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Vaccination Status and Effectiveness of COVID-19 Vaccines in Patients with Prostate and Bladder Cancer

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ABSTRACT

Considering the importance of understanding COVID-19 prevalence and vaccine effectiveness in individuals dealing with bladder or prostate cancer, as well as the plausible adverse repercussions of immunization, this study was undertaken to assess the prevalence and vaccination rates of COVID-19 in this group of patients. Furthermore, the investigation seeks to evaluate potential adverse effects and the efficacy of vaccines in patients diagnosed with prostate and bladder cancer. In this cross-sectional study conducted from 2020 to 2022, we systematically extracted clinical and demographic information, COVID-19 diagnoses, clinical symptoms, and paraclinical data from the bladder and prostate cancer registry at our institution. Our analysis encompassed assessing the frequency of COVID-19 infections, vaccination rates, and the occurrence of adverse effects associated with vaccination within this specific cohort. Among the 249 enrolled patients, COVID-19 infection was confirmed in 19.4% of bladder cancer patients and 16.6% of prostate cancer patients. A substantial majority, 81% (202 patients), had received vaccination, with the Sinopharm vaccine being the preferred choice for the majority (90%). The study's outcomes reveal a vaccine efficacy of 82% in individuals with bladder cancer, while displaying a higher efficacy of 96% among patients with prostate cancer. This study provides evidence supporting the efficacy of the SARS-CoV-2 vaccine in reducing COVID-19-associated complications and mortality, as well as its high efficacy in patients with prostate and bladder cancer.

Keywords: COVID-19, vaccination, prostate cancer, bladder cancer

INTRODUCTION:

Since March 2020, the WHO has declared a global emergency due to the spread of a new beta coronavirus called SARS-CoV-2. There have been millions of reported cases and fatalities worldwide (1). Several factors, including racial differences and underlying conditions like obesity, diabetes, and cardiovascular disease, have been linked to a higher susceptibility to the disease and an increased risk of mortality (2).

Due to their compromised conditions, cancer patients appear to be at a higher risk of contracting the coronavirus infection and more susceptible to its complications and mortality (3, 4). Understanding the epidemiological characteristics of COVID-19 and the associated risk factors is crucial for the development of effective public health strategies. Infection or the severity and progression of COVID-19 should be prevented among cancer patients, and vaccination is the most effective method for achieving this objective. Several highly effective COVID-19 vaccines have been developed and introduced to the market at an unprecedented rate thanks to global efforts. Receiving at least two doses of the vaccine has substantially reduced the incidence of severe COVID-19 in the general population in many regions of the world. Most countries have adopted the National Comprehensive Cancer Network's (NCCN) recommendation that cancer patients with a high risk of severe COVID-19 infection should receive vaccination priority. Important questions and concerns remain, however, regarding the mechanisms of action and efficacy of these vaccines in this group of patients, as the immune system dysfunction caused by the disease and its treatment may result in a reduced immune response following vaccination, thereby compromising the vaccine's efficacy. In addition, due to their immunocompromised condition, many cancer patients have been excluded from clinical trials investigating the efficacy of vaccines (5, 6).

Although previous studies have investigated the efficacy and safety of COVID-19 vaccination in cancer patients in general(7, 8), no prior study has evaluated the prevalence of COVID-19, vaccination rates, and their efficacy in Iranian patients with urological malignancies (prostate and bladder). The prevalence and rate of COVID-19 vaccination, as well as the possible complications of vaccination and the efficacy of the vaccine in patients with prostate and bladder cancers, were the objectives of the present study, which was designed to determine the prevalence and rate of COVID-19 vaccination, as well as the possible complications of vaccination and the efficacy of the vaccine.

Materials and Methods:

Design

Between the years 2020 and 2022, this cross-sectional study was carried out. The study's protocol received approval from the institutional review board, and written informed consent was obtained from all participating individuals. This investigation exclusively involved individuals who had confirmed diagnoses of either bladder cancer or prostate cancer and who were actively receiving treatment at a referral center for urological cancers. Information encompassing demographic details, clinical records, COVID-19 status, clinical symptomatology, and paraclinical data, were meticulously collected from the institution's registry system. Notably, the study's criteria excluded individuals with prior history of malignancies, metastatic cancer, or any familial or genetic conditions.

Statistical analysis

Categorized data were presented as percentages and compared applying Chi-square test in statistical analysis. For quantitative data, either the t-test or the one-way analysis of variance (ANOVA) was utilized, with a predefined significance level of 0.05. All statistical analyses were performed using SPSS software (Version 16).

Results:

A total of 249 cases were included in our study, comprising 103 and 146 patients with bladder and prostate cancers, respectively (Table 1). In the bladder

cancer group, 20 patients (19.4%) had contracted COVID-19 until the day of data acquisition (COVID-positive) (Confirmed using polymerase chain reaction (PCR) (11, 55.0%), according to symptoms, transmission evidence, and physician opinion (7, 35.0%), or based on chest computed tomography (CT) (2, 10.0%)) (Table 2). Number of COVID-positive cases in the prostate cancer group was 24 (16.4%) (confirmed via PCR = 19 (79.2%), symptoms = 4 (16.7%), CT = 1 (4.2%)). There was no difference in age, gender, risk factors, comorbidities, and tumor grade or Gleason score between the COVID-positive and negative cases in either of the groups. Five out the forty-four patients (11.4%) were hospitalized (hospitalization time 18.2 ± 10.4 days), one (5.0%) from the bladder cancer group (30 days) and four (16.7%) from the prostate cancer group (15.3 ± 9.3 days), with one patient from each group requiring intensive care. Bladder and prostate cancer groups were statistically similar in all aspects (Table 2).

A total of 202 (81.1%) patients were vaccinated (Table 3). Most of the cases had received the Sinopharm vaccine (182, 90.1%), followed by AstraZeneca (11, 5.4%), Barekat (5, 2.5%), and Sputnik (4, 2.0%). No statistical difference was observed in vaccine type between the two cancer groups. A total of 27 (13.4%) patients exhibited mild adverse reactions to the administered vaccines. Among them, six belonged to the bladder cancer group (constituting 7.2% of the bladder cancer patient cohort), which was notably lower than the incidence among patients diagnosed with prostate cancer (21 patients, accounting for 17.6%, with a statistically significant difference of $p = 0.032$).

The percentage of patients who had received COVID-19 vaccination were similar in COVID-positive and negative cases in both bladder cancer (80.0% vs 80.7%, respectively, $p = 1.000$) and prostate cancer groups (79.2% vs 82%, respectively, $p = 0.775$) (Table 1); however, only 6 (30%) and 2 (8.3%) of the Covid-positive patients in the bladder and prostate cancer groups, respectively, were inoculated before acquiring Covid-19. This results in a risk ratio of 0.18 (vaccine effectiveness = 82%, $p < 0.001$) in bladder cancer patients and 0.04 (vaccine effectiveness = 96%, $p < 0.001$) in prostate cancer patients.

Discussion:

During the COVID-19 pandemic, the surveillance, diagnosis, and treatment of cancer patients were substantially impacted on a global scale (9). In addition to the threats posed by acute complications and mortality due to COVID-19 in cancer patients, recent evidence suggests that COVID-19 can disrupt the continuity of oncological care, and reports indicate that nearly 15% of cancer patients who have recovered from the acute phase have been affected by this situation(10) multicentre registry study</title><secondary-title>The Lancet Oncology</secondary-title></titles><periodical><full-title>The Lancet Oncology</full-title></periodical><pages>1669-1680</pages><volume>22</volume><number>12</number><dates><year>2021</year></dates><isbn>1470-2045</isbn><urls></urls></record></Cite></EndNote>.

The development of COVID-19 vaccines has resulted in a significant reduction in the risk of severe COVID-19 infection and mortality, as a result of a global effort. Vaccines have demonstrated efficacy in reducing the severity of COVID-19, despite their limited effectiveness in controlling viral transmission, particularly with the advent of novel variants(11-13).

Prior to the pandemic, the majority of cancer patient vaccination studies focused on vaccines against influenza, pneumococcal infection, hepatitis B, or varicella reactivation, and the clinical benefits of vaccination for the majority of infections were already established(14-16). Recent studies have examined the clinical efficacy and safety profiles of SARS-CoV-2 vaccines in a variety of cancer types, regardless of their prior exposure to anticancer therapy(17-20). Antibody response has been confirmed in over 90 percent of solid tumor patients after SARS-CoV-2 vaccination, which is comparable to the general population(21-23).

Starting in January 2022, a total of 10 COVID-19 vaccines had been granted Emergency Use Authorizations

(EUAs) by the World Health Organization (WHO) and the Food and Drug Administration (FDA), including Pfizer-BioNTech, Oxford/AstraZeneca, Serum Institute of India (Oxford/AstraZeneca formulation), Janssen (Johnson & Johnson), Moderna, Sinopharm (Beijing), Sinovac, Bharat Biotech and Novavax(6). In a trial that examined data from three continents, the Oxford-AstraZeneca vaccine, which employed a viral vector and ChAdOx1 vector to encode the wildtype SARS-CoV-2 Spike protein, demonstrated 64.1% efficacy after the first dose and 70.4% efficacy for individuals who were fully vaccinated(12). Wuhan Institute of Biological Products/ China National Biotech Group-Sinopharm, also known as Sinopharm, produced the first Chinese vaccine approved for use in an emergency. Within 28 days of vaccination, phase 1/2 studies reported no severe side effects, and the majority of reported side effects were modest to moderate. This vaccine demonstrated 79% efficacy against symptomatic COVID-19, 14 days or more after the second dose in a multicenter Phase 3 trial(24). In our investigation, 81.1% (202 individuals) of all patients had undergone vaccination. The majority (90%) received the Sinopharm vaccine, followed by the AstraZeneca vaccine (5.4%). There was no statistically significant difference between the two cancer groups regarding the type of vaccine administered. In our study, there were no significant differences between COVID-positive and COVID-negative cases in terms of age, gender, risk factors, comorbidities, tumor stage, or Gleason score. Hospitalization rates and the need for special care did not differ significantly between the two patient categories. In both bladder cancer and prostate cancer, a similar proportion of COVID-positive and COVID-negative patients received the COVID-19 vaccine. In addition, no patients experienced severe adverse reactions after vaccination, and the majority of reported cases were mild (Table 3).

In a retrospective study utilizing data from the OnCovid registry, it was found that vaccinated patients who contracted SARS-CoV-2 were less likely to develop severe COVID-19 and had substantially lower mortality rates than unvaccinated controls(25). In a multicenter retrospective cohort study conducted between 2020 and 2021, vaccination against COVID-19 was associated with a reduced rate of SARS-CoV-2 infection in cancer patients(26).

However, data from the COVID-19 and Cancer Consortium (CCC19) on 54 fully vaccinated patients indicated that despite the fact that vaccination against COVID-19 remains a necessary strategy for protecting cancer patients, these patients could still experience breakthrough infections and remain at risk for severe outcomes. The importance of conducting additional research in independent groups was emphasized (27). A previous multicenter study on cancer patients with Sinopharm vaccine in Iran reported the safety and short-term efficacy of Sinopharm inactivated vaccine (BBIBP-CorV) in cancer patients (7). Moreover, in an observational study, a retrospective analysis was conducted on 415 cancer patients in Morocco to evaluate the adverse effects of COVID-19 vaccines and compare the prevalence and severity of toxicity in vaccinated cancer patients to those who had not yet begun vaccination. The conclusion reached was that COVID-19 vaccines are safe for the population of cancer patients (28).

In our study, a total of 27 (13.4%) patients showed mild adverse reactions to the vaccines. The adverse effect after vaccination was significantly lower in the patients with bladder cancer than the patients with prostate cancer (7.2% Vs. 17.6%, $p = 0.032$). Based on the findings of our study, the efficacy of the vaccine in patients with bladder cancer was 82%, while it was 96% in patients with prostate cancer. There were some limitations in this study. First, the lack of serologically evaluated efficacy. Second, there is no subdivision or sub analysis based on the treatment modality the patients were receiving at the time of vaccination

Conclusion:

This study provides evidence to support that the SARS-CoV-2 vaccine is efficacious in preventing COVID-19-related complications and mortality in bladder and prostate cancer patients. Therefore, it appears that

global SARS-CoV-2 vaccination should continue to be an essential goal for cancer patient management during and after COVID-19.

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Ethics committee approval: All procedures performed in this study were in accordance and the work was accepted by the Tehran University of Medical Sciences Ethics Committee (IR.TUMS.VCR.REC.1399.093).

Informed consent: Written informed consent was signed by each patient for their anonymized information to be published in this article.

Contributions: Conception and design of the study: SOM. Collecting and analyzing and interpretation of the data, drafting and critical revision: SOM, AN, and MRN. All authors have approved the final manuscript.

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