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Association of metabolic syndrome and lifestyle factors with lower urinary tract symptoms and benign prostatic hyperplasia

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Abstract---Objective: The study aimed to find out how often people with urinary problems also have metabolic syndrome and benign prostatic hyperplasia. It also looked at how lifestyle choices might be linked to these urinary issues. Methods: This was a cross-sectional study carried out at the Shaikha Fatima Institute of Nursing and Health Sciences in Lahore from May to December 2022. It involved 150 participants, and data analysis was done using Statistical Package for Social Sciences version 22.0. Results: The result of study revealed that mean $\pm$ SD of age and BMI was 43 $\pm$ 14.23 and 23 $\pm$ 5.2 respectively. Most common symptom was UTI which was present in 93(62.0%) of cases followed by urinary urgency 58(38.7%), and BPH 57(38.0%). About 43(28.7%) patients with LUTS had metabolic syndrome. Significant association of metabolic syndrome was found with urinary incontinence, burning micturition, urinary urgency, UTI and BPH. The life style factors were also associated with metabolic syndrome. Significant association was found between metabolic syndrome and stressful life, alcohol consumption, consumption of vegetables and fat content in diet >2tbsp/ day, and sedentary working environment. Conclusion: The study concluded that metabolic syndrome was linked to lower urinary tract symptoms (LUTS) and benign prostatic hyperplasia (BPH). Additionally, it found that LUTS/BPH were associated with certain lifestyle factors such as a

sedentary lifestyle, low intake of vegetables, and high consumption of fatty foods.

Keywords---Metabolic Syndrome, Lower Urinary Tract Symptoms, Lifestyle Factors, Prostatic Hyperplasia, Hyperplasia.

Introduction

Benign prostatic hyperplasia (BPH) and lower urinary tract symptoms (LUTS) are common issues among older men, greatly affecting their quality of life. (1). While traditionally attributed to age, genetics, and hormonal changes, emerging research suggests a potential link between metabolic syndrome (MetS), lifestyle factors, and the development or exacerbation of BPH and LUTS (2).

Metabolic syndrome (MetS) is marked by central obesity, insulin resistance, dyslipidemia, and hypertension. It has gained significant attention recently because of its link to cardiovascular diseases and type 2 diabetes. However, its role in urological conditions like BPH and LUTS is increasingly recognized (3).

Early studies identified correlations between MetS and BPH/LUTS, prompting further investigation into the underlying mechanisms. Insulin resistance, hyperinsulinemia, and altered sex hormone metabolism are among the proposed pathways linking MetS to prostate growth and urinary symptoms (4). Moreover, lifestyle factors like lack of physical activity, poor diet, and obesity have been implicated in both metabolic syndrome (MetS) and the progression of benign prostatic hyperplasia (BPH) and lower urinary tract symptoms (LUTS) (5).

Understanding the interplay between MetS, lifestyle factors, and urological conditions is crucial for developing effective prevention and management strategies. Lifestyle modifications targeting MetS components, such as increased physical activity, weight management, and dietary changes, may offer promising avenues for alleviating BPH/LUTS symptoms and reducing the risk of associated complications.

Evidence suggests that lifestyle modifications targeting MetS risk factors could mitigate the progression of BPH/LUTS and reduce the risk of cardiovascular events. Physical activity, weight management, and dietary changes have shown promise in reducing the severity of LUTS and BPH (6). LUTS prevalence increases with age, affecting up to 90% of men over 80. While age, genetics, and hormones play roles in BPH/LUTS, modifiable factors like lifestyle habits also contribute (7). Thus, addressing MetS components could potentially alleviate BPH/LUTS symptoms and improve overall health outcomes.

Rationale of study

The study seeks to investigate how metabolic syndrome (MetS) and lifestyle choices relate to lower urinary tract symptoms (LUTS) in men with benign prostatic hyperplasia (BPH). Understanding how MetS and lifestyle habits might affect the prevalence and severity of LUTS is important for improving clinical

treatment and preventive measures. By exploring these connections, the research aims to offer valuable insights into the complex nature of BPH and LUTS, ultimately enabling a more holistic approach to patient care.

Objectives

1. To check how often metabolic syndrome and lifestyle habits occur in patients with lower urinary tract symptoms and benign prostatic hyperplasia.
2. To find out if there's a connection between metabolic syndrome and lower urinary tract symptoms and benign prostatic hyperplasia.
3. To see if there's a link between lifestyle habits and lower urinary tract symptoms and benign prostatic hyperplasia.

Research Questions

1. What percentage of patients with lower urinary tract symptoms (LUTS) and benign prostatic hyperplasia (BPH) have metabolic syndrome and certain lifestyle factors?
2. Is there a strong connection between metabolic syndrome and the presence and seriousness of lower urinary tract symptoms (LUTS) in individuals with benign prostatic hyperplasia (BPH)?
3. How do lifestyle choices relate to the frequency and seriousness of lower urinary tract symptoms (LUTS) in patients with benign prostatic hyperplasia (BPH)?

Methods

This cross-sectional study took place at both the Shaikha Fatima Institute of Nursing and Health Sciences and Services Hospital in Lahore. A sample size of 150 cases was calculated and participants meeting the inclusion/exclusion criteria were selected from outdoor units using convenience sampling method after obtaining approval from the institutional ethical committee. All participants provided written informed consent, agreeing to take part in the study and allowing their data to be used for research purposes. Data collection was performed using a pre-designed proforma, and analysis was conducted using SPSS Version 24. Quantitative variables such as age, monthly income, and BMI were presented by calculating mean and standard deviation. Univariate analysis was used to investigate the relationship between metabolic syndrome and lifestyle factors, with a significance level set at $p \leq 0.05$.

Results

Table 1: Demographic Characteristics of Study Participants

Demographic Characteristics	Mean	± SD
Age	43	± 14.23
BMI	23	± 5.2
Monthly income(Rs)	45000	±18000
	Frequency	Percentage
Marital status		
• Married	138	92.0
• Unmarried	12	8.0
Occupation		
• Physically active	112	74.7
• sedentary	38	25.3

Out of 150 patients; mean± SD of age and BMI was 43±14.23 and 23±5.2 respectively, average monthly income was Rs.45000 with a standard deviation of Rs.18000. Among our study participants 138(92.0%) were married and 12(8.0%) were unmarried. 112(74.7%) of our subjects had physically active occupation and 38(25.3%) had a sedentary occupation as shown in table below.

Table: 2 Medical History of study participants

Clinical Parameters	Frequency	Percentage
Obesity		
• Yes	88	58.7
• No	62	41.3
Hypertension		
• Yes	38	25.3
• No	112	74.7
Diabetes		
• Yes	42	28.0
• No	108	72.0
Family history of BPH		
• Yes	22	14.7
• No	128	85.3
Previous history of joint replacement surgery		
• Yes	8	5.3
• No	142	94.7
Cardiovascular history		
• Yes	48	32.0
• No	102	68.0

Medical history of study participants was asked. Obesity was found in 88(58.7%) of cases, 38(25.3%) were hypertensive and 42(28.0%) were diabetics. 22(14.7%) had family history of benign prostatic hyperplasia, 8(5.3%) underwent joint

replacement surgery and 48(32.0%) had history of cardiovascular disease as shown in table2.

Table: 3 Urinary tract symptoms

Urinary tract symptoms	Frequency	Percentage
Urinary incontinence		
• Yes	23	15.3
• No	127	84.7
Burning		
• Yes	49	32.7
• No	101	67.3
Dribbling		
• Yes	33	22.0
• No	117	78.0
Urinary urgency		
• Yes	58	38.7
• No	92	61.3
UTI		
• Yes	93	62.0
• No	57	38.0
BPH		
• Yes	57	38.0
• No	93	62.0

150 patients suffering from lower urinary tract symptoms were studied, most common symptom was UTI that was present in 93(62.0%) of cases, urinary urgency was reported in 58(38.7%), BPH was diagnosed in 57(38.0%), 32.7% complained of burning micturition, dribbling was reported in 33(22.0%) and 23(15.3%) had complaint of urinary incontinence, as shown in table 3.

Table: 4 Frequency of metabolic syndrome in study participants

	Frequency	Percentage
Metabolic syndrome		
• Yes	43	28.7
• No	107	71.3

Table 4 shows that majority of participants had no metabolic syndrome and 43 reported metabolic syndrome

Table: 5 Frequency of Life style factors in patients with lower urinary tract symptoms

Life style factors	Yes n (%)	No n (%)
Having stressful life	39 (26.0)	111 (74.0)
Physically active	63 (42.0)	87 (58.0)
Consumption of alcohol	8 (5.3)	142(94.7)
Consumption of vegetables	87 (58.0)	63 (42.0)
Fat content in diet	123 (82.0)	27 (18.0)
working environment	Sedentary	Active
	69 (46.0)	81 (54.0)

Table 5 showed the life style factors. About 39(26.0%) had a stressful life, 63(42.0%) had physically active, 8(5.3%) regularly consume alcohol beverages one or more times per week, 87(58.0%) consumed vegetables more than three times a week, fat content of >2 tablespoon/day was noted in 123(82.0%), 68(46.0%) had a sedentary occupation while 81(54.0%) were physically active at their work place.

Table: 6 Association of metabolic syndrome with lower urinary tract symptoms

lower urinary tract symptoms	Metabolic syndrome		Total	P-value
	Yes	No		
Urinary incontinence				
• Yes	19(82.6%)	4(17.4%)	23	0.000**
• No	24(18.8%)	103(81.2%)	127	
Burning				
• Yes	29(59.2%)	20(40.8%)	49	0.000**
• No	14(13.8%)	87(86.2%)	101	
Dribbling				
• Yes	12(36.4%)	21(63.6%)	33	0.28
• No	31(26.4%)	86(73.6%)	117	
Urinary urgency				
• Yes	26(44.8%)	32(55.2%)	58	0.001*
• No	17(18.5%)	75(81.5%)	92	
UTI				
• Yes	36(38.7%)	57(61.3%)	93	0.000**
• No	7(12.3%)	50(87.7%)	57	
BPH				
• Yes	23(40.4%)	34(59.6%)	57	0.02*
• No	20(21.5%)	73(78.4%)	93	

Table 6 showed some important connections between metabolic syndrome and different lower urinary tract symptoms. Out of the 23 patients experiencing urinary incontinence, 82.6% had metabolic syndrome (p=0.000). Among the 49 patients reporting burning sensation during urination, 59.2% had metabolic syndrome (p=0.000). Urinary urgency was experienced by 58 patients, with 44.8% having metabolic syndrome (p=0.001). Furthermore, 93 patients with urinary tract infections were significantly associated with metabolic syndrome (p=0.000). Among the 58 patients diagnosed with benign prostatic hyperplasia, 40.4% had

metabolic syndrome ($p=0.02$). However, there was no notable link found between dribbling and metabolic syndrome ($p=0.28$).

Table: 7 Association of life style factors with metabolic syndrome

Life style factors	Metabolic syndrome		Total	P-value
	Yes n (%)	No n (%)		
Having stressful life				
• Yes	28(71.7%)	11(28.3%)	39	0.000**
• No	15(37.5%)	96(86.4%)	111	
Physically active				
• Yes	14(22.2%)	49(77.8%)	63	0.15
• No	29(33.3%)	58(66.7%)	87	
Consumption of alcohol				
• Yes	5(62.5%)	3(37.5%)	8	0.04*
• No	38(26.8%)	104(73.2%)	142	
Consumption of vegetables				
• Yes	14(16.1%)	73(83.9%)	87	0.000**
• No	29(46.0%)	34(54.0%)	63	
Fat content in diet				
• Yes	28(22.7%)	95(77.2%)	123	0.002*
• No	15(55.6%)	12(44.4%)	27	
Working Environment				
• Sedentary	32(46.3%)	37(53.6%)	69	0.000**
• Active	11(13.6%)	70(86.4%)	81	

Table 7 displays the association of lifestyle factors with metabolic syndrome. Among the 39 participants with stressful lives, 71.7% had metabolic syndrome ($p=0.000$). For physical activity, out of 63 subjects, only 22.2% had metabolic syndrome ($p=\text{not significant}$). Alcohol consumption was reported by 8 subjects, with 62.5% developing metabolic syndrome ($p=0.04$). Regarding vegetable consumption candidates consuming vegetables had a significant association with lower rates of metabolic syndrome ($p=0.000$). A fat content in the diet was noted in 123 subjects, with 22.7% having metabolic syndrome ($p=0.002$). Furthermore, a statistically significant association ($p=0.000$) was found between a sedentary working environment and metabolic syndrome, with 46.3% of the 69 subjects with sedentary jobs developing metabolic syndrome.

Discussion

Research studies across various populations have shown that certain risk factors contribute to male lower urinary tract symptoms (LUTS) in benign prostatic hyperplasia (BPH). These factors include metabolic syndrome (MS) and lifestyle-related diseases resulting from factors like lack of exercise, alcohol consumption, smoking, obesity, hypertension, hyperlipidemia, and cardiovascular disease (8). In this study, the connection between lower urinary tract symptoms and metabolic syndrome was investigated. 23 patients had urinary incontinence among these 82.6% had metabolic syndrome and 17.4% didn't have metabolic syndrome,

Significant association of metabolic syndrome was found with urinary incontinence $P=0.000$. Burning micturition was reported in 49, among these 59.2% had metabolic syndrome and 86.2% were metabolically healthy, burning micturition was significantly associated with metabolic syndrome $P=0.000$, urinary urgency was complained by 58 patients out of these 44.8% had metabolic syndrome and significant association was discovered between urinary urgency and metabolic syndrome, with 55.2% of individuals not having metabolic syndrome ($P=0.001$), 93 patients were suffering from UTI among those 38.7% had metabolic syndrome and 61.3% were metabolically healthy, $P=0.000$ (significant association) and out of 58 BPH patients 40.4% had metabolic syndrome and 59.6% didn't have metabolic syndrome $P=0.02$ shows significant association between metabolic syndrome and BPH. No association between dribbling and metabolic syndrome $P=0.28$ was found in our study.

These findings were corroborated by another study, which examined the relationships between the rates of mild, moderate, or severe lower urinary tract symptoms (LUTS) and metabolic syndrome (MS). The study revealed that there was no significant association between MS and the presence of LUTS when compared to individuals without LUTS (9).

Metabolic syndrome affects not only the urinary system but also various other bodily systems. Researchers have examined the connection between metabolic syndrome and the severity and frequency of lower urinary tract symptoms (LUTS) (3). The association between voiding and storage symptoms with metabolic syndrome involves understanding the underlying pathological mechanisms related to atherosclerosis (9).

Atherosclerosis plays a crucial role in aging and is not fully understood in causing lower urinary tract symptoms (LUTS). One idea suggests that pelvic atherosclerosis could cause chronic lack of blood flow to the bladder, penis, and prostate, leading to LUTS problems (10).

The link between lower urinary tract symptoms (LUTS) and metabolic syndrome (MS) has been a topic of debate. Similar to our study, findings from long-term population studies have indicated no connection between measurements like body size, high blood pressure, or a history of diabetes and the development of clinical benign prostatic hyperplasia (BPH) (11). Another study by Temml et al. also found no significant associations between metabolic syndrome and overall LUTS severity or specific symptoms. They suggested that factors like nicotine use, which increase activity in the sympathetic nervous system, might contribute to LUTS instead.

In the present study, it was observed that life style factors of our study participants were associated with metabolic syndrome. 39 participants had stressful life out of these 71.7% had metabolic syndrome and 28.3% didn't have metabolic syndrome, significant association was found between metabolic syndrome and stressful life $P=0.000$, 63 subjects were physically active among these only 22.2% had metabolic syndrome remaining 77.8% were metabolically active, in our study no association was found between physical activity and metabolic syndrome. 8 subjects were involve in consumption of alcohol, 62.5%

developed metabolic syndrome while 37.5% didn't developed it $P=0.04$ shows significant association between alcohol consumption and metabolic syndrome, 87 candidates consumed vegetables more than 3 times a week out of these only 16.1% had metabolic syndrome and 83.9% were metabolically healthy, significant association was found between consumption of vegetables $P=0.000$ and fat content in diet $>2\text{tbsp/ day}$ was noted in 123 subjects, 22.7% had metabolic syndrome and 77.2% didn't have metabolic syndrome, $P=0.002$ shows significant association between these, statistically significant association $p=0.000$ between sedentary working environment was observed in our study as among 69 subjects who had sedentary working 46.3% developed metabolic syndrome and 53.6% were metabolically healthy.

Our study results aligned with those of another study, which found that moderate and severe lower urinary tract symptoms (LUTS) were linked to sleep disorders and stress. The study also identified several factors associated with moderate to severe LUTS, including age, lifelong smoking habits, marital status, income, job, and decreased levels of HDL-cholesterol. These findings were consistent with those of a previously published study (12).

According to our study, alcohol intake and exercise didn't show a connection with the presence of lower urinary tract symptoms (LUTS) in men. This suggests that preventing moderate to severe LUTS might require long-term lifestyle changes and maintaining stable socioeconomic conditions rather than short-term adjustments. However, because alcohol consumption and exercise were linked to reduced sleep disorders, it's important not to overlook the significance of moderating alcohol intake and engaging in regular exercise to enhance quality of life, especially for middle-aged men. Among the metabolic syndrome (MetS) and its components, only decreased HDL cholesterol was linked to moderate to severe LUTS, consistent with previous research (Jeong et al., 2022). Interestingly, hypertension was negatively associated with the severity of voiding symptoms but not storage symptoms. This might be due to the beneficial effects of angiotensin II receptor blocker medication for hypertension on relieving LUTS, as noted in prior studies (Ito et al., 2013), although further investigation is warranted to confirm these findings.

Conclusion

In this study, it was concluded that metabolic syndrome (MS) or its individual components could account for the association between MS and lower urinary tract symptoms (LUTS) in benign prostatic hyperplasia (BPH). Additionally, LUTS/BPH were found to be linked to lifestyle factors such as a sedentary lifestyle, low vegetable consumption, and high intake of fatty foods. These associations should be confirmed in larger, prospective studies for further validation.

Study Limitation

In our study, we refrained from conducting extensive analyses due to the relatively small sample size and insufficient information available. Furthermore, the cross-sectional study design limited our ability to draw definitive conclusions.

Because of this design limitation, we could only suggest a potential relationship between lifestyle factors and MetS-related variables with the presence of lower urinary tract symptoms (LUTS) and benign prostatic hyperplasia (BPH). Therefore, our results may not be applicable to the broader population of elderly men.

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Authors' contributions

All the authors contributed equally in data collection, analysis, and description of study.

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