Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic erupted in December 2019. As the viral infection is driven by increased angiotensin-converting enzyme-2 (ACE2) expression, with the urothelial cells exhibiting a high expression, it is logical to think that there may be an increase in the frequency of lower urinary tract symptoms (LUTS) in patients diagnosed with coronavirus disease 2019 (COVID-19)(1, 2). There does not exist a relationship between the presence of the virus in the urine and the presence of urological symptoms(3–6). The increase in inflammatory cytokines in the urine and bladder inflammation might be responsible for the presence of associated bladder dysfunction(2,7,8). This is a very little studied subject, and the few studies present a low sample size as well as quite disparate results.

This study aims to examine the effects of infection with SARS-CoV-2 on the male and female genitourinary tract, especially if there is a change in the frequency of genitourinary tract symptoms (consistent with urinary incontinence (UI), urinary tract infection (UTI), urinary retention (UR), hematuria, erectile dysfunction (ED) and neurogenic detrusor (ND) and acute kidney failure (AKF) in the different waves of COVID19, as well as a possible oscillation in the symptoms frequency related to comorbidities and demographic variables, using the medical records of patients who have been hospitalized for this infection.

RESULTS

There were a total of 4,661 unique patients. Urological symptoms were found to be increased in COVID-19 patients, reaching 21.1% of them. The largest proportion of patients come from the first wave (1,492; 32.0%), followed by the second wave (1,062; 22.8%), third (903; 19.4%), fourth (391; 8.4%), fifth (246; 5.3%) and sixth wave (567; 12.2%). Of the 4,661 unique patients, 2,483 (53.3%) were men and 2,178 (46.7%) were women. The mean age of the patients was 69.1 (SD 17.2). Only 74 (1.5%) patients were foreigners.

The median age was statistically significant higher for those patients with urological diseases (Table 1). The gender proportion was very close. Additionally, this group presented a higher percentage of comorbidities (78.9% vs 57.5%) being the all comorbidities higher and statistical different for those without LUTS. Statistical comparisons were conducted by parametric or nonparametric tests for quantitative variables, and χ² test for qualitative variables.

HYPOTHESIS / AIDS OF STUDY

The frequency of the different urological diagnosis varied between the waves (Table 2). We analyzed the distribution of demographic variables (sex and age), length of stay and comorbidities in each of the waves in order to explain the frequency change of the different urological diagnosis (Table 2). Male gender was higher in all waves except in the 6th wave, however this difference was not significant (P > 0.05). For age, we found that the median age was significantly higher for the 6th wave against the rest (P ≤ 0.001). The median length stay was higher in the 2nd,3rd, 4th waves. For the comorbidities, we found that in the 6th wave the percentage was significantly lower to the other waves, followed to the 1st wave. Between these comorbidities we found that smokers and former smokers were more frequent in the 4thth wave (32.2%) and in the 6th wave the lowest frequency (15.2%). Mortality was higher in the 1st wave, reaching up to 17.4% of COVID-19 cases. The urological history was significantly lower in the 6th than in the other waves.

The difference among gender in each wave showed that for males the diagnosis AKF was significantly higher for the 1st (14.2% vs 9.4%) and 2nd waves (11.3% vs 7.1%), and hematuria diagnosis in the 3rd wave (1.7% vs 0.0%). On the other hand, the presence of UI diagnosis and UTI was higher for females, being significantly higher for 1st (urinary incontinence diagnosis: 3.1% vs 1.0%) and 2nd wave (UI diagnosis: 3.0% vs 1.1%; UTI: 16.1% vs 6.3%).

CONCLUDING MESSAGE

Clinicians should be aware of these symptoms of the disease, leading to a faster therapeutic procedure and consequently reducing the mortality rate.
FIGURE 2

| Table 2. Urological diagnosis depending on COVID-19 waves. |
|---------------------------------------------------------|
| Demographic variables                                   |
| Gender                                                  |
| Male (n = 1,492)                                        |
| Female (n = 1,062)                                      |
| Age range                                               |
| 70 [19-101]                                             |
| 70 [22-105]                                             |
| 72 [21-104]                                             |
| 71 [19-102]                                             |
| 71 [18-102]                                             |
| 77 [17-101]                                             |
| Length of stay                                          |
| 7 [1-179]                                               |
| 6 [1-163]                                               |
| 9 [0-341]                                               |
| 8 [1-130]                                               |
| 7 [0-127]                                               |
| 7 [0-79]                                                |
| Comorbidities                                           |
| Diabetes (n = 426)                                      |
| Smoking and former smoker (n = 205)                     |
| Death (n = 164)                                         |
| Urological history                                      |
| 142 (9.9%)                                              |
| 112 (10.8%)                                             |
| 91 (10.0%)                                              |
| 42 (10.7%)                                              |
| 27 (11.8%)                                              |
| 32 (10.6%)                                              |
| Diagnosis                                               |
| Acute kidney failure (n = 179)                          |
| Urinary incontinence (n = 99)                           |
| Urinary tract infection (n = 150)                        |
| Urinary retention (n = 32)                              |
| Hematuria (n = 10)                                      |
| Erectile dysfunction (n = 0)                            |
| Neurogenic bladder (n = 0)                              |
| Total (n = 296)                                         |

* Significant differences (p<0.05) are indicated by bold text.

REFERENCES

1. Zou X, Chen K, Zou J, Han P, Hao J, Han Z. Single-cell RNA-seq data analysis on the receptor ACE2 expression reveals the potential risk of different human organs vulnerable to 2019-nCoV infection. Front Med. 2020;14(2):185-192. doi:10.1007/s11684-020-0754-0

2. Lamb LE, Timar R, Wills M, et al. Long COVID and COVID-19-associated cystitis (CAC). Int Urol Nephrol. 2022;54(1):17-21. doi:10.1007/s11255-021-03030-2

3. Chan VWS, Chiu PKF, Yee CH, Yuan Y, Ng CF, Teoh JYC. A systematic review on COVID-19: urological manifestations, viral RNA detection and special considerations in urological conditions. World J Urol. 2021;39(9):3127-3138. doi:10.1007/s00345-020-03246-4

Funding None Clinical Trial No Subjects Human Ethics Committee Medical and Media Research Ethics Committee Helsinki Yes Informed Consent Yes

Continence 2S2 (2022) 100470
doi: 10.1016/j.cont.2022.100470