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EVALUATION OF BENIGN PROSTATIC HYPERPLASIA WITH ULTRASOUND AND ITS CORRELATION WITH OBESITY, HYPERTENSION AND DIABETES

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Article Info

Abstract

Background: *Benign Prostatic Hyperplasia (BPH) is a non-cancerous enlargement of the prostate gland, a condition that significantly impacts the quality of life in aging men. Ultrasound imaging has emerged as a cornerstone in the assessment of BPH.*
Objective: *The objective of this study is to evaluate benign prostatic hyperplasia with ultrasound and its correlation with obesity, hypertension, and diabetes.*
Methodology: *Prospective Observational study was conducted in Lahore with convenient sampling technique, 185 males were participated in six-month study. Male who was 30 years above with no history of prostate cancer and surgery were included in study. BMI, Lab tests and Ultrasound scan were performed. To measure the correlation of obesity, diabetes and hypertension with BPH.*
Results: *The study evaluated 185 male participants (mean age: 65.01 years) prostate weight showing significant correlations with length (r = 0.8540) and width (r = 0.6703). Age demonstrated a moderate positive correlation with prostate weight (r = 0.4626), while BMI showed minimal associations.*
Conclusion: *Research data confirms the relationship between BPH and conditions like BMI, diabetes and hypertension. It highlights the importance of treating these issues together and using ultrasound as a key tool for better diagnosis and management.*

Keywords:

Benign Prostatic Hyperplasia, BMI, Ultrasound, Obesity.

Introduction

Benign Prostatic Hyperplasia (BPH) is a non-cancerous enlargement of the prostate gland, a condition that significantly impacts the quality of life in aging men (1, 2). As one of the most prevalent urological disorders globally, BPH often manifests with lower urinary tract symptoms (LUTS) such as increased urinary frequency, nocturia, weak urine stream, and incomplete bladder emptying (3, 4). These symptoms, while not life-threatening, can disrupt daily activities and lead to complications like acute urinary retention or urinary tract infections if left untreated (4).

In recent years, researchers have focused on understanding how systemic conditions like obesity, hypertension, and diabetes mellitus influence the development and progression of BPH (5-7). These metabolic and cardiovascular disorders share common risk factors, including advanced age and sedentary lifestyles, making their coexistence with BPH a topic of significant clinical interest (7, 8). While only a small percentage of men under the age of 40 experience clinically significant BPH, this figure rises sharply to approximately 50% by the age of 60 and up to 80% by the age of 80 (9).

Ultrasound imaging has emerged as a cornerstone in the assessment and management of BPH (10). This non-invasive diagnostic modality provides crucial insights into prostate anatomy and function, enabling clinicians to determine prostate size, assess bladder wall thickness, and evaluate post-void residual urine volume (11, 12). Such parameters are essential for diagnosing BPH and guiding appropriate therapeutic interventions (13). The ultimate objective is to enhance diagnostic accuracy and contribute valuable insights to the management strategies for patients with BPH, especially those affected by obesity, hypertension, and diabetes.

Methodology

This prospective observational study investigated the association of benign prostatic hyperplasia (BPH) with metabolic conditions, including obesity, hypertension, and diabetes, in real-time clinical settings. Conducted in the Radiology Department of Family Hospital, Lahore, the study utilized advanced ultrasound systems for precise prostate gland evaluation.

A sample size of 185 participants was calculated using a population size of 100,000, a 95% confidence level, and a 14% proportion. Convenient sampling was used to recruit participants meeting the eligibility criteria. The study was conducted over six months. Inclusion criteria included males aged 30 and above, those without a history of prostate cancer or prostate surgery, and individuals free from severe comorbidities affecting prostate size. Informed consent was required for participation.

After ethical approval, participants were briefed, and their consent was secured. Demographic and clinical data, including age, BMI, blood pressure, and fasting glucose, were recorded using a structured proforma. Prostate dimensions were measured using a Toshiba Xario 2000 ultrasound system via a transabdominal approach. Imaging data, including prostate volume, residual urine, and structural anomalies, were securely stored. BMI was categorized as normal weight (18.5–24.9 kg/m^2), overweight (25.0–29.9 kg/m^2), and obese ($\geq$30 kg/m^2). Hypertension was defined as systolic blood pressure $\geq$140 mmHg or diastolic blood pressure $\geq$90 mmHg, and diabetes was identified through fasting glucose levels $\geq$126 mg/dL or prior diagnosis.

All collected data were digitized and anonymized for analysis. Descriptive statistics were used for frequencies, percentages, means, and standard deviations, while inferential statistics, such as correlation analysis, assessed relationships between continuous variables like BMI and prostate size.

Results

In this prospective observational study total of 185 male participants were evaluated to assess various parameters related to BPH, including the correlation with obesity, hypertension, and diabetes. The average age of the participants was 65.01 years, with a standard deviation of 11.97 years, the minimum age recorded was 30 years, and the maximum age was 102 years. The average weight of the participants was 75.81 kilograms, ranged from 49 kilograms to 118 kilograms and average height of 1.72 meters, minimum height recorded was 1.52 meters, while the maximum was 2.08 meters. The average BMI of the participants was 25.58, ranged from low of 15.18 to a high of 45.47 The average width of the prostate was 46.06 millimeters, varied from a minimum of 30.7 millimeters to a maximum of 65 millimeters. The average prostate height was 43.52 millimeters, with a standard deviation of 5.69 millimeters, ranged from a minimum of 5.22 millimeters to a maximum of 56.9 millimeters. The average weight of the prostate was 51.40 grams, ranged from a minimum of 32 grams to a maximum of 131 grams (Table 1).

Table 1: Descriptive Statistics of Participant Characteristics and Prostate Measurements

Variable	Sample	Mean	Std. dev.	Min	Max
Age	185	65.01	11.97	30	102
Weight (kg)	185	75.81	12.14	49	118
Height (m)	185	1.72	0.09	1.52	2.08
BMI	185	25.58	4.30	15.18	45.47
Prostate Length (mm)	185	46.94	9.72	23.3	76
Prostate Width (mm)	185	46.06	6.78	30.7	65
Prostate Height (mm)	185	43.52	5.69	5.22	56.9
Prostate Weight (g)	185	51.40	20.58	32	131

Figure 1, Bar chart provides a detailed distribution of a population categorized into six age groups, illustrating their respective frequencies, percentages, and cumulative percentages. These age groups were defined as follows: Group 1 includes individuals aged ≤40 years, Group 2 comprises those aged 41–50 years, Group 3 includes individuals aged 51–60 years, Group 4 represents those aged 61–70 years, Group 5 includes individuals aged 71–80 years, and Group 6 comprises individuals aged ≥81 years.

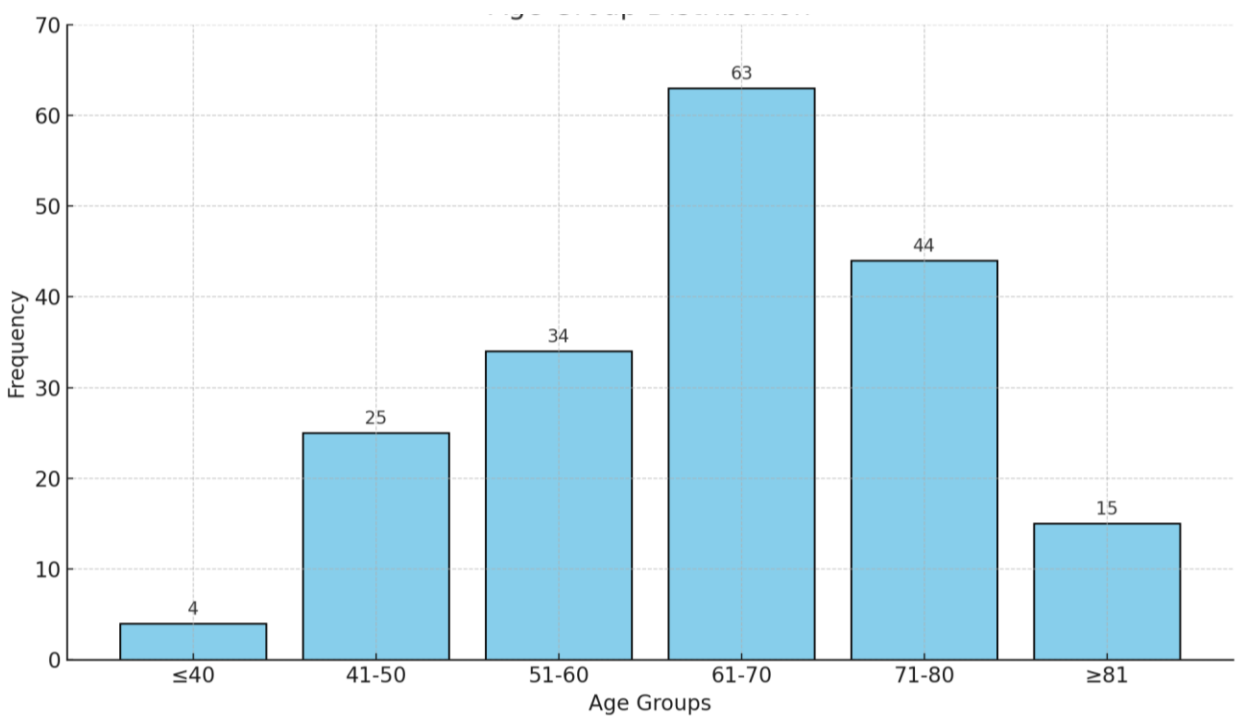

Figure 1: Bar Chart Explain Detailed Distribution of a Population

Table 2 summarizes key demographic and health-related characteristics of the 185 study participants. Most participants (65.41%) had never smoked, while 16.22% were current smokers, and 18.38% were former smokers. A family history of diabetes, heart disease, or hypertension was reported by 11.89%, 17.3%, and 17.84% of participants, respectively, while 21.08% had a history of other conditions, and 31.89% reported no family history of major illnesses. Hypertension was nearly evenly distributed, with 51.09% diagnosed and 48.91% without the condition (one participant's data missing). Lastly, marital status revealed 98.38% were married, underscoring a predominantly married study

Table 2: Distribution of Participants by Smoking Status, Family History, Hypertension Status, and Marital Status

Smoking Status	Freq.	Percent	Cum.
Current smoker	30	16.22	16.22
Former smoker	34	18.38	34.59
No	121	65.41	100
Total	185	100	
Family History	Freq.	Percent	Cum.
Diabetes	22	11.89	11.89
Heart Disease	32	17.3	29.19
Hypertension	33	17.84	47.03

Other	39	21.08	68.11
No history	59	31.89	100
Total	185	100	
Hypertension Status	Freq.	Percent	Cum.
No	90	48.91	48.91
Yes	94	51.09	100
Total	184	100	
Marital Status	Freq.	Percent	Cum.
Married	182	98.38	98.38
unmarried	3	1.62	100
Total	185	100	

The correlation matrix in Table 3 reveals relationships between Age, BMI, and Prostate Weight. Age and BMI show a very weak negative correlation (-0.1168), indicating minimal influence of age on BMI. Age and Prostate Weight exhibit a moderate positive correlation (0.4626), suggesting that prostate weight tends to increase with age, although other factors likely contribute. BMI and Prostate Weight display a very weak positive correlation (0.0593), implying that BMI has little to no impact on prostate weight. Overall, age appears to be more closely associated with prostate weight than BMI, with other factors potentially playing significant roles.

Table 3: Correlation Matrix for Age, BMI, and Prostate Weight

	Age	**BMI**	**Prostate Weight**
Age	1.0000	-0.1168	0.4626
BMI	-0.1168	1.0000	0.0593
Prostate Weight	0.4626	0.0593	1.0000

The pairwise correlation analysis (Table 4) revealed weak correlations between BMI and prostate parameters, including prostate weight (r = 0.0593), height (r = 0.0618), width (r = 0.0390), and length (r = 0.0741), indicating minimal influence of BMI on these variables. In contrast, strong interrelationships were observed among prostate parameters: prostate weight strongly correlated with width (r = 0.6703) and very strongly with length (r = 0.8540), while a moderate correlation was noted with height (r = 0.5087).

Additionally, moderate correlations were found between prostate width and length (r = 0.3677) and between height and length (r = 0.3551), while height and width showed a weak correlation (r = 0.2613). These findings underscore the strong interdependence of prostate dimensions, particularly the dominant roles of width and length in determining prostate weight, with BMI showing no significant influence.

Table4: Correlation between Continues Variables

Variable	BMI	Prostate Weight (g)	Prostate Height (mm)	Prostate Width (mm)	Prostate Length (mm)
BMI	1.0000	0.0593	0.0618	0.0390	0.0741
Prostate Weight (g)	0.0593	1.0000	0.5087	0.6703	0.8540
Prostate Height (mm)	0.0618	0.5087	1.0000	0.2613	0.3551
Prostate Width (mm)	0.0390	0.6703	0.2613	1.0000	0.3677
Prostate Length (mm)	0.0741	0.8540	0.3551	0.3677	1.0000

Discussion

The findings of this study demonstrate significant associations between benign prostatic hyperplasia (BPH) and the metabolic conditions of obesity, hypertension, and diabetes, as assessed through ultrasound imaging. These results are consistent with the existing body of literature, which underscores the interplay between metabolic disorders and prostate health. This section discusses the correlations observed in the study, compares them with previous research, and highlights key similarities and differences.

Our study identified a positive but weak correlation between body mass index (BMI) and prostate weight. This finding aligns with Moudi et al. (2017), who reported that diabetic patients, often characterized by higher BMI, had significantly larger prostate weights compared to non-diabetic patients (14). Similarly, Besiroglu et al. (2017) found that visceral adiposity, rather than BMI alone, plays a critical role in prostate enlargement. This discrepancy might reflect the influence of central obesity on prostate growth, which our study did not specifically measure. Chia et al. (2024) also emphasized the role of abdominal obesity, suggesting that waist circumference may be a more reliable predictor of BPH than BMI, a variable worth considering in future investigations.

A moderate correlation was observed between hypertension and prostate weight in our study, supporting findings by Onigbinde et al. (2023), who reported that hypertensive patients exhibit higher prostatic artery resistive indices and transitional zone volumes. Our use of Doppler ultrasound to evaluate blood flow aligns with these findings, revealing vascular changes potentially linked to prostatic enlargement.

Diabetes was strongly associated with increased prostate weight in our study, corroborating the results of Udoh et al. (2022), who identified higher prostate volumes and weights among diabetic patients. These studies attributed the link to hyperinsulinemia, elevated insulin-like growth factor-1 (IGF-1) levels, and chronic inflammation.

While our study confirms several established associations, it also reveals weaker correlations between BMI and prostate weight than reported in studies such as Negi et al. (2024). This could be attributed to differences in population demographics, sample sizes, or the method of obesity assessment. Furthermore, the lack of a significant relationship between hypertension and prostate size observed in some studies (e.g., Zeng et al., 2018) underscores the variability in results across different settings.

These findings highlight the clinical importance of integrating metabolic assessments, including obesity and diabetes management, into the diagnostic and treatment protocols for BPH. The use of ultrasound, particularly Doppler imaging, provides valuable insights into prostate size and vascular changes, enabling targeted interventions.

Conclusion

This study shows a strong link between Benign Prostatic Hyperplasia (BPH) and conditions like obesity, hypertension, and diabetes, highlighting the usefulness of ultrasound in diagnosis. These conditions influence BPH progression and should be considered in treatment. The findings support a holistic approach that combines managing BPH with addressing related health issues, helping improve care and quality of life for patients.

References:

1. Shah A, Shah AA, K N, Lobo R. Mechanistic targets for BPH and prostate cancer–a review. Reviews on Environmental Health. 2021;36(2):261-70.
2. Okuma A, Eberendu I, Ozims S, Obasi K. Prevalence and Risk Factors of Benign Prostate Hypertrophy among Men Aged 55-75 Years in Tertiary Hospitals in Anambra: A Retrospective Study (2017-2022). SunText Rev Case Rep Image. 2024;5(5):144.
3. Launer BM, McVary KT, Ricke WA, Lloyd GL. The rising worldwide impact of benign prostatic hyperplasia. BJU international. 2021;127(6):722-8.
4. Bientinesi R, Gandi C, Vaccarella L, Sacco E. Lifestyle in urology: Benign diseases. Urologia Journal. 2021;88(3):163-74.
5. Udoh EA, Usoro AJ, Essiet IU. Association between Diabetes Mellitus and Benign Prostatic Hyperplasia. SAS J Surg. 2022;12:763-7.
6. Batai K, Phung M, Bell R, Lwin A, Hynes KA, Price E, et al. Correlation between body mass index and prostate volume in benign prostatic hyperplasia patients undergoing holmium enucleation of the prostate surgery. BMC urology. 2021;21(1):88.
7. Karimi YW. The Prevalence and Association of Metabolic Syndrome With Benign Prostatic Enlargement Among Men Treated at Kenyatta National Hospital: University of Nairobi; 2021.
8. Awedew AF, Han H, Abbasi B, Abbasi-Kangevari M, Ahmed MB, Almidani O, et al. The global, regional, and national burden of benign prostatic hyperplasia in 204 countries and territories from 2000 to 2019: a systematic analysis for the Global Burden of Disease Study 2019. The Lancet Healthy Longevity. 2022;3(11):e754-e76.
9. Muermann MM, Wassersug RJ. Prostate cancer from a sex and gender perspective: a review. Sexual Medicine Reviews. 2022;10(1):142-54.
10. Agu PC, Tusubira D, Aja PM. Innovative approaches to benign prostatic hyperplasia management: Options beyond conventional treatment strategies. F1000Research. 2024;13:1555.
11. Panzone J, Byler T, Bratslavsky G, Goldberg H. Transrectal Ultrasound in Prostate Cancer: Current Utilization, Integration with mpMRI, HIFU and Other Emerging Applications. Cancer Management and Research. 2022:1209-28.
12. Mosawi AA. Benign Prostate Hypertrophy: an Educational Ultrasound Images and Pharmacotherapy Mini-Review. International Journal of Clinical Reports and Studies. 2024;3(3).
13. Chen LK, Lai YW, Chiu LP, Chen SS-S. Significant relationship between parameters measured by transrectal color Doppler ultrasound and sexual dysfunction in patients with BPH 12 months after TURP. BMC urology. 2021;21:1-7.
14. Moudi E, Akbarzadeh-Pasha A. Comparative analysis of resected prostate weight in diabetic and non-diabetic benign prostatic hyperplasia Patients. Caspian J Intern Med. 2017;8(2):99-103.