

ASSOCIATION OF BENIGN PROSTATIC HYPERPLASIA WITH INGUINAL HERNIA IN ELDERLY MALES

Usama Altaf¹, Muhammad Daniyal Siddique², Rizwan Rasool³, Abdul Moeed⁴, Bushra Amanat⁵, Taha Azam⁶

¹MBBS, House Officer Shaikh Zayed Hospital, Lahore

²MBBS, Foundation University Medical college, Islamabad

³MBBS, Post Graduate Trainee General Surgery and Allied Nawaz Sharif Social Security Teaching Hospital Multan Road Lahore

⁴MBBS, Medical Officer, Aftab Hospital,

⁵MBBS, CMO, BHU Dhamawa,

⁶MBBS, Shaikh Zayed Hospital, Lahore

¹sh.altafhussain165@gmail.com, ²mdaniyal1999@gmail.com, ³rizwanrsool300@gmail.com, ⁴4a.mjahangir30@gmail.com, ⁵amanatbushra123@gmail.com, ⁶tahaazam20@gmail.com

DOI: <https://doi.org/10.5281/zenodo.20623922>

Keywords

Benign prostatic hyperplasia, Elderly males, Inguinal hernia, Lower urinary tract symptoms, Prostate volume.

Article History

Received: 07 April 2026

Accepted: 19 May 2026

Published: 10 June 2026

Copyright @Author

Corresponding Author: *

Usama Altaf

Abstract

Background: Benign prostatic hyperplasia (BPH) and inguinal hernia are common age-related conditions affecting elderly males. Chronic bladder outlet obstruction and repeated straining during micturition in patients with BPH may contribute to the development of inguinal hernia. The coexistence of these conditions may have important clinical implications for patient management.

Objectives: To determine the association of benign prostatic hyperplasia with inguinal hernia in elderly males.

Study Design & Setting: A cross-sectional study was conducted in the Departments of Surgery and Urology of Shaikh Zayed Hospital, Lahore.

Methodology: A total of 130 male patients aged 60 years and above with diagnosed BPH were enrolled through consecutive non-probability sampling. Demographic and clinical data including age, body mass index, duration of lower urinary tract symptoms, prostate volume, smoking status, chronic cough, and constipation were recorded. BPH severity was assessed using the International Prostate Symptom Score (IPSS). Patients were evaluated for the presence of inguinal hernia through clinical examination. Data were analyzed using SPSS version 26.0, and associations were determined using the Chi-square test. A *p*-value of ≤ 0.05 was considered statistically significant.

Results: The mean age of participants was 69.4 ± 6.8 years. Inguinal hernia was present in 38 (29.2%) patients. A significant association was observed between inguinal hernia and BPH severity ($p=0.006$), with hernia prevalence increasing from 12.5% in mild cases to 48.6% in severe cases. Inguinal hernia was also significantly associated with age ≥ 70 years ($p=0.021$), duration of symptoms >3 years ($p=0.003$), prostate volume >40 mL ($p=0.015$), chronic cough ($p=0.018$), and constipation ($p=0.009$).

Conclusion: Inguinal hernia was frequently observed among elderly males with

BPH and showed significant associations with disease severity and several clinical risk factors. Routine assessment for inguinal hernia may be beneficial in elderly patients with BPH.

INTRODUCTION

Benign prostatic hyperplasia (BPH) is a common age-related, nonmalignant enlargement of the prostate gland characterized by stromal and epithelial cell proliferation within the transitional zone of the prostate.^{1,2} It is one of the most prevalent urological disorders affecting elderly men and is frequently associated with lower urinary tract symptoms (LUTS), including urinary frequency, urgency, nocturia, weak urinary stream, and incomplete bladder emptying. As life expectancy continues to increase worldwide, the burden of BPH has become increasingly significant due to its impact on quality of life, healthcare utilization, and associated comorbid conditions.^{3,4}

The prevalence of BPH rises progressively with advancing age. Histological evidence of prostatic hyperplasia is observed in approximately 40% of men in their fifties and up to 80–90% of men over the age of 80 years.⁵ Similarly, inguinal hernia represents one of the most common surgical conditions in elderly males, with a lifetime risk estimated at approximately 27% in men. Both conditions are highly prevalent in aging populations and frequently coexist, particularly in regions where delayed healthcare-seeking behavior and increasing longevity contribute to a growing disease burden.⁶ The development of BPH is multifactorial and influenced by advancing age, hormonal alterations, genetic predisposition, obesity, metabolic syndrome, and chronic inflammation.⁷ Likewise, recognized risk factors for inguinal hernia include aging, connective tissue weakness, chronic cough, constipation, obesity, smoking, and activities associated with increased intra-abdominal pressure. The overlap of these risk factors has prompted interest in the potential relationship between the two conditions.⁸

Several pathophysiological mechanisms have been proposed to explain this association. Chronic bladder outlet obstruction caused by prostatic enlargement may lead to prolonged

straining during micturition, resulting in repeated increases in intra-abdominal pressure. Over time, this persistent pressure may weaken the inguinal floor and contribute to hernia formation. Furthermore, age-related alterations in collagen metabolism and connective tissue integrity may predispose individuals to both prostatic enlargement and abdominal wall weakness.⁹ Patients with BPH commonly present with LUTS, whereas inguinal hernia typically manifests as a groin swelling associated with discomfort or pain. Untreated BPH may lead to urinary retention, recurrent urinary tract infections, bladder stones, and renal impairment, while inguinal hernia may progress to incarceration or strangulation, necessitating emergency surgical intervention. Clinical evaluation, symptom assessment tools, digital rectal examination, ultrasonography, and uroflowmetry aid in the diagnosis of BPH, whereas inguinal hernia is primarily diagnosed through clinical examination and imaging when required.¹⁰ Management of BPH includes lifestyle modification, pharmacological therapy with alpha-blockers and 5-alpha reductase inhibitors, minimally invasive interventions, and surgical procedures such as transurethral resection of the prostate. Inguinal hernia is primarily managed through surgical repair using open or laparoscopic techniques.¹¹

Despite growing recognition of the coexistence of these disorders, published studies have reported variable findings regarding the strength and clinical significance of their association. Some investigations suggest that chronic urinary obstruction contributes substantially to hernia development, whereas others emphasize shared age-related and connective tissue-related mechanisms. Consequently, the relationship between BPH and inguinal hernia continues to attract clinical interest, particularly in elderly male populations where both conditions are highly prevalent and may influence overall patient management.

MATERIALS AND METHODS

This cross-sectional study was conducted in the Department of Surgery and Urology of Shaikh Zayed Hospital, Lahore over a period of six months from Dec 2025 to May 2026. Male patients aged 60 years and above presenting to the outpatient departments or admitted to the hospital during the study period were enrolled through consecutive non-probability sampling. A total of 130 patients were included in the study. The sample size of 130 patients was calculated using the WHO sample size calculator by taking an anticipated prevalence of inguinal hernia among patients with benign prostatic hyperplasia of 22%, a confidence level of 95%, and an absolute precision of 7%. The minimum required sample size was calculated to be 130 patients.

Patients with a previously repaired inguinal hernia, history of pelvic or abdominal malignancy, congenital abdominal wall defects, severe neurological disorders affecting bladder function, or those unwilling to participate were excluded. Written informed consent was obtained from all participants before enrollment. Detailed demographic and clinical information was recorded using a structured proforma. Age, body mass index, duration of lower urinary tract symptoms, history of chronic cough, constipation, smoking, and other relevant clinical variables were documented. Benign prostatic hyperplasia was diagnosed on the basis of clinical history, digital rectal examination, ultrasonographic findings, and uroflowmetry where indicated. The severity of lower urinary tract symptoms was assessed using the International Prostate Symptom Score (IPSS). Patients were examined for the presence of inguinal hernia by an experienced surgeon through clinical examination in both standing and supine positions. Ultrasonography was performed in equivocal cases to confirm the diagnosis.

All collected data were entered and analyzed using Statistical Package for Social Sciences (SPSS) version 26.0. Quantitative variables such as age, body mass index, prostate volume, and duration of symptoms were expressed as mean \pm

standard deviation. Qualitative variables such as presence of inguinal hernia, smoking status, chronic cough, and severity categories of BPH were presented as frequencies and percentages. The association between benign prostatic hyperplasia and inguinal hernia was assessed using the Chi-square test. A p-value of ≤ 0.05 was considered statistically significant.

RESULTS

The study included 130 elderly male patients with benign prostatic hyperplasia. The mean age of the participants was 69.4 ± 6.8 years, while the mean body mass index was 26.7 ± 3.9 kg/m². The mean duration of lower urinary tract symptoms was 4.8 ± 2.7 years, and the mean prostate volume was 48.9 ± 15.6 mL. Smoking was reported in 40.0% of patients, chronic cough in 22.3%, chronic constipation in 26.2%, diabetes mellitus in 35.4%, and hypertension in 46.9% of patients, as given in Table 1.

Among the 130 participants, the largest proportion belonged to the 65–69 years age group (32.3%), followed by 60–64 years (27.7%). According to the International Prostate Symptom Score, 18.5% of patients had mild symptoms, 53.1% had moderate symptoms, and 28.5% had severe symptoms. Inguinal hernia was identified in 38 (29.2%) patients, whereas 92 (70.8%) patients had no inguinal hernia, as given in Table 2.

A significant association was observed between the severity of benign prostatic hyperplasia and the presence of inguinal hernia ($p=0.006$). The frequency of inguinal hernia increased from 12.5% among patients with mild symptoms to 24.6% among those with moderate symptoms and 48.6% among those with severe symptoms, as given in Table 3.

The prevalence of inguinal hernia was significantly higher among patients aged 70 years or above compared to those aged below 70 years (42.3% vs. 20.5%, $p=0.021$). Similarly, patients with lower urinary tract symptoms for more than 3 years showed a significantly greater frequency of inguinal hernia than those with symptoms for 3 years or less (39.7% vs. 15.8%, $p=0.003$). In addition, inguinal hernia was more common

among patients with a prostate volume greater than 40 mL compared to those with a prostate volume of 40 mL or less (36.6% vs. 16.7%, $p=0.015$), as given in Table 4.

A statistically significant association was also found between inguinal hernia and chronic cough ($p=0.018$). Patients with chronic cough

had a higher prevalence of inguinal hernia than those without chronic cough (48.3% vs. 23.8%). Likewise, patients with chronic constipation demonstrated a significantly higher frequency of inguinal hernia compared with those without constipation (47.1% vs. 22.9%, $p=0.009$), as given in Table 5.

Table 1: Baseline Demographic and Clinical Characteristics of Study Participants (n=130)

Variable	Mean \pm SD / n (%)
Age (years)	69.4 \pm 6.8
Body Mass Index (kg/m ²)	26.7 \pm 3.9
Duration of LUTS (years)	4.8 \pm 2.7
Prostate Volume (mL)	48.9 \pm 15.6
Smokers	52 (40.0)
Chronic Cough	29 (22.3)
Chronic Constipation	34 (26.2)
Diabetes Mellitus	46 (35.4)
Hypertension	61 (46.9)

Table 2: Distribution of Age Groups, BPH Severity, and Inguinal Hernia Status (n=130)

Variable	Frequency	Percentage (%)
Age Group (years)		
60-64	36	27.7
65-69	42	32.3
70-74	28	21.5
75-79	17	13.1
≥ 80	7	5.4
IPSS Category		
Mild	24	18.5
Moderate	69	53.1
Severe	37	28.5
Inguinal Hernia		
Present	38	29.2
Absent	92	70.8

Table 3: Association of Inguinal Hernia with Severity of Benign Prostatic Hyperplasia (n=130)

IPSS Category	Hernia Present n (%)	Hernia Absent n (%)	P-value
Mild (n=24)	3 (12.5)	21 (87.5)	
Moderate (n=69)	17 (24.6)	52 (75.4)	
Severe (n=37)	18 (48.6)	19 (51.4)	0.006

Table 4: Association of Inguinal Hernia with Age Group, Duration of Symptoms, and Prostate Volume (n=130)

Variable	Hernia Present n (%)	Hernia Absent n (%)	P-value
Age Group (years)			
60-69 (n=78)	16 (20.5)	62 (79.5)	
≥70 (n=52)	22 (42.3)	30 (57.7)	0.021
Duration of LUTS			
≤3 years (n=57)	9 (15.8)	48 (84.2)	
>3 years (n=73)	29 (39.7)	44 (60.3)	0.003
Prostate Volume			
≤40 mL (n=48)	8 (16.7)	40 (83.3)	
>40 mL (n=82)	30 (36.6)	52 (63.4)	0.015

Table 5: Association of Inguinal Hernia with Chronic Cough and Constipation (n=130)

Variable	Hernia Present n (%)	Hernia Absent n (%)	P-value
Chronic Cough Present (n=29)	14 (48.3)	15 (51.7)	
Chronic Cough Absent (n=101)	24 (23.8)	77 (76.2)	0.018
Constipation Present (n=34)	16 (47.1)	18 (52.9)	
Constipation Absent (n=96)	22 (22.9)	74 (77.1)	0.009

DISCUSSION

Benign prostatic hyperplasia (BPH) is a common age-related condition characterized by nonmalignant enlargement of the prostate gland in elderly men. It frequently causes lower urinary tract symptoms that may lead to chronic straining during micturition. Inguinal hernia is another common condition among older males and is associated with increased intra-abdominal pressure and weakening of the abdominal wall.¹² Several studies have suggested a possible association between BPH and inguinal hernia due to shared risk factors and pathophysiological mechanisms. Persistent bladder outlet obstruction caused by BPH may contribute to hernia formation through repeated straining. Understanding this association may facilitate early diagnosis and comprehensive management of affected patients.^{14,15}

The present study evaluated the association between benign prostatic hyperplasia (BPH) and inguinal hernia among elderly males. The mean age of our study population was 69.4 ± 6.8 years, and inguinal hernia was identified in 29.2% of

patients with BPH. Furthermore, inguinal hernia demonstrated significant associations with increasing age (p=0.021), severity of BPH symptoms (p=0.006), prolonged duration of lower urinary tract symptoms (LUTS) (p=0.003), larger prostate volume (p=0.015), chronic cough (p=0.018), and constipation (p=0.009). These findings support the hypothesis that chronic bladder outlet obstruction and repeated straining during micturition may contribute to the development of inguinal hernia in elderly men.

Our findings are consistent with those of Wu et al. (2020), who reported that men with LUTS/BPH had a significantly higher risk of developing inguinal hernia than controls. After adjustment for age and comorbidities, LUTS/BPH was associated with a 2.25-fold increased risk of inguinal hernia (HR=2.25, 95% CI: 2.04-2.49). The authors further observed that the association was strongest among elderly males and that patients with LUTS/BPH developed inguinal hernia earlier during follow-up. Similarly, our study demonstrated a significant relationship between advancing age

and hernia occurrence, with inguinal hernia affecting 42.3% of patients aged ≥ 70 years compared with 20.5% of those aged < 70 years ($p=0.021$).¹⁶

The relationship between symptom severity and hernia occurrence observed in our study also agrees with the findings of Parthiban and Durairaj (2019). They reported that BPH was significantly more common among patients with inguinal hernia and that moderate-to-severe LUTS were associated with a higher frequency of hernia. Likewise, we found a progressive increase in hernia prevalence with worsening BPH severity. Inguinal hernia was present in only 12.5% of patients with mild symptoms, increased to 24.6% among those with moderate symptoms, and reached 48.6% among patients with severe LUTS ($p=0.006$).¹⁹ Furthermore, Parthiban and Durairaj observed that increasing age and prolonged urinary symptoms were associated with greater hernia occurrence. This closely parallels our findings, where patients with LUTS duration greater than three years demonstrated a significantly higher prevalence of inguinal hernia than those with symptoms for three years or less (39.7% vs. 15.8%, $p=0.003$). Their conclusion that chronic straining secondary to bladder outlet obstruction contributes to hernia formation provides a plausible explanation for the associations observed in our population.¹⁹

Our results are also comparable with those reported by Gueye et al., who investigated the coexistence of BPH and inguinal hernia in elderly men. They reported a mean age of 70.2 years among patients with both conditions, which is remarkably similar to the mean age of 69.4 ± 6.8 years observed in our study. Gueye et al. highlighted that the coexistence of BPH and inguinal hernia was common in elderly males, a finding that is supported by our observation that nearly one-third (29.2%) of BPH patients had concomitant inguinal hernia. Although their study additionally focused on previous hernia repair, hernia recurrence, and acute urinary retention, the overall demographic profile and coexistence pattern were comparable to those identified in our study.¹⁷

Further support for our findings comes from Bhandari et al. (2025), who reported frequent coexistence of inguinal hernia and LUTS secondary to BPH. They observed that most affected patients were older than 60 years and that moderate and severe urinary symptoms predominated among patients with hernia. Similarly, all participants in our study were aged 60 years or above, and the majority of hernia cases were observed among patients with moderate and severe LUTS. Specifically, 17 of the 38 hernia cases (44.7%) occurred in patients with moderate symptoms, while 18 cases (47.4%) occurred in those with severe symptoms. The findings of both studies suggest that worsening urinary symptoms may be an important indicator of increased hernia risk in elderly males with BPH.¹⁸

Although Muhammad et al. (2025) primarily compared BPH and prostate cancer, several aspects of their findings correspond with our observations. They reported that BPH was more prevalent than prostate cancer (64% vs. 20%) and that the majority of affected patients were aged 60 years and above.²⁰ Likewise, our entire study population consisted of elderly males with a mean age approaching 70 years. Muhammad et al. also identified smoking and obesity as common risk factors among patients with prostate disease. In our study, 40.0% of patients were smokers and the mean body mass index was 26.7 ± 3.9 kg/m², suggesting the presence of similar lifestyle-related risk factors. While their study did not specifically evaluate inguinal hernia, the overlap in demographic and risk factor profiles supports the concept that age-related and lifestyle-associated factors contribute substantially to the burden of BPH and its associated complications.²⁰

An additional finding of our study was the significant association between inguinal hernia and prostate volume greater than 40 mL (36.6% vs. 16.7%, $p=0.015$). This observation may indicate that increasing prostatic enlargement contributes to greater bladder outlet obstruction and straining, thereby increasing hernia risk. Similarly, chronic cough and constipation were significantly associated with inguinal hernia in

our study, affecting 48.3% and 47.1% of exposed patients, respectively. These findings reinforce the role of repeated increases in intra-abdominal pressure as an important mechanism linking BPH and inguinal hernia.

Study Limitations

This study was conducted at a single center, which may limit the generalizability of the findings. The cross-sectional design did not allow determination of a causal relationship between BPH and inguinal hernia. Additionally, the relatively small sample size may have affected the precision of some subgroup analyses.

CONCLUSION

Inguinal hernia was found to be a common finding among elderly males with benign prostatic hyperplasia. The presence of inguinal hernia was significantly associated with increasing severity of BPH, older age, longer duration of symptoms, larger prostate volume, chronic cough, and constipation. These findings highlight the importance of careful hernia assessment in elderly patients presenting with benign prostatic hyperplasia.

Acknowledgement: We sincerely acknowledge the support and guidance of our mentors, colleagues, and the staff of the participating hospital for their valuable assistance throughout this study.

Conflict of Interest: No

Funding Disclosure: None

REFERENCES

1. Kaltsas A, Giannakas T, Stavropoulos M, Kratiras Z, Chrisofos M. Oxidative stress in benign prostatic hyperplasia: mechanisms, clinical relevance and therapeutic perspectives. *Diseases*. 2025 Feb 11;13(2):53.
2. David BG. The Role of Hormonal Changes in the Development of Benign Prostatic Hyperplasia: A Mini Review. *pathology*. 2025;16:18.
3. Mugisha Emmanuel K. Pathophysiology of benign prostatic hyperplasia: Cellular and molecular mechanisms. *IDOSR*

Journal of Applied Sciences. 2025;10:26-35.

4. Khan A, Alzahrani HA, Felemban SG, Algarni AS, Alenezi AB, Kamal M, Rehman ZU, Asdaq SM, Ahmed N, Alharbi BM, Alanazi BS. Exploring TGF- β signaling in benign prostatic hyperplasia: from cellular senescence to fibrosis and therapeutic implications. *Biogerontology*. 2025 Apr;26(2):79.
5. Guimaraes CT, Sauer LJ, Romano RF, Pacheco EO, Bittencourt LK. Prostate benign diseases. Liu J, Yin J, Chen P, Liu D, He W, Li Y, Li M, Fu X, Zeng G, Guo Y, Wang X. Smoothened inhibition leads to decreased cell proliferation and suppressed tissue fibrosis in the development of benign prostatic hyperplasia. *Cell death discovery*. 2021 May 18;7(1):115. *Topics in Magnetic Resonance Imaging*. 2020 Feb 1;29(1):1-6.
6. Shah A, Shah AA, K N, Lobo R. Mechanistic targets for BPH and prostate cancer—a review. *Reviews on Environmental Health*. 2021 Jun 25;36(2):261-70.
7. Fiard G, Stavrinos V, Chambers ES, Heavey S, Freeman A, Ball R, Akbar AN, Emberton M. Cellular senescence as a possible link between prostate diseases of the ageing male. *Nature Reviews Urology*. 2021 Oct;18(10):597-610.
8. Liu J, Yin J, Chen P, Liu D, He W, Li Y, Li M, Fu X, Zeng G, Guo Y, Wang X. Smoothened inhibition leads to decreased cell proliferation and suppressed tissue fibrosis in the development of benign prostatic hyperplasia. *Cell death discovery*. 2021 May 18;7(1):115.

9. Minutoli L, Rinaldi M, Marini H, Irrera N, Crea G, Lorenzini C, Puzzolo D, Valenti A, Pisani A, Adamo EB, Altavilla D. Apoptotic pathways linked to endocrine system as potential therapeutic targets for benign prostatic hyperplasia. *International journal of molecular sciences*. 2016 Aug 11;17(8):1311.
10. Chen X, Yang S, He Z, Chen Z, Tang X, Lin Y, Huang Y, Hou J, Wei X. Comprehensive analysis of the global, regional, and national burden of benign prostatic hyperplasia from 1990 to 2021. *Scientific reports*. 2025 Feb 15;15(1):5644.
11. Chen W, Pascal LE, Wang K, Dhir R, Sims AM, Campbell R, Gasper G, DeFranco DB, Yoshimura N, Wang Z. Differential impact of paired patient-derived BPH and normal adjacent stromal cells on benign prostatic epithelial cell growth in 3D culture. *The Prostate*. 2020 Oct;80(14):1177-87.
12. Giacomini A, Grillo E, Rezzola S, Ribatti D, Rusnati M, Ronca R, Presta M. The FGF/FGFR system in the physiopathology of the prostate gland. *Physiological reviews*. 2021 Apr 1;101(2):569-610.
13. Egan KB. The epidemiology of benign prostatic hyperplasia associated with lower urinary tract symptoms: prevalence and incident rates. *Urologic Clinics*. 2016 Aug 1;43(3):289-97.
14. Xu G, Dai G, Huang Z, Guan Q, Du C, Xu X. The etiology and pathogenesis of benign prostatic hyperplasia: the roles of sex hormones and anatomy. *Research and Reports in Urology*. 2024 Dec 31:205-14.
15. Madersbacher S, Sampson N, Culig Z. Pathophysiology of benign prostatic hyperplasia and benign prostatic enlargement: a mini-review. *Gerontology*. 2019 Aug 21;65(5):458-64.
16. Wu YH, Juan YS, Shen JT, Wang HS, Jhan JH, Lee YC, et al. Lower urinary tract symptoms-benign prostatic hyperplasia may increase the risk of subsequent inguinal hernia in a Taiwanese population: A nationwide population-based cohort study. *PLoS One*. 2020;15(6).
17. Gueye SM, Ba M, Ndoye AK, Fall PA, Mensah A, Diagne BA. Simultaneous treatment of benign prostatic hypertrophy and inguinal hernia: an old procedure revisited. *Dakar Med*. 2009;44(2):219-221.
18. Bhandari S, Adhikari S, Gautam S, Shrestha R. Benign prostatic hyperplasia among patients with inguinal hernia: A descriptive cross-sectional study. *Postgrad Med J NAMS*. 2025;25(1):1-6.
19. Parthiban SS, Durairaj B. A study on association between inguinal hernia and benign prostatic hyperplasia. *International Surgery Journal*. 2019 May 28;6(6):2065-9.
20. Muhammad R, Bhatti MS, Khan MS, Ali S, Bokhari NM, Mehtab G, Ahmad I, Ali J. Prevalence of Benign Prostatic Hyperplasia and Prostate Cancer Among Adults in Pakistan. *Indus Journal of Bioscience Research*. 2025 Mar 15;3(3):164-8.