasing IPSS scores, the degree of obstruction may be more severe, and the inflammatory response may be more pronounced [13]. Circulating inflammatory factors can cause systemic inflammation, damage vascular endothelial cells and muscle cells, impair tissue function, and thereby promote the development of frailty. A prolonged disease course further increases the likelihood of BPH-related complications, including hematuria, urinary tract infection, bladder stones, and renal function impairment. Hematuria may contribute to anemia, which can manifest as fatigue, reduced exercise tolerance, and activity limitation [14]. At the same time, chronic symptom burden and concerns about treatment effectiveness and declining quality of life may predispose patients to negative emotions such as anxiety and depression. These psychological problems may in turn impair sleep quality, reduce appetite, and decrease engagement in daily activities, forming a self-

reinforcing cycle that accelerates functional decline and frailty progression. For example, depressive symptoms may reduce motivation to participate in rehabilitation or physical activity, further worsening physical function and aggravating frailty. Therefore, the IPSS score itself is not a direct cause of frailty; rather, the higher symptom severity reflected by an elevated IPSS score may indirectly contribute to frailty through multiple pathways, including disturbed sleep, reduced activity capacity, compromised nutritional intake, increased inflammatory burden, and adverse psychological states [15].

Once alcohol enters the human body, most of it is metabolized in the liver. Long-term alcohol consumption can interfere with the liver's metabolism and storage of various nutrients, such as vitamins and proteins. For elderly patients with BPH, they may already have varying degrees of nutrient absorption disorders. Vitamin B1 deficiency caused by alcohol can affect energy metabolism in the nervous system, damage nerve cell function, and lead to abnormal nerve conduction. Protein metabolism disorders can affect muscle synthesis and repair, weaken muscle strength, and increase the risk of frailty [16]. At the same time, alcohol has a vasodilatory effect, causing the blood vessels of prostatic tissue to dilate and become congested. For elderly patients with BPH, the prostate has already undergone hyperplasia and enlargement, and congestion may further aggravate urethral compression, leading to worsened voiding difficulty. Frequent and strenuous voiding consumes substantial physical energy, and over time, this may cause patients to become gradually weakened and increase the likelihood of frailty.

For elderly patients with BPH, cardiovascular diseases can affect cardiac pumping function, resulting in poor systemic circulation. The kidneys, as important excretory and endocrine organs, may therefore have reduced blood perfusion [17]. The prostate in patients with BPH already has hyperplasia, and local blood flow may also be affected. When systemic circulation is impaired, prostatic tissue may not receive sufficient nutrient supply, cellular metabolism may become disordered, and normal prostatic function may be affected, thereby exacerbating BPH. In addition, cardiovascular diseases often require long-term drug treatment, and the adverse effects of some drugs may affect cognitive function and physical ability, indirectly promoting frailty. When elderly patients with BPH have diabetes, the hyperglycemic state can trigger a series of metabolic disorders. First, hyperglycemia can damage vascular endothelial cells, leading to local microvascular lesions in the prostate and affecting oxygen and nutrient delivery to prostatic tissue, thereby exacerbating prostatic hyperplasia. Second, diabetic peripheral neuropathy can affect the nerves controlling the bladder and urethra, resulting in detrusor dysfunction symptoms, such as voiding difficulty, and increased residual urine volume, which further aggravate lower urinary tract symptoms and affect quality of life. Long-term discomfort may cause patients to reduce physical activity and lose muscle mass, thereby leading to frailty. Different chronic diseases may affect frailty in elderly patients with BPH through distinct mechanisms; however, these mechanisms are not isolated but are interrelated and mutually reinforcing. For example, circulatory disorders and inflammatory states caused by cardiovascular disease may aggravate microvascular lesions and oxidative stress responses in patients with diabetes, and hypoxia caused by respiratory diseases may also affect cardiovascular function and increase cardiac burden. When multiple chronic diseases coexist, these interactions become more complex, causing more severe impairment of physical function in elderly patients with BPH and significantly increasing the risk of frailty.

The MNA-SF score provides a rapid assessment of nutritional status in older adults from aspects such as diet, weight, physical activity, and mental state [18]. The higher the score, the better the nutritional status. In elderly patients with BPH, good nutritional status helps maintain physiological functions and counteract the negative effects of the disease. Studies have shown that elderly patients with BPH with lower MNA-SF scores have a significantly higher incidence of frailty. This may be because poor nutritional status leads to insufficient energy reserves and reduced immune function, making patients less able to cope with the stress caused by BPH and, therefore, more likely to enter a frail state. A low MNA-SF score indicates that the patient may have malnutrition, with insufficient intake of proteins, vitamins, and minerals. Protein is an important substrate for muscle synthesis, and protein deficiency can lead to decreased muscle mass and strength, resulting in reduced activity endurance, which is an important manifestation of frailty [19]. For example, due to nutritional deficiency, patients may not be able to maintain normal muscle mass and may show difficulty in daily activities, such as walking and climbing stairs, gradually developing frailty.

Patients with BPH often experience sleep disorders due to voiding difficulty (*e.g.*, increased nocturia and increased residual urine volume), which may further inhibit growth hormone secretion and accelerate muscle loss [20]. Numerous studies have confirmed that the progression of diseases in elderly patients may increase the risk of sarcopenia. Conversely, sarcopenia can lead to weakened chewing muscle strength and reduced sensitivity of the swallowing reflex in the elderly. This increases the likelihood of chewing and swallowing difficulties, thereby restricting the dietary choices of the elderly. Over time, this may aggravate oral functional disorders, resulting in insufficient nutrient intake, prolonged meal times, and exacerbated eating discomfort [21]. Malnourished patients often have deficiencies of micronutrients such as vitamin D and zinc, which weaken immune function. Urinary tract obstruction caused by BPH is prone to be accompanied by urinary tract infection, and inflammatory mediators (such as Interleukin-6 and Tumor necrosis factor-α) increase, accelerating muscle protein breakdown [22]. At the same time, the chronic stress state caused by infection may lead to persistently elevated cortisol, further inhibiting protein synthesis. Clinical studies have shown that systemic inflammatory markers including C-reactive protein and pro-inflammatory cytokines (such as IL-6 and tumor necrosis factor-α) are closely associated with both lower urinary tract symptoms and metabolic abnormalities, reinforcing the link between chronic inflammation and disease progression in BPH patients [23]. At the same time, long-term malnutrition leads to insufficient renal perfusion, accelerating the progression of complications related to prostatic hyperplasia.

A decline in renal function can cause electrolyte imbalance,

directly leading to muscle weakness; at the same time, the accumulation of metabolic waste may further impair central nervous system function, which may manifest as cognitive decline. Studies have shown that for elderly patients with dementia or cognitive impairment, chronic fatigue syndrome and activities of daily living (ADL) are superior to high cellular fibrosis response (HFRS) in terms of 30-day and 90-day mortality rates [24]. Older patients with BPH often have multiple chronic diseases, such as hypertension and diabetes, and need to take multiple medications (such as α-receptor blockers and 5α-reductase inhibitors). Malnutrition may alter the pharmacokinetics of drugs. For example, hypoproteinemia may lead to an increase in the volume of drug distribution, and fluctuations in blood drug concentrations may cause adverse effects, further limiting activity. At the same time, certain drugs may aggravate electrolyte disorders, creating a synergistic deterioration with malnutrition.

The study has some limitations worth acknowledging. The direct inclusion of continuous variables in logistic regression, as discussed in this paper, has certain limitations that may compromise model accuracy, interpretability, and practical applicability. Logistic regression assumes a linear relationship between independent variables and the log-odds (logit). When the actual relationship is non-linear (*e.g.*, U-shaped or S-shaped), entering continuous variables directly may lead to model underfitting, and residual analysis may show systematic bias. Continuous variables may require larger sample sizes to stabilize parameter estimates; insufficient sample sizes may result in overfitting, thereby reducing generalizability. In addition, if continuous variables interact with other variables, univariate analysis may fail to capture important information.

5. Conclusions

In conclusion, elderly patients with benign prostatic hyperplasia are prone to frailty. In the present study, a shorter disease duration and fewer chronic diseases were associated with a lower likelihood of frailty: for each 1-year decrease in disease duration, the odds of frailty decreased by 85.5%, and for each one-condition decrease in the number of chronic diseases, the odds of frailty decreased by 60.7%. In addition, for each 1-point increase in IPSS score, the odds of frailty changed by 7.0%, and for each 1-point decrease in MNA-SF score, the odds of frailty changed by 15.5%. In clinical practice, for patients presenting with the above characteristics, targeted intervention measures should be implemented to delay or prevent frailty in elderly patients with benign prostatic hyperplasia.

AVAILABILITY OF DATA AND MATERIALS

The data that support the findings of this study are available from the corresponding author upon reasonable request.

AUTHOR CONTRIBUTIONS

QW, MYG, MNC, YSC—designed the study and carried them out; supervised the data collection. QW, HPH—prepared the manuscript for publication and reviewed the draft of the manuscript. All authors analyzed the data, interpreted the data. All authors have read and approved the manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical approval was obtained from the Ethics Committee of The Affiliated Hospital of Xuzhou Medical University (Approval no. XYFY2023-KL174-02). Written informed consent was obtained from a legally authorized representatives for anonymized patient information to be published in this article.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

[1] Chen Y, Li Y, Li L, Wang M, Lv Z, Liu S, *et al*. Global, regional, and national lifetime risks of developing benign prostatic hyperplasia in men aged over 40: a population-based cross-sectional study from 1990 to 2021. Tropical Medicine and Health. 2025; 53: 93.

[2] Duan D, Kim LJ, Jun JC, Polotsky VY. Connecting insufficient sleep and insomnia with metabolic dysfunction. Annals of the New York Academy of Sciences. 2023; 1519: 94–117.

[3] Hjelholt TJ, Lietzen LW, Kongensgaard R, Bech JK, Azuz S, Hjelholt AJ, *et al*. Optimizing prevention of recurrent urinary tract infections in older patients with frailty. Drugs Aging. 2025; 42: 807–820.

[4] Roehrborn CG, Marks LS, Fenter T, Freedman S, Tuttle J, Gittleman M, *et al*. Efficacy and safety of dutasteride in the four-year treatment of men with benign prostatic hyperplasia. Urology. 2004; 63: 709–715.

[5] Sobrinho ACDS, Da Silva Rodrigues G, Gomes GAO, Bueno Júnior CR. Movement-based interventions in pre-frail and frail older adults: an integrative review of clinical, digital, and implementation evidence. Clinical Interventions in Aging. 2026; 21: 235–255.

[6] Wang CC, Xie H, Cai WW. Analysis on the frailty of the elderly in community and its influencing factors. Chinese Journal of General Practice. 2021; 19: 625–627. (In Chinese)

[7] Wong CK, Choi EP, Chan SW, Tsu JH, Fan CW, Chu PS, *et al*. Use of the International Prostate Symptom Score (IPSS) in Chinese male patients with benign prostatic hyperplasia. The Aging Male. 2017; 20: 241–249.

[8] Rubenstein LZ, Harker JO, Salvá A, Guigoz Y, Vellas B. Screening for undernutrition in geriatric practice: developing the short-form mini-nutritional assessment (MNA-SF). The Journals of Gerontology: Series A. 2001; 56: M366–M372.

[9] Nasreddine ZS, Phillips NA, Bédirian V, Charbonneau S, Whitehead V, Collin I, *et al*. The Montreal Cognitive Assessment, MoCA: a brief screening tool for mild cognitive impairment. Journal of the American Geriatrics Society. 2005; 53: 695–699.

[10] Bauer SR, Parker-Autry C, Lu K, Cummings SR, Hepple RT, Scherzer R, *et al*. Skeletal muscle health, physical performance, and lower urinary tract symptoms in older adults: the study of muscle, mobility, and aging. The Journals of Gerontology: Series A. 2024; 79: glad218.

[11] Baug S, Beisland C, Moen CA, Odland P, Blomquist J, Juliebø-Jones P. Transurethral resection of the prostate in the extreme elderly ($\geq$ 85 years):

treatment success, morbidity and survival. World Journal of Urology. 2025; 43: 572.

[12] Kyoda Y, Shibamori K, Shindo T, Maehana T, Hashimoto K, Kobayashi K, *et al*. Intrinsic and extrinsic factors causing hyperplasia of the prostate. International Journal of Urology. 2024; 31: 705–717.

[13] McConnell JD, Roehrborn CG, Bautista OM, Andriole GL, Dixon CM, Kusek JW, *et al*. The long-term effect of doxazosin, finasteride, and combination therapy on the clinical progression of benign prostatic hyperplasia. The New England Journal of Medicine. 2003; 349: 2387–2398.

[14] Nik-Ahd F, Zhao S, Boscardin WJ, Wang L, Covinsky K, Suskind AM. Development of the UroARC surgical calculator: a novel risk calculator for older adults undergoing surgery for bladder outlet obstruction. The Journal of Urology. 2024; 212: 451–460.

[15] Kuno T, Tamura K, Fukuhara H, Fukata S, Ashida S, Karashima T, *et al*. Tadalafil 5 mg once daily improved each IPSS subscore, QOL, and nocturia in elderly BPH patients over 70 years old in a real-world clinical setting. Urologia Internationalis. 2022; 106: 1005–1011.

[16] Ali SR, Nkembo AT, Tipparaju SM, Ashraf M, Xuan W. Sarcopenia: recent advances for detection, progression, and metabolic alterations along with therapeutic targets. Canadian Journal of Physiology and Pharmacology. 2024; 102: 697–708.

[17] Ouyang C, Zhou L, Liu J, Wang L, Lu Y. Benign prostatic hyperplasia increases long-term chronic kidney disease risk. Mayo Clinic Proceedings. 2025; 100: 790–800.

[18] Kaiser MJ, Bauer JM, Ramsch C, Uter W, Guigoz Y, Cederholm T, *et al*. Validation of the Mini Nutritional Assessment short-form (MNA-SF): a practical tool for identification of nutritional status. Journal of Nutrition, Health and Aging. 2009; 13: 782–788.

[19] Wei JT, Dauw CA, Brodsky CN. Lower urinary tract symptoms in men: a review. JAMA. 2025; 334: 809–821.

[20] Merrill RM, Song D, Ashton MK. Comparing the strength of associations between male genital problems and mental illnesses and sleep disorders. American Journal of Men's Health. 2024; 18: 15579883241228243.

[21] Jiang W, Liu H, Tao X, Xu Q, Min J, Luo Y, *et al*. Research on the current status and risk prediction model of oral frailty among the elderly in Anhui Province. Journal of Practical Stomatology. 2025; 41: 261–266.

[22] Hu Z, Tian Y, Hu X. Associations between the risk of LUTS/BPH and the number and class of chronic diseases among middle-aged and elder men. Scientific Reports. 2025; 15: 14965.

[23] He Q, Wang Z, Liu G, Daneshgari F, MacLennan GT, Gupta S. Metabolic syndrome, inflammation and lower urinary tract symptoms: possible translational links. Prostate Cancer and Prostatic Diseases. 2016; 19: 7–13.

[24] Wang Z, Dong YQ, Kumari S, Murphy D, Merchant RA. The impact of frailty, activity of daily living, and malnutrition on mortality in older adults with cognitive impairment and dementia. Nutrients. 2025; 17: 2612.

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