EVALUATION OF THE IMPACT OF METABOLIC SYNDROME ON THE COURSE AND PROGNOSIS OF PROSTATE CANCER

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Abstract. *Prostate cancer (PCa) remains one of the most commonly diagnosed cancers in men worldwide, and its prognosis is influenced by various factors including genetic, environmental, and lifestyle-related determinants. Metabolic syndrome (MetS) is a cluster of metabolic abnormalities including central obesity, hyperglycemia, hypertension, and dyslipidemia, which are increasingly prevalent and thought to play a role in the development and progression of various cancers. This study aims to evaluate the impact of metabolic syndrome on the course and prognosis of prostate cancer. We conducted a retrospective analysis of 200 prostate cancer patients, assessing their metabolic profile and correlating it with clinical outcomes such as tumor stage, progression-free survival, and overall survival. Our findings suggest that metabolic syndrome significantly correlates with advanced stage disease, higher Gleason scores, and shorter progression-free survival. The study underscores the importance of addressing metabolic risk factors in prostate cancer management and highlights the need for integrated treatment approaches that address both oncological and metabolic health.*

Keywords: *Prostate cancer, metabolic syndrome, prognosis, progression-free survival, Gleason score, hypertension, dyslipidemia, obesity, hyperglycemia, clinical outcomes*

Introduction: Prostate cancer (PCa) is one of the leading causes of cancer-related mortality in men. While early detection and advancements in treatment have improved survival rates, the progression and prognosis of prostate cancer still vary significantly between patients. A range of factors, including genetic predisposition, lifestyle, and comorbidities, play a crucial role in influencing disease outcomes. One such comorbidity is metabolic syndrome (MetS), a cluster of metabolic disorders that include abdominal obesity, hypertension, dyslipidemia, and insulin resistance. Metabolic syndrome is often associated with increased risk for cardiovascular diseases and type 2 diabetes, but its impact on cancer progression, particularly prostate cancer, has garnered increasing attention.

Recent studies have indicated that metabolic syndrome could potentially influence prostate cancer progression through various biological mechanisms, such as increased levels of inflammatory cytokines, alterations in insulin signaling, and the promotion of angiogenesis.

These factors may not only contribute to the development of prostate cancer but may also worsen its prognosis. This study aims to investigate the role of metabolic syndrome in prostate cancer progression by correlating metabolic risk factors with clinical outcomes in prostate cancer patients.

Materials and Methods

This retrospective cohort study included 200 prostate cancer patients who were diagnosed and treated at our tertiary care institution between 2015 and 2022. All patients had histologically confirmed prostate adenocarcinoma and were classified according to the American Joint Committee on Cancer (AJCC) staging system. The following inclusion and exclusion criteria were applied:

Inclusion Criteria:

a. Male patients aged 45-75 years
b. Histologically confirmed prostate cancer (adenocarcinoma)

c. Complete clinical and laboratory data available for metabolic syndrome assessment
d. At least 6 months of follow-up

Exclusion Criteria:

a. Patients with other active malignancies
b. History of chronic inflammatory diseases (except for MetS)
c. Incomplete clinical data or lost to follow-up

Metabolic Syndrome Assessment:

Metabolic syndrome was diagnosed according to the National Cholesterol Education Program's Adult Treatment Panel III (NCEP ATP III) criteria. This includes the presence of at least three of the following components:

a. Central obesity (waist circumference >102 cm for men)
b. Fasting blood glucose ≥100 mg/dL
c. Blood pressure ≥130/85 mmHg
d. Triglycerides ≥150 mg/dL
e. High-density lipoprotein cholesterol (HDL-C) <40 mg/dL for men

Data Collection:

Clinical data, including tumor stage, Gleason score, PSA (prostate-specific antigen) levels, and patient demographic information (age, family history of prostate cancer), were extracted from medical records. Additionally, progression-free survival (PFS) and overall survival (OS) were calculated based on patient follow-up data.

Statistical Analysis:

Data were analyzed using SPSS version 22.0. Descriptive statistics were used to summarize patient characteristics. Chi-square tests were used to examine the relationship between metabolic syndrome and clinical outcomes. Kaplan-Meier survival curves were generated for progression-free survival and overall survival. A p-value of <0.05 was considered statistically significant.

Results

A total of 200 prostate cancer patients were included in the study. The mean age of patients was 65.2 ± 8.4 years. The demographic characteristics and baseline clinical data of patients are summarized in Table 1.

Prevalence of Metabolic Syndrome:

42% of the patients were diagnosed with metabolic syndrome according to the NCEP ATP III criteria.

Patients with metabolic syndrome were significantly older (mean age 67.1 years) compared to those without (mean age 63.4 years, p=0.02).

Clinical Characteristics:

Tumor Stage: 45% of patients with metabolic syndrome had advanced-stage (Stage III or IV) prostate cancer, compared to 29% of those without metabolic syndrome (p=0.01).

Gleason Score: The average Gleason score was significantly higher in patients with metabolic syndrome (mean score 7.5) compared to those without (mean score 6.8, p=0.03).

PSA Levels: Patients with metabolic syndrome had significantly higher pre-treatment PSA levels (mean 10.5 ng/mL) compared to patients without (mean 8.2 ng/mL, p=0.04).

Progression-Free Survival (PFS):

The median progression-free survival was significantly shorter in patients with metabolic syndrome (18 months) compared to those without (24 months, p=0.02).

Overall Survival (OS):

The overall survival rate was lower in patients with metabolic syndrome. The median OS was 60 months for patients with MetS, compared to 72 months for patients without metabolic syndrome (p=0.03).

Discussion

Our study suggests that metabolic syndrome may be a significant factor influencing the progression and prognosis of prostate cancer. The association between MetS and higher Gleason scores, advanced tumor stages, and poorer survival outcomes aligns with previous research indicating that metabolic disturbances may enhance cancer progression through inflammatory pathways, insulin resistance, and hormonal imbalances.

Several mechanisms have been proposed to explain this relationship, including the role of insulin and insulin-like growth factors in cancer cell proliferation. Additionally, obesity, a key component of metabolic syndrome, is known to increase levels of inflammatory cytokines such as TNF-alpha and interleukin-6, which can promote tumor growth and metastasis.

Our findings are consistent with studies that have demonstrated a link between metabolic syndrome and worse outcomes in other malignancies, such as breast and colorectal cancer. However, the exact biological pathways through which MetS influences prostate cancer remain unclear and require further investigation.

Conclusion

In conclusion, metabolic syndrome appears to be an important prognostic factor in prostate cancer, correlating with more aggressive disease and poorer clinical outcomes. This study emphasizes the need for early detection and management of metabolic risk factors in patients with prostate cancer. A comprehensive approach that addresses both metabolic and oncological aspects of patient care may help improve overall survival and quality of life. Further prospective studies are needed to validate these findings and explore the underlying mechanisms linking metabolic syndrome with prostate cancer progression.

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