
**ANALYSIS OF LONG-TERM UROGENITAL SYSTEM DISORDERS IN
PATIENTS RECOVERED FROM COVID-19**

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Abstract

This article investigates the long-term urogenital system disorders in patients who have recovered from COVID-19. The study focuses on kidney function, urinary tract, and male and female reproductive health. Clinical observations revealed significant post-COVID changes in nephrological and reproductive functions. The article analyzes the pathophysiological mechanisms, laboratory and instrumental diagnostics, and promising therapeutic approaches.

Keywords: COVID-19, urogenital system, kidney function, reproductive health, post-COVID syndrome

Introduction

In recent years, the COVID-19 pandemic has emerged as one of the most significant global health challenges. This viral infection rapidly spread worldwide, demonstrating that it is not merely an acute respiratory illness but a complex pathology that can cause long-term complications in multiple organs and systems. Initially, COVID-19 was considered primarily a respiratory disease affecting lung tissue. However, subsequent clinical and laboratory studies confirmed that this infection impacts the entire body. The virus enters the body by binding to angiotensin-converting enzyme 2 (ACE2) receptors, which are expressed not only in the respiratory tract but also in the heart, liver, gastrointestinal tract, central nervous system, and urogenital system. Particularly noteworthy are the long-term changes observed in the kidneys and reproductive organs, which significantly affect patients' quality of life and reproductive health.

The urogenital system plays a crucial role in maintaining fluid balance, regulating metabolism, removing toxins, and supporting sexual and reproductive function. Therefore, dysfunctions in this system after COVID-19 are of great clinical importance. Current research indicates that 30–40% of patients recovering from COVID-19 experience varying degrees of urogenital system impairment. Worsening kidney function, proteinuria, hematuria, urinary disorders, decreased testosterone levels and sperm quality in men, and menstrual cycle irregularities in women are among the most frequent post-COVID complications.

Scientific analyses show that SARS-CoV-2 directly damages kidney glomeruli and tubular epithelium and triggers excessive immune activation, resulting in inflammation. Consequently, there is an increased risk of chronic kidney disease, reproductive dysfunction, and susceptibility to urinary tract infections.

These conditions represent not only a medical concern but also a public health challenge since long-term urogenital disorders affect work capacity, demographic indicators, and economic stability. Therefore, in-depth research, systematic clinical observation, laboratory evaluation, and the development of effective diagnostic and therapeutic approaches are essential priorities.

Relevance of the Study

The COVID-19 pandemic has put global healthcare systems under unprecedented stress. Although initially studied as an acute respiratory infection, further clinical and laboratory research has demonstrated that COVID-19 exerts a lasting impact on multiple organ systems. Urogenital system involvement has emerged as one of the most clinically significant post-COVID complications.

Kidney dysfunction, increased risk of chronic kidney disease, urinary tract abnormalities, hormonal imbalance and spermatogenesis disorders in men, and menstrual irregularities in women are now frequently reported.

Epidemiological data show that 30–40% of patients experience some level of urogenital dysfunction after COVID-19. This represents not merely an individual health issue but a problem with major social and economic implications.

The relevance of this topic can be explained by several key factors:

Scientific: Studying the mechanisms of SARS-CoV-2 effects on the urogenital system provides a basis for developing new diagnostic and therapeutic strategies.

Practical: There is a growing need for regular patient follow-up, laboratory monitoring, and early detection of urogenital dysfunction in the post-COVID period.

Social: Reproductive health impairment has direct consequences for population growth, family stability, and workforce availability.

Preventive: Early diagnosis and timely preventive measures are crucial to reduce post-COVID complications.

Thus, studying long-term urogenital system disorders in COVID-19 survivors is both scientifically and clinically urgent. Such research will help improve diagnostics, treatment quality, and ultimately the health and quality of life of affected patients.

Literature Review

Recent research has confirmed that COVID-19 affects not only the respiratory system but also other organ systems, including the urogenital tract. SARS-CoV-2 utilizes ACE2 receptors to enter kidney tissue, testes, and ovarian cells, thereby impairing their function.

Renal dysfunction is among the most common complications in COVID-19 patients. Clinical studies report that 20–30% of hospitalized patients develop acute kidney injury, with some progressing to chronic kidney disease.

In men, COVID-19 is often associated with impaired spermatogenesis, reduced testosterone levels, and sexual dysfunction. Histological studies have documented orchitis-like inflammatory changes and structural damage in testicular tissue.

In women, menstrual irregularities, hormonal imbalance, and decreased ovarian activity have been reported. Some studies also indicate long-term reproductive health changes in post-COVID patients.

Urinary tract symptoms such as pollakiuria, dysuria, and nocturia are frequently described in the literature, possibly related to viral effects on bladder epithelium.

Overall, current evidence highlights that long-term urogenital complications after COVID-19 represent a significant scientific and clinical issue, warranting further research and extensive clinical observation.

Materials and Methods

Study Design and Participants:

This study was conducted between 2022 and 2023 at the Republican Specialized Urology and Nephrology Center.

Total participants:120

80 patients recovered from COVID-19 (study group)

40 healthy individuals with no history of COVID-19 (control group)

Age range: 20–60 years (60% male, 40% female)

Methods:

1.Clinical Interview: Disease severity, post-COVID urinary symptoms, and sexual dysfunction were recorded.

2.Laboratory Tests:

- Urinalysis
- Blood biochemistry (creatinine, urea, electrolytes)
- Hormonal tests (testosterone, LH, FSH, estradiol)

3. Imaging:

- Renal ultrasound
- Scrotal ultrasound (in men)
- Transvaginal ultrasound (in women)

4. Functional Evaluation:

- Calculation of glomerular filtration rate (GFR)
- Sperm analysis (in men)
- Menstrual cycle and ovulation monitoring (in women)

Statistical Analysis:

Data were processed using SPSS 25.0 software. Mean values and standard deviations were calculated. Group differences were assessed using Student's t-test and χ^2 test. $p < 0.05$ was considered statistically significant.

Results**1. Clinical Symptoms:**

- 42% of patients reported frequent urination, 36% dysuria, 28% lower abdominal or lumbar discomfort.
- 31% of men experienced erectile dysfunction, and 24% of women had menstrual irregularities.
- Such findings were significantly less frequent in the control group ($\leq 7\%$).

2. Laboratory Findings:

- Creatinine levels were 1.5 times higher in the study group ($p < 0.05$).
- Proteinuria (22%) and microhematuria (18%) were observed.

Hormonal analysis showed:

- 25% decrease in testosterone levels in men
- Altered LH/FSH ratio in women

3. Imaging Findings:

- **Diffuse pyelonephritic changes were seen in 27% of patients.**
- Fibrotic changes in renal parenchyma were found in 18%.
- Signs of subacute orchitis were noted in men, and delayed ovulation was observed in women.

4. Functional Parameters:

- GFR decreased by 15% on average ($p < 0.01$).
- Sperm motility was reduced by up to 30%.
- Menstrual disturbances persisted in 20–25% of women during follow-up.

Discussion

Our findings demonstrate that COVID-19 has a significant long-term impact on urogenital function.

Renal Changes: Proteinuria, hematuria, and decreased GFR are consistent with SARS-CoV-2–induced direct nephrocyte damage via ACE2 receptor binding, which is well documented in international studies.

Reproductive Changes: Lower testosterone levels and impaired spermatogenesis in men likely result from inflammation and fibrosis of testicular tissue. In women, menstrual irregularities and hormonal imbalance are possibly due to hypothalamic–pituitary–ovarian axis dysfunction.

Long-Term Sequelae: Full recovery of urogenital function may not occur within 6–12 months, and some patients may develop irreversible fibrotic changes.

Clinical Implications: Physicians should not ignore urogenital complaints in post-COVID patients. Routine renal function tests, hormonal profiling, and reproductive health evaluations should be included in post-COVID follow-up protocols.

Practical Recommendations

1. **Regular Monitoring:** Post-COVID patients should undergo urogenital system evaluation for at least 6–12 months.
2. **Renal Function Surveillance:** Routine urinalysis, creatinine, and GFR assessment should be performed.
3. **Reproductive Health Assessment:** Testosterone levels and sperm analysis in men; menstrual and hormonal monitoring in women.
4. **Dispensary Registration:** Patients with persistent dysfunction should be placed under regular follow-up.
5. **Rehabilitation Programs:** Personalized rehabilitation aimed at restoring kidney function and hormonal balance.
6. **Preventive Measures:** Lifestyle modification, nutrition, physical activity, and stress management.
7. **Further Research:** Continued studies to better understand mechanisms and develop novel therapeutic approaches.

Conclusion

COVID-19 has significant long-term effects on the urogenital system. Persistent kidney dysfunction (proteinuria, hematuria, elevated creatinine) and reproductive disturbances (hormonal imbalance, impaired spermatogenesis, menstrual irregularities) were observed in a substantial proportion of patients.

Our findings confirm that post-COVID monitoring, timely diagnostics, rehabilitation, and preventive measures are essential for improving patients' quality of life and reducing the risk of future complications.

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