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Cancer Increases the Risk of COVID-19 Infection: A Literature Review

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Abstract

A new public health crisis threatening globally, is the emergence of novel Corona virus 2019 (COVID-19) or the acute respiratory syndrome corona virus 2 (SARS-CoV-2). The COVID-19 virus was originated in China, particularly in the Wuhan lab of Hubei province in December 2019. It has been found that cancer patients are highly susceptible to infection with COVID 19, and developed more critical symptoms as compared to the normal or non-cancer patients possibly due to the systemic immunosuppressive status, caused by excessive tumor growth as well as effects of anticancer treatment. Extensive literature survey shows that patients with hematological malignancies including lymphoma, leukemia, and myeloma had a more severe infection of COVID-19 as compared to the solid tumor patients. In this review, we have discussed the risk and impact of COVID-19 infection on the individuals on the basis of cancer subgroups and patient demographics (sex, age group), and preventive guidelines and resources in addition to highlighting the clinical management and recommendations.

Keywords: COVID-19 • Cancer • Corona virus • Oncology • Pandemic

Introduction

COVID-19, also known as SARS-CoV-2, a novel corona virus had become a worldwide threatened problem and the major public health emergency of healthcare concern on 11th March 2020 [1]. The world is in the center of a COVID-19 pandemic and all the countries are struggling to fight against the COVID-19 pandemic. Although the novel COVID-19 virus is estimated to have spread on earth centuries back but the disease was not so acute and the person only suffered through mild laryngopharyngeal congestion, simple pneumonia and mild fever. According to World Health Organization (WHO), COVID-19 is a new acute respiratory syndrome corona virus (SARS-CoV-2) has rapidly spread across the world, since its first reported case in late December 2019 from Wuhan virology lab of China [2,3]. According to the World Health Organization (WHO) by 10 OCT, 2020 around 1,063,429 people have died and more than 36, 616,555 confirmed cases have been reported over 235 countries [4]. After the outbreak of this particular disease WHO on 1st January, 2020 declared a pandemic of a new type of disease, and soon after Wuhan seafood market was completely closed. However, researchers of china, in his one experimental study, suggested that a small fraction of COVID patients had preexisting conditions including hypertension (12.8%), diabetes mellitus (6.4%), heart disease (3.7%), liver diseases (2.7%), metastasis (1.4%), and others (3.7%) [5]. Local hospital people assume and diagnose severe pneumonia of unknown etiology. The emerging of this COVID-19 pandemic was directly affected to the oncologist for cancer research.

Literature Review

Based on Chinese studies, a cancer patient is very vulnerable to infection with SARS-CoV which caused an illness called COVID-19 that represents polymorphic phenotypic characteristics. COVID-19 infected Individuals develop more critical symptoms and can exhibits a severe clinical phenotype with the development of failure of the respiratory system, release of cytokine syndrome, and multi-organ failure [6-8]. Individual infected with COVID-19 have been identified who appear to be at increased risk of extreme morbidity and mortality, including older male (i.e., aged ≥60 years.), pregnant women, smaller child (0-10 year), and those with co-morbidities including diabetes mellitus, hypertension, chronic lung disease, and active cancer while receiving chemotherapy [9,10]. Several subgroups of cancer are more vulnerable to infection with SARS-CoV-2, and we should assess the individualized risk for a given cancer patient, taking into account their primary tumor subtype, stage, age (old), and gender (male) [11-14]. Several studied from the large real-world registered database including the Thoracic Cancers International COVID-19 Collaboration (TERAVOLT) and Cancer Consortium (CCC19) have adequate pieces of evidence to the ideal risk assessment of cancer history to the infection with COVID-19 related complications [9,10]. COVID-19-associated patients have died through the lung failure, which was evident through histological studies of the peripheral lungs showing the damaged alveoli with infiltration of perivascular T cell. In COVID-19 patient, the histological pattern of pulmonary vessels exhibits thrombosis with microangiopathy [15-17]. This process associated with COVID-19 patients is also persistent in several subgroups of cancer history. We need to identify several factors including viral, environmental, morphological, and immunologic factors that in alone or in combination will determine the dynamics of COVID-19 infection in cancer history. The nationwide cohort of Liang et al., concluded that the population of a cancer history was predisposed to a higher risk of severe condition (intensive care unit (ICU) admission, invasive mechanical ventilation or death) compared to patients without cancer [18]. Several cancer patients often go to the hospital for their anticancer treatment and disease surveillance. They may be immunocompromised due to the underlying tumor growth or chemotherapy and are at higher risk of developing infections. After declaring the novel corona virus outbreak is a pandemic by WHO, it is an urgent necessity to address the impact of such types of a pandemic on the patient with cancer. Overall, we need to determine the COVID-19 mortality and morbidity according to anticancer treatment (conventional therapy, targeted therapy, or immunological-checkpoint therapy) as well as other comorbidities. Due to limited data, there are no guidelines are provided by international health society to addresses the management of cancer patients during corona infection.

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Results and Discussion

Corona virus disease 2019 (COVID-19)

This severe acute respiratory syndrome corona virus 2 (SARS-CoV-2), also known as novel Corona virus (COVID-19), is a single-stranded RNA beta-corona virus whose genome contains structural, non-structural, and accessory proteins [19]. Corona viruses constitute a big family of viruses that can cause simple diseases from a mild cold to severe disorders in humans as well as animals. COVID-19 disease caused by SARS-CoV-2, is first detected in Wuhan virology lab, China in late December, 2019 [20]. Some corona viruses are zoonotic in nature, which means they spread from animals to humans. After the outbreak of this novel corona virus, it was assumed that it was spread by the bat family member Coronaviridae in the wholesale seafood market after most liking bat recipe by Chinese fellow. It is assumed that bats are the reservoir of corona virus but later on, this virus was also found in Civets, Dromedary camel, and Pangolins. Severe complications have been reported to occur in 33% of patients with COVID-19 that include shortness of breath, renal failure, septic shock, acute respiratory injury and viral pneumonia [21]. The mechanism of transmission and administration of COVID-19 remained elusive. Direct contact with the intermediate food host like consumption of uncooked bat recipe was hypothesized to be the main route of transmission of COVID-19 from bat to human beings but this has not been scientifically established now. The mode of transmission from human to human is through coughing, sneezing, spitting, shaking hands with others, etc., and also through direct contact with other COVID-19 patients [22,23]. The virus might have entered in the human host and genetically modified itself with the rapid multiplication. The exponential increase in the number of corona cases and associated mortality rate in the world has forced lockdown in all over the countries to control the spread of the virus. For controlling the risk of spreading of corona infection, WHO specified the uses of some precautionary strategies including uses of N-95 face mask, maintaining proper social distancing, regular uses of hand sanitizer etc.

At present, no drugs and vaccines are available for the treatment of COVID-19, this is the main reason it has been challenged globally to the scientist to find out the full proof cure of the particular COVID-19. There are, on a trial basis, few antiviral, anti-malarial and anti-inflammatory drugs has been used either as monotherapy or in combination with other therapeutic drugs for diagnosis of COVID patients [24-26], and to some extent outcome will found but it has a limited scope and none has any potential effect on corona infected patients. Hence, later on, the modification of such medicine either change in chemical structure or group replacement may be shown positive results, after massive screening out of the new drugs against COVID-19. Currently, many medical management in all over the country are investigating the potential medications against COVID and supportive management (like as hydration, oxygen therapy, and fever/pain management,), infection prevention and control measures of this complications [27]. There are more than 100 drugs/vaccine are under development against COVID-19, with a number of these in the clinical trial phase, some of them are listed in table, but no specific treatment or vaccine is approved yet. Apart from the WHO-solidarity trial, a large number of cases report the use of other drugs for the treatment of COVID–19. According to a report in the newspaper of London “The Times” there is a probability that vaccines against corona will be coming by the end of this year which is undergoing trial by the university of oxford scientists in the collaboration with pharmaceutical giant AstraZeneca (Table 1).

COVID-19 and cancer

Cancer has been reported as a major risk factor for adverse results from COVID-19 complication. Individuals influenced by cancer are a highly vulnerable to COVID infections because of coexisting chronic lungs disorders, poor health, and systemic immuno-suppressive status caused by both malignancy and anticancer treatments [28]. Considering the signs and symptoms of COVID-19 disease, cancer patients must be informed to maintain a social distancing along with other practices including hygiene conditions around their vicinity. A literature survey was conducted from PubMed, Google Scholar, and Science Direct, it has been found that a cancer patient is regarded as a highly vulnerable to COVID infection with a non-cancer patient and develops more critical complication symptoms of COVID-19 [29]. The immunosuppressed condition of cancer patients due to treatment with anticancer therapy or malignancy have chances to more risk of COVID infection comparatively non-cancer patient [30-32]. Liang et al. concluded that the cancer patients have an increased risk of severe COVID infections, with an average 2-4 fold more in the risk of needing invasive mechanical ventilation or admission to ICU bed or dying as compared to non-cancer patients [33]. It has been also found by the researcher that that cancer patient, which had treatment with chemotherapy, radiotherapy, or undergone surgery in the last 30 days before going to the hospital, was found to have increased chances for COVID infection than the general population. Patients with lung cancer did not express an increased probability of severe infection compared with other types of cancer patients [33]. In the Chinese research lab, Zhang et al. also reported a case of a male patient (57-year-old) with lung cancer who have common symptoms such as fever, cough, breathing problems, myalgia, and diarrhea and later tested to be positive for COVID-19 [34]. Nosocomial infections are more commonly found in cancer patients who are at high risk for viral, bacterial, and fungal infection that have to going for COVID infection [35-37]. During the pandemic COVID-19 outbreak, the primary risk for cancer patients can be narrowed by providing required medical health care and essential medical services in a timely fashion [38]. Due to a higher probability of infection in the hospital or medical lab, cancer/health care providers (i.e., doctors, nurses, ward boy, and all other allied professionals) have a chance of acquiring increased risk for corona virus infection. On the basis of ongoing research, we can recapitulate the necessity of additional preventive measures to ensure that cancer patients are not further exposed to the COVID virus and if they become infected, additional medical care could be provided in order to reduce the risk of mortality. According to the country of origin, the distributions of the articles included in our review paper are shown in the pie chart (Figure 1).

Guidelines and clinical resources

While extending of COVID-19 pandemic cases, the national health society has a high need for extraordinary precautionary guidelines for caring to cancer patients, cancer care providers, and medical health care systems. During the COVID-19 outbreak, all countries around the world have imposed the nationwide lockdown in order to control the spreading of corona virus infection. All Oncological societies, many clinical communities, and other national authorities have recently been published several preventive guidelines for caring of the cancer patient, medical health care, and cancer society on the proper recommendations and also to increases the use of the available resources for sustaining the medical services to cancer patients. Cancer caretaker also advises the cancer patients who have completed their treatments and are free from disease to stay at home all-time, minimal hospital visits, neat & clean the environment around their vicinity, maintain social distancing, routinely hand hygiene uses of N-95 face mask, avoiding communication with other infected person, proper use of sanitizer [39]. Due to managing the demands of COVID-19 outbreaks, surgical oncologists remain focused on providing the best care for patients, until effective drugs or vaccines becomes available for worldwide use. In this corona waking period, British Columbia Cancer Center offers instruction for COVID associated cancer patients including assessment of COVID status, Safety for Health Care Professionals (HCPs), sensible use of limited PPE kit, and other medical resources [40]. Recently, clinical guidelines are being designed by the National Institute for Health and Care Excellence (NICE) for the systemic delivery of treatments to thecancer patients during COVID pandemic. These guidelines include communicating with patients, managing patients with confirmed or suspected COVID-19, staff who are self-isolating, categorized patients for treatment, modifications to normal service, and treatment breaks. These guidelines are very useful to the medical provider for providing the best available resource of their cancer patient until detailed and more effective guidelines are available [41]. Additionally, the European Society of Medical Oncology (ESMO) has issued an updated clinical resource related to a cancer patient with COVID-19 which including self-protection information, risk procedures, treatment continuity, and key role to deliver the best awareness to cancer patients during the corona pandemic [42]. WHO is bringing the world’s scientists and global health professionals together to

Table 1. Some COVID-19 drugs candidates under development in different phases.

S. No	Drugs Name	Other Agent	Disease	Status	Phase	Clinical Identifier (NCT) no.
1	Hydroxychloroquine	.....	Anti-malarial	Completed	Phase 3	NCT04261517
2	Lopinavir/ritonavir	Hydroxychloroquine sulfate	Antiviral	Terminated	Phase 2	NCT04307693
3	Infliximab	.....	Anti-inflammatory	Recruiting	Phase 2	NCT04425538
4	AZD1222	.....	.....	Recruiting	Phase 2	NCT04568031
5	Treatment and prophylaxis	.....	.....	Completed	Phase 3	NCT04304053
6	Pulmozyme	.....	Antiviral	Recruiting	Phase 2	NCT04432987
7	Tocilizumab	.....	Anti-viral	Recruiting	Phase 2	NCT04445272
8	Emtricitabine/tenofovir	Rosuvastatin	Antiviral	Recruiting	Phase 2	NCT04359095
9	Favipiravir	Placebo	Antiviral	Active	Phase 3	NCT04336904
10	Ivermectin and Doxycycline	.....	Anti-parasitc	Completed	Phase 3	NCT04523831
11	Sirolimus	.....	Anti-inflammatory	Recruiting	Phase 2	NCT04461340
12	Nitric Oxide	.....	Anti-inflammatory	Recruiting	Phase 2	NCT04388683
13	Nitazoxanide	.....	Antiviral	Recruiting	Phase 2	NCT04523090
14	Enoxaparin sodium	Fondapariniux, Argatroban	Anti-viral	Recruiting	Phase 4	NCT04406389
15	Remdesivir	.....	Anti-viral	Recruiting		NCT04365725
16	Hydroxychloroquine	.....	Anti-malarial	Terminated	Phase 3	NCT04329611
17	Losartan	.....		Recruiting	Phase 1	NCT04335123
18	Baricitinib	.....	Anti-inflammatory	Recruiting	Phase 2	NCT04321993
19	TXA127	Placebo	.....	Recruiting	Phase 2	NCT04401423
20	CPI-006	.....	.....	Recruiting	Phase 1	NCT04464395
21	Pamrevlumab	.....	Anti-inflammatory	Recruiting	Phase 2	NCT04432298
22	Famotidine	.....	Anti-malarial	Recruiting	Phase 3	NCT04504240
23	Oseltamivir	IMU-838	Anti-viral	Recruiting	Phase 2	NCT04516915
24	Favipiravir	Avigan	Anti-viral	Recruiting	Phase 3	NCT04558463
25	Ribavirin	Daclatasvir	Anti-viral	Recruiting	Phase 3	NCT04460443
26	Nitazoxanide	.....	Anti-viral	Recruiting	Phase 3	NCT04486313
27	Nafamostat	.....	Anti-viral	Recruiting	Phase 3	NCT04390594
28	Ruxolitinib	.....	Anti-inflammatory	Recruiting	Phase 3	NCT04377620
29	Enoxaparin		Anti-viral	Recruiting	Phase 3	NCT04366960
30	Siltuximab	Methylprednisolone	Anti-viral	Recruiting	Phase 2	NCT04329650
31	Sarilumab	.....	Anti-viral	Recruiting	Phase 2	NCT04357808
32	Anakinra	Kineret	Anti-viral	Recruiting	Phase 3	NCT04443881
33	Umifenovir	Arbidol	Anti-viral	Enrolling	Phase 4	NCT04350684
34	Almitrine	.....	Anti-inflammatory	Recruiting	Phase 3	NCT04357457
35	Bromhexine	.....	Anti-viral	Recruiting	Phase 4	NCT04355026
36	Cyclosporine	.....	Anti-inflammatory	Recruiting	Phase 4	NCT04392531
37	Tofacitinib	.....	Anti-viral	Recruiting	Phase 2	NCT04415151

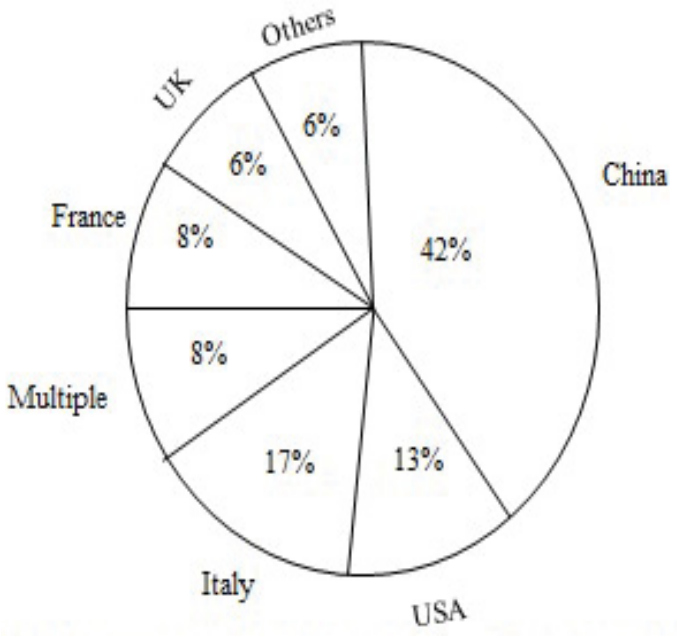

Figure 1. The percentage of articles published in different countries on cancer and COVID-19.

promote the research and development progression, and develop new norms and standards to cover the spread of the COVID-19 outbreak and help care for those affected?

Management and recommendations

Whenever the cancer treatment continues or to stop it, the potential risk of cancer progression in the patients is very controversial, hence the oncological society may be recommended as the cancer patient should continue and complete their conventional treatment despite the risk of infection. If the diagnosis and treatment of malignancy (advance stage) will be a delay which results depreciated the performance, admission for symptom palliation, and progressive growth of cancer [43]. Before the generalization of any type of recommendation, clinical trials must be needed for cancer patients with COVID-19 disease. Cancer patients with Early stages are likely less susceptible to SARC-Co-V 2 infection compared to advance stages [44]. Therefore, delaying the some treatment of some cancer (like as breast, prostate, cervical) with early stages might be an option for avoiding COVID infection, but patients with solid tumors such as lung & pancreatic cancer and hematological cancer such as acute leukemia, and lymphoma should take the treatment and diagnostic measurements on timely in order to decrease the mortality. During the COVID-19 outbreak, Kutikov et al., have offered the specific recommendations which can be used to monitor the decision making on continuing or delaying anti-cancer treatment [45]. Thus, it is recommended that individually, each cancer patient should be categorize for delaying or

continue treatment on the basis of which would be eligible for delay treatment without any complications [43]. Some crucial strategies can be used in order to reduce the viral crisis or future illness associated with cancer history:

I. The first strategy for cancer patients is delaying the anticancer treatment in stable cancer cases at high-risk of COVID exposure.

II. The second plan is executing personal precautions strictly in the cancer survivors.

III. Cancer patients with COVID-19-infection who are old or have other comorbidities such as diabetes, hypertension must be provided with more additional care and intensive treatment.

Concluding Remarks

After an extensive literature search and analysis of the recently published studies on COVID-19, we addressed some of the current challenges associated with adjusting cancer patients during the COVID-19 periods and suggested some clinical guidance and recommendations. During the COVID-19 pandemic, the major management strategies for cancer patients include clear communication and knowledge about hand hygiene, control measurements of infection, high-risk exposure, and characteristics of the COVID-19. Our study suggested that cancer patients need to adopt extra precautionary measures to ensure their non-exposure to the corona virus, and if they become infected, additional awareness should be provided to mitigate the risk of the severity of infection. This review on cancer COVID-19 patient is based on the current knowledge and latest information available to the medical healthcare. If the COVID-19 outbreak extends, the medical community will likely to face with additional challenges. On the basis of the limited clinical information, heterogeneity of cancer types and stages as well as limited treatments, the reports associated with COVID-19 cancer patients is based on relatively small sample size. Therefore, further and more research is required to understand the nature of COVID-19 virus and the risk associated with the COVID-19 cancer patients.

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Conflict of Interest

Authors do not have any conflict of interest to disclose.

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