

SARS-CoV-2 and cancer: the case of Cyprus

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Abstract

Background: The new human worldwide threat, known as SARS-CoV-2 or Covid-19 disease has become a major healthcare concern. Patients with co-morbid conditions such as cancer are more vulnerable to infections and often carry a higher risk of associated complications.

Aim of the study: The aim of the study was to report the percentage of cancer patients infected with SARS-CoV-2 in Cyprus and to assess the effectiveness of public health policy measures adopted during the period between the months March 2020 and September 2021. The data were compared with the international literature.

Methods: All the recorded data from the statistical service of the SARS-CoV-2 advisory scientific committee of the Ministry of Health in Cyprus Republic were analysed. Formal approval was obtained, to have access in these data.

Results: During the time period from 01/03/2020 to 13/09/2021, 117.754 Cypriot citizens were infected with SARS-CoV-2 virus, 780 of which (0.66%) had a prior diagnosis of cancer according to their medical history. Thirty seven percent (37%) of the infected cancer patients were male, whereas the vast majority aged between 60-69 years old. Ninety one percent (91.58%) of the cancer pa-

tients had symptomatic SARS-CoV-2 disease, while 38 out of 780 died of the infection. Almost 4 percent ((3.85%) of the deaths were attributed to SARS-CoV-2, whereas the overall mortality of cancer patients at the same time period was 4.87%.

Conclusion: The public health policy adopted throughout the SARS-CoV-2 pandemic period in Cyprus, proved to be efficient, as it helped to maintain mortality rates low upon comparison with those of international literature.

Introduction

Cancer patients are considered a group highly vulnerable to infections, due to their cancer type itself or due to immunocompromise following anticancer treatments (chemotherapy, immunotherapy, radiotherapy or surgery). Moreover, cancer diagnosis largely occurs in the elderly population, which might also suffer from other co-morbidities that worsen its general health status. Studies have shown that patients with chronic health problems needing frequent hospital visits are at greater risk of being infected by SARS-CoV-2, due to their contact with other Covid-19 patients or with contaminated areas [1-6]. Specifically, cancer patients exhibit 2.3 times higher risk of being infected by the SARS-CoV-2 than the general population [1].

In a nationwide Chinese cohort, Liang et al reported that cancer patients had increased risk for both SARS-CoV-2 infection and developing severe complications, such as the need of intensive ventilation, admission to the intensive care unit, thrombotic events and death when compared with those without cancer diagnosis [1].

In Cyprus, the national public health measures implemented to control the disease spread, were found to be efficient for the general population, including cancer patients [8]. These measures followed the “one fits for all” model that was implemented internationally, since a disease specific approach has been proved non effective and dangerous in similar past circumstances. The Cyprus Oncology Society has approved the general measures; however, declared that not all the cancer patients are considered vulnerable. More specifically, vulnerable cancer patients were considered those under active treatment (chemotherapy, targeted therapy, immunotherapy, radiotherapy), or those which have not completed six months from their last treatment. This policy was established in many countries worldwide as a result of evidence-based published data [2,9]. Furthermore, the Cyprus Oncology Society issued a national guidance for the management of cancer patients (treatment issues, follow up visits, and staging frequency) during the pandemic based on international recommendations [10].

The purpose of this study is to analyze data on patients with SARS-CoV-2, having pre-existing cancer diagnosis, in Cyprus during the period between March 2020 and September 2021, including the first four waves of the pandemic. The data were also compared with the international literature, to assess the effectiveness of public health policy on the face-off of the pandemic in Cyprus.

Materials and Methods

The data were obtained after the approval of the Ministry of Health guardian of the citizen data, during SARS-CoV-2 pandemic. Descriptive statistics were performed regarding the distribution of cancer patients infected by SARS-CoV-2 per sex, age, district, presence of symptoms, date, vaccination status, death, hospitalization, and finally import to ICU. A vaccination is considered complete fourteen days after receiving both doses of the vaccine, partial when at the time of diagnosis only one dose of the vaccine has been administered or a time period equal less than fourteen days has elapsed from the second dose of the vaccine, while is considered incomplete when no information were provided or there was a mismatch with vaccination registry.

Results

During the period from March 2020 and September 2021, 117.764 people in Cyprus diseased with SARS-CoV-2, 780 of which declared cancer as a co-morbidity (0.66%). This rate is higher than the cancer rate in the general population (0.42%), according to the data reported by the National Cancer Archive for 2017 (423 patients per 100.000 inhabitants) [11].

Of the 780 cancer patients diseased with SARS-CoV-2,

37% were men (n=290) and 63% were women (n=490). The age distribution of cancer patients diseased is presented in Figure 1. Most of them were categorized in 60-69 years (n=232 patients), 50-59 years (n=164 patients) and 70-79 years (n=134 patients) age groups.

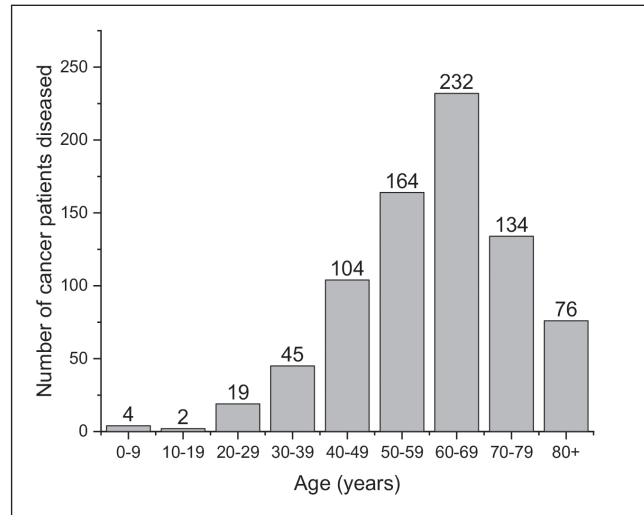


Figure 1: Age distribution of cancer patients diseased with SARS-CoV-2 between March 2020 and September 2021

The distribution of cancer patients diseased with SARS-CoV-2 per district is presented in Figure 2. Most of the cases were found in Nicosia (n=303) and the fewest in Famagusta (n=44) and Paphos (n=42).

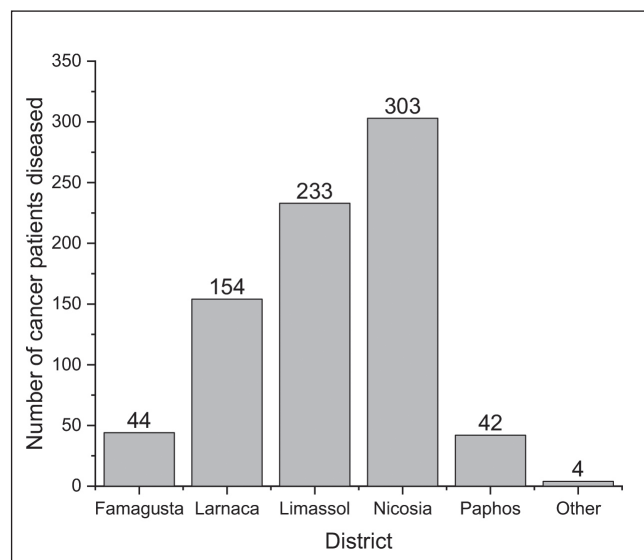


Figure 2: Distribution of cancer patients diseased with SARS-CoV-2 between March 2020 and September 2021 per district.

The vast majority of cancer patients diseased with SARS-CoV-2, 91.58% (n=598/653), were symptomatic and most of them were diagnosed during the period from December 2020 to April 2021 (n: 555 cases) culminating in December 2020 (n=165) and April 2021 (n=144). The highest number of SARS-CoV-2 cases during the whole pandemic period in the general population (n=29.267 cases)

was recorded in July 2021, while only 30 cases were reported among cancer patients during this time. The distribution of cancer patients and non-cancer cases diseased with SARS-CoV-2 per month is presented in Table 1.

Month/Year	Cancer cases n	Non cancer cases n	Total infected cases n
March 2020	11	353	364
April 2020	7	491	498
May 2020	4	82	86
June 2020	0	52	52
July 2020	3	140	143
August 2020	4	345	349
September 2020	1	288	289
October 2020	5	2861	2866
November 2020	17	6457	6474
December 2020	165	11834	11999
January 2021	105	7577	7682
February 2021	35	3522	3557
March 2021	106	10658	10764
April 2021	144	19653	19797
May 2021	59	6445	6504
June 2021	16	3814	3830
July 2021	30	29267	29297
August 2021	56	11070	11126
September 2021	12	2141	2153

Of the 780 cancer patients diseased with SARS-CoV-2, 38 died. Of these, 30 (78.9%) had SARS-CoV-2 as the cause of death according to the IRIS system and 8 had other causes. The death rate due to Covid-19 is 3.85% (30/780), while the overall death rate among cancer patients was 4.87% (38/780).

Of the 780 cancer patients diseased with SARS-CoV-2, 647 were unvaccinated (83%), 72 (9%) had partial vaccination and only 61 (8%) were fully vaccinated (Figure 3).

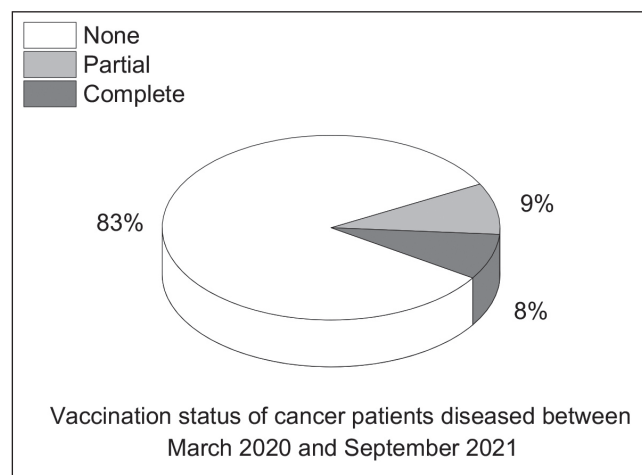


Figure 3: Vaccination status of cancer patients diseased with SARS-CoV-2 between March 2020 and September 2021.

After the start of vaccination in vulnerable groups of the population at March 2021, 423 of the cancer patients diseased. Of these, 70% (n=295) were unvaccinated, 16% (n=67) were partially vaccinated and 14% (n=61) were fully vaccinated (Figure 4).

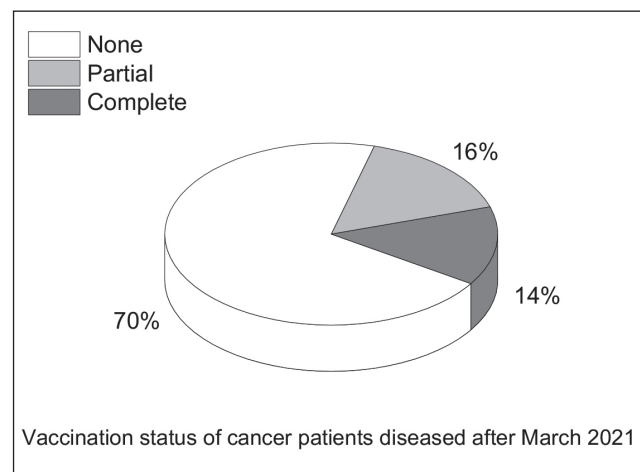


Figure 4: Vaccination status of cancer patients diseased with SARS-CoV-2, after March 2021.

Twenty one percent (21%, n=167) of the cancer patients diseased with SARS-CoV-2 needed hospitalization, while 18 of them (11%) were admitted to the intensive care unit (ICU). The vaccination status of cancer patients diseased with SARS-CoV-2 that need hospitalization is presented in Table 2.

Hospitalization	Cancer Patients n	Vaccination status		
		Complete n (%)	Partial n (%)	None n (%)
Yes	613	50 (8%)	59 (10%)	504 (82%)
No	167	11 (6.5%)	13 (8%)	143 (85.5%)

Discussion

Cancer is one of the most prevalent diseases globally, as it includes more than one hundred different types, which can affect more than one organ at the same time and can weaken the immune system, which cannot control the growth of tumor cells. Also, anti-neoplastic treatments usually tend to be very aggressive and can temporarily decrease the ability of the immune system to fight bacteria and viruses. International and national cancer organisations have been collecting data both on cancer patients and the general population regarding the SARS-CoV-2 infection during the pandemic. Additionally, oncology societies and organisations are providing guidance on the management of patients with solid and hematological malignancies in relation to SARS-CoV-2. For cancer patients with no SARS-CoV-2 infection, the main goal is to reduce the risk of infection and the negative consequences that this might have

on cancer treatment outcomes. For the infected patients, the guidance gives emphasis on minimizing the risk of SARS-CoV-2 complications and eradicating the possibility of spreading the virus within the health care facilities.

Qiang Su et al, on a meta-analysis including 32 studies and 21,248 patients, between December 2019 and March 2020, found that the percentage of cancer patients infected with SARS-CoV-2 was 3.97%, which is higher than the overall percentage of cancer patients in China (0.29%). The percentage of infected patients in China with prior diagnosis of cancer was 2.59%. More specifically, higher rates (3.79%) were observed in Wuhan which was severely affected and 2.31% in other parts of the country [12]. Many studies have shown a percentage rate of infection for cancer patients between 0.92% and 3.4% [13,14,15]. Interestingly, the highest rates of infected cancer patients were observed in Italy, where 8.5% of the 9,280 patients admitted in 68 different hospitals in Veneto with SARS-CoV-2, had prior diagnosis of cancer [16]. A rate of 7.2% is reported in a screening of 138 patients admitted to Zhongnan Hospital in China [2]. Ludi Yang et al in a meta-analysis of 14 studies with 62,000 infected patients and 2,256 cancer patients among them, reported that the frequency varied between different countries with the highest rate being in Spain (17.29%, 385/2,226) and the lowest in China (0.514%, 107/20,812). Furthermore, after analyzing 19 studies with a total of 63,019 infected patients, the percentage of cancer patients with SARS-CoV-2 is estimated at 6%, which is much higher than that in the general population (approximately 0.2%) [17]. The percentage of cancer patients in Cyprus infected with SARS-CoV-2 was reported at 0.66% which is much lower than most of the previously published studies, but is higher than the cancer rate in the general population (0.43%) [11].

Contrary to international studies that report either an equal distribution between the sexes [18] or a higher percentage among men, linking the male patients with an increased risk of serious illness or death, most cancer patients infected with SARS-CoV-2 in Cyprus were women [19,20]. In line with the literature the most affected age groups are those over 60 years [21]. The age is generally associated with an increased risk of death [19,20]. Specifically, the older men with cancer have an increased risk of death [23]. Although the probability of serious disease in cancer patients is higher than in the general population [21], in Cyprus the 78.2% of cancer patients with SARS-CoV-2 had mild to moderate symptoms in contrast to the 71% reported in international literature [22]. The percentages of cancer patients needed hospitalization (21.28%) and admitted to ICU (2.3%) are lower than the internationally reported (29% and 10.84%, respectively) [22].

Regarding deaths among cancer patients with SARS-CoV-2, rates between 5.6% and 28% are reported in the literature [2,3,5,23,24,25]. Based on the update presented in "COVID-19 and Cancer Consortium (CCC-19)", the average mortality rate is 16% [5]. During the presentation of a database with 2,749 patients in the "2020 AACR Virtual Meeting on COVID-19 and Cancer" it was reported that pa-

tients with level 0 functional capacity on the ECOG (Eastern Cooperative Oncology Group performance status) scale and without co-morbidities have a mortality rate of only 4% [5]. Several studies reported an increased mortality rate in elderly cancer patients with poor clinical condition status > 2 on the ECOG scale and advanced cancer stage [5,19,24,26]. The death rate among cancer patients with SARS-CoV-2 in Cyprus is 4.87% and it is below the range of international reports (5.6%-28%) and the average value (16%) [2,3,5,23,24,25].

A US and Swiss study has shown that cancer patients could develop antibodies to SARS-CoV-2 by up to 94% after receiving two doses of the vaccine [27]. The World Health Organization (WHO) and other agencies, such as the US Centers for Disease Control and Prevention (CDC) recommend the vaccination against SARS-CoV-2 as it has been shown to reduce the risk of serious illness and death [28]. In Cyprus, the vaccination offered protection, as evidence by the fact that 82.95% of cancer patients who needed hospital admission and treatment were unvaccinated. In particular, after March 2021, when the national vaccination program started, 423 cancer patients became diseased with SARS-CoV-2, 70% of which were unvaccinated.

However this study has an important limitation. The available data obtained from the statistical service of the Ministry of Health were self-reported or individuals familiar information. This means that some of the diseased with SARS-CoV-19 patients or their families might not reported cancer as co-morbidity in their past medical history, so the actual real number of the affected cancer patients might be higher.

Conclusion

Despite the above limitation, this study pointed that the public health protection policy followed throughout the SARS-CoV-2 pandemic in Cyprus, kept the death incidence in both the general population and the cancer patients at low levels.

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