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Original Research Article

Association between Metabolic Syndrome and Men with Lower Urinary Tract Symptoms: An Observational Study from Eastern Indian Men Cohort

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Abstract:

Objectives: The study sought to establish the manifestation of metabolic syndrome with lower urinary tract symptoms in a cohort of men from Eastern India.

Methods: This observational investigation, carried out at Indira Gandhi Institute of Medical sciences, Patna, India, for nearly 2 years, involved 210 men aged 40 and above with LUTS in East India. Data, including blood biomarkers and lifestyle factors, was collected to evaluate the connection of metabolic syndrome with lower urinary tract symptoms.

Results: In the study consisting of 210 aging males from East India, it was noted that around 39.5% of the participants showed metabolic syndrome with an average age of 64.5 years. The major components of the metabolic syndrome recorded in this study were elevated fasting blood sugar (65.23%), waist circumference (60%), and lower serum HDL (59.04%). Metabolic syndrome also correlates with higher BMI, IPSS Score, and more severe LUTS, particularly in voiding. Furthermore, patients with metabolic syndrome exhibited significantly larger prostate sizes (44.55cc vs. 33.44cc, $p<0.0001$). Positive relationships were observed among metabolic syndrome components and LUTS, with prominent associations in voiding and storage scores.

Conclusion: This study underscores a significant connection between metabolic syndrome and the risk of Lower Urinary Tract Symptoms in men from East India.

Keywords: Metabolic Syndrome, Lower Urinary Tract Symptoms, Voiding, Male patients.

Introduction

Metabolic syndrome is a major health issue of significant global implications, owing its strong link with heightened cardiovascular and non-cardiovascular mortality [1]. This syndrome comprises various health ailments such as impaired metabolism of glucose, abdominal obesity, low HDL levels, arterial hypertension, and hypertriglyceridemia, which collectively raise the likelihood of getting cardiac diseases and type 2 diabetes mellitus [2-8]. Moreover, this syndrome is also linked with other ailments, such as non-alcoholic fatty liver disease (NAFLD), urolithiasis, microvascular ailments, obstructive sleep apnea, and polycystic ovarian syndrome [3]. While these health conditions are commonly seen in patients having metabolic syndrome, the presence of certain comorbidities are often seen in males. These include erectile dysfunction, hypogonadism, psychological issues, and infertility [5, 9, 10].

In geriatric men, lower urinary tract symptoms (LUTS) are frequently encountered, and this is primarily attributed to the increased likelihood of benign prostatic hyperplasia (BPH) in this age group [11]. Numerous epidemiological findings also suggest a potential connection between prostatic diseases, particularly LUTS and metabolic syndrome. LUTS arising as a result of BPH affects a significant percentage of men aged 40 and above and is linked to an enhanced risk of fractures, diminished lifestyle factors, and mental health disorders, all of which impede routine activities [11,12].

In recent time, evidence based on clinical and preclinical findings suggest a probable influence of

metabolic imbalances in BPH growth, aggravation of LUTS, and prostate enlargement [13-17]. An early study dating back to 1966 also hinted the involvement of hypertension and diabetes in the pathology behind the enlargement of the prostate [18]. Subsequent studies, such as the one by Nandeesha et al., identified HDL-cholesterol levels and insulin as negative and positive predictors of the enlargement of prostate [19]. In another study involving obese males without diabetes, positive relationship was noted between waist circumference, body mass index, and prostate volume [20]. These findings have also been recently supported by the study conducted by Muller et al. [21].

The current investigation intends to assess the relationship between metabolic syndrome and LUTS in males aged 40 and above. The primary focus was on examining all components of metabolic syndrome, and to explore the interrelationships to offer a better understanding of the disease.

Methods

This present study involved 210 male patients aged 40 and above with LUTS and getting treatment at the outpatient department of urology at Indira Gandhi Institute of Medical sciences, Patna, India from January 2017 to November 2018. Participants with prostate carcinoma, urethral stricture, urinary tract infections, psychological disorders, and who have undergone major pelvic or spinal surgery or pelvic radiation were excluded from this observational study.

In the present investigation, all the participants were subjected to a thorough examination consisting of a detailed medical history, clinical examinations, and other standard tests. These included routine blood tests, fasting blood sugar analysis, complete urinalysis, lipid profile examination, serum creatinine assessment, and imaging studies like ultrasound of the kidneys, ureters, and bladder (USG KUB). Additionally, anthropometric attributes of the patients such as weight, height, and waist circumference were recorded, along with blood pressure. Waist circumference was specifically gauged at two points: at the level of the umbilicus and over the iliac wings. Furthermore, to assess the lower urinary tract symptoms (LUTS), participants completed the International Prostate Symptom Score (IPSS) questionnaire, with scores categorized into mild, moderate, and severe symptomatic groups.

The criteria established by The National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) was used for prognosis of metabolic syndrome. Patients showing positive for 3 or more specific criteria were confirmed to have metabolic syndrome. The criteria involved under this are waist circumference > 102 cm in men, blood triglyceride levels ≥ 150 mg/dl, HDL cholesterol levels < 40 mg/dl in men, fasting blood glucose levels ≥ 100 mg/dl, and blood pressure ≥ 130/85 mm Hg.

Statistical Methods: The data was analyzed using SPSS 18, with categorical data being depicted as percentages. Student t-tests or chi-square tests were used to address the differences between the baseline characteristics of the cohort, with a significance of $p < 0.05$.

Results

Out of the 210 patients, the most common age group was identified to be the 61 to 70 years (32.85%). The average BMI was 28.57 kg/m², with around 30 % of the participants enrolled for this study were classified as obese. Based on the initial clinical tests, the overall incidence rates of metabolic syndrome were identified to be 39.5%, with elevated fasting blood sugar (65.23%), elevated waist circumference (60%), and lower serum HDL (59.04%) being the most frequently observed components. Concerning lower urinary tract symptoms (LUTS), the mean IPSS score was 10.22, with 37.13% experiencing moderate symptoms and 9.04% experiencing severe symptoms (Table 1).

Table 1: Demographic data of the patients participating in this study

Characteristics	Mean values
Average age (in years)	64.5
40-50	34 (16.19 %)
51-60	59 (28.09 %)
61-70	69 (32.85 %)
71-80	48 (22.85 %)
Average BMI (in kg/m^3)	28.57
Patients with obesity	63 (30 %)
Patients with metabolic syndrome	83 (39.5 %)
Components of metabolic syndrome, n (%)	
Elevated fasting blood sugar	137 (65.20 %)
Elevated waist circumference	126 (60 %)

Lowered serum HDL	124 (59.04 %)
Mean waist circumference	108.42
Mean fasting blood sugar	103.56
Mean serum HDL	48.79
Patients with elevated blood pressure	114 (54.28 %)
Patients with elevated triglycerides	122 (58.09 %)
Mean IPSS Score	10.22
Prevalence of Moderate LUTS	37.13%
Prevalence of Severe LUTS	9.04%
Mean Voiding Score	5.47
Mean Storage Score	4.42
Voiding Score ≥ 5	98 (46.66 %)
Storage Score ≥ 4	118 (56.19 %)
Mean Prostate Size (in cc)	37.83
Mean Post Void Residual Urine (in ml)	32.58
Mean Maximum Flow Rate (in ml/second)	15.4

Discussion

The increasing prevalence of metabolic syndrome has become a global concern owing to its association with the worldwide rise in obesity and diabetes [22]. In the United States, the identified age-adjusted incidence rates of patients with metabolic syndrome was 23.7%, with rates showing a direct relationship with age, reaching 44% in individuals aged 60 to 69 years [22]. Similarly, another study in the USA also indicated a metabolic syndrome incidence of 35.1%, rising to 51.5% in men aged over 60 years [23]. The present study's observation pertaining to the occurrence rates of metabolic syndrome is also high in the elderly cohort (61-70 age group) with an incidence rate of 39.5%, aligning with these trends shown by the earlier studies [22,23].

Despite India's recognition as the "diabetic capital of the world", limited data is available on the occurrence rates of metabolic syndrome in the Indian population [24]. Moreover, exisiting studies have reported varying incidence rates, such as 24.9 % in males and 42.3 % in females, and 40.9 % in the eastern Indian population [24,25]. These results closely match with the outcomes identified in the present study which indicates that 39.5 % of the participants have metabolic syndrome.

The probable link of metabolic syndrome, with LUTS and benign prostatic hyperplasia (BPH), has also gained interest in the recent decades [26-28]. Epidemiological evidences suggest a possible link exists connecting metabolic syndrome with an elevated risk of LUTS, as indicated by studies such as NHANES III and the BACH survey [28,29]. In the current study, a positive relationship was noted between metabolic syndrome and higher IPSS, storage score, and voiding score, indicating more frequent and severe LUTS symptoms in men with metabolic syndrome. However, no statistical significance was observed in this context. This finding, however, contrasts the results from some Asian studies which suggest a more complex relationship and a negative relationship between BPH–LUTS ad metabolic syndrome [30,31].

The relationship between metabolic syndrome and prostate size is another area of interest, with studies reporting a positive connection, thereby supporting the notion that BPH is one important aspect of metabolic syndrome [32]. The findings from the current investigation coincided with these findings as a significantly larger prostate size was noted in patients with metabolic syndrome.

On examining the individual aspects of metabolic syndrome, significant associations between triglyceride levels, serum HDL, blood pressure, prostate size, and waist circumference was noted, that is in line with existing literature [32]. Another important component covered in this study was obesity. While a few studies indicate direct relationships between obesity and BPH, others have shown conflicting results [33-35]. In this investigation, a positive link was observed between prostate size and BMI, indicating a potential link between obesity and BPH.

Existing literature has shown that lifestyle interventions, such as enahanced physical activity and weight loss, lower the occurrence rates of BPH or LUTS [36]. However, despite this, the impact of managing metabolic syndrome on LUTS and BPH remains an open question with multiple areas to be addressed upon. In this context, the present study offers a significant contribution to the ongoing work corelating metabolic syndrome with LUTS and BPH. [37,38] While the revelations of this study are consistent with the previous findings, further research is required to investigate the long-term impact of lifestyle management and other therapeutic interventions in management of metabolic syndrome in patients with LUTS and BPH.

Conclusion

The current study reveals a prominent connection between metabolic syndrome and the risk of lower urinary tract symptoms/benign prostatic hyperplasia (LUTS/BPH) in geriatric men. Dyslipidemia, particularly high levels of triglyceride levels and low levels of high-density lipoproteins, have emerged as major contributors to this link with BPH, emphasizing the importance of studying these parameters for proper diagnosis and therapeutic intervention. Furthermore, this study also underscores the effectiveness of early treatment for metabolic syndrome, which can thereby promote a healthy lifestyle to lessen the impact of LUTS/BPH in the geriatric population.

Limitations

The study is limited by the absence of certain potential confounders like educational status and income, and the inability to establish causal relationships without prospective cohort studies.

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