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Review on Impact of COVID-19 on Cancer Care in India: Challenges, Disruptions, and Future Directions

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ABSTRACT

The COVID-19 pandemic has significantly disrupted global healthcare systems, with cancer care being notably affected. Millions of cancer patients worldwide have faced delayed diagnoses, treatment interruptions, and worsened outcomes due to the healthcare system's overburdening during the pandemic. The overlap between COVID-19 symptoms and cancer markers has created challenges in diagnosing and managing both conditions simultaneously. Cancer patients, particularly those undergoing active treatment, are at heightened risk for severe COVID-19 symptoms, further complicating their care. Additionally, the pandemic has exacerbated existing healthcare disparities, especially in rural and underserved areas, where access to cancer care is already limited. Financial burdens, psychological distress, and increased fear of recurrence further impact cancer patients' quality of life. The growing reliance on telemedicine has provided a temporary solution for continuity in care, though it presents challenges related to accessibility, patient satisfaction, and provider preferences. To prepare for future health emergencies, strengthening global collaboration, improving telemedicine infrastructure, and increasing cancer screening and prevention efforts are essential. This review highlights the profound impact of COVID-19 on cancer care and offers recommendations to mitigate these challenges in future crises.

Keywords: *COVID 19, Cancer, Telemedicine, Vaccine efficacy, Health emergencies*

1. INTRODUCTION

Millions of people worldwide lose their lives to cancer every year, making it one of the deadliest groups of human diseases. These disease groupings include over a hundred genetically distinct illnesses that have a number of similarities in their molecular processes and metabolic changes. It is well known that the tissue microenvironment and inflammatory alterations directly affect the survival of tumour growth [1] .

. One of the novel coronaviruses, SARS-CoV-2, is the cause of COVID-19. On December 31, 2019, WHO became aware of this novel virus after a number of "viral pneumonia" cases were reported in Wuhan, People's Republic of China [2]. Since December 2019, a new coronavirus disease has spread quickly throughout China, triggering a global outbreak and raising serious concerns for public health. The COVID-19 outbreak was declared a worldwide public health emergency by the World Health Organization (WHO) on January 30, 2020. The first COVID-19 instance in India was documented in the Kerala district on January 27, 2020. Since then, the way cases are reported across the nation has varied greatly. SARS-CoV-2 antigen testing using either the Rapid Antigen Test (RAT) or Real-Time Reverse Transcription Polymerase Chain Reaction (RT-qPCR) is the foundation for case reporting [3]. There have been 533,570 deaths and 45,035,393 cases of COVID-19 in India to date.

The coronavirus (CoV) belongs to the family of viruses that infect birds and mammals. The WHO in Geneva, Switzerland, called a pandemic novel coronavirus "Corona Virus Disease 2019" (2019-nCoV). The 2019 coronavirus is now known as the SARSCoV-2 pandemic because of its more SARS-like RNA pattern. Within the family Coronaviridae, order Nidovirales, and realm Riboviria, it is a member of the subfamily Orthocoronavirinae [4]. Under transmission electron microscopy, a two-dimensional image of Corona shows a distinctive appearance of "paying homage to a crown" surrounding the virions. As a result, the virus was named Corona, which refers to "crown" or "halo" in Latin.[5]

The World Health Organization (WHO) carried out a Global Pulse Survey during the COVID-19 pandemic to examine the continuity of critical health services. The research claims that in the final quarter of 2021, between 5 and 50% of cancer care—screening and treatment—was interrupted worldwide.[6]

Cancer diagnostics and covid 19

COVID-19 and cancer have similar markers, but determining whether the increase in these biomarkers is due to COVID-19, malignancy, or both is challenging for hospitals and clinicians [7]. The impact of COVID-19 on cancer patients and the system that supports them may cause mortality among cancer patients in the UK to increase by 20% over the following 12 months, resulting in 6000 more deaths. Between 2018 and 2020, there were 4.1 million cancer-related interactions, 3.9 million applicable operations, and 251,647 new malignancies diagnosed. Post-pandemic cancer diagnoses across races/ethnicities should be tracked to see if measures to boost equality in cancer detection and early treatment are bearing fruit. In the United States, cancer-related mortality rose by 3% during the pandemic era, most likely due to delayed diagnoses and inefficient patient care[8]. A positive COVID-19 test resulted with a longer cancer treatment duration, per the retrospective study of two institutes. A series of positive tests, the interval between test results, the fear of medical care and hospitalization, etc., all affect how long the delays last. Thirty-eight percent of the 131 cancer patients who needed hospitalization due to COVID-19 needed intensive care unit care, and seven percent of them passed away[9].

Barrière et al. provide five recommendations to health authorities and healthcare practitioners.[10]

Statement 1: All cancer patients should receive a third vaccination dose three to four months after receiving the second dose (Dose 2), along with controls for any remaining anti-S serum antibodies, because cancer patients have a lower median anti-S antibody titer after two vaccine doses than the general population. The data currently available suggest faster Omicron VOC immunity waning than the Delta strain, but improved protection upon booster dosage (Dose 3). [11]

Statement 2: If a patient's serum anti-SARS-CoV-2 S (antiS) titer is less than 1000 BAU/mL, the fourth dose of vaccination should be recommended. This cut-off corresponds to titers seen in a group of patients without comorbidities 3-4 months after Dose 2, for whom Dose 3 therapy is now advised in the majority of industrialized nations to provide the greatest protection against the Omicron form.[12]

Statement 3: The monoclonal antibody (mAB) tixagevimab/cilgavimab is utilized as a pre-exposure prophylactic for cancer patients who do not show seroconversion after Dose 3 or 4. This combination of long-acting anti-S antibodies has a notable influence on the in vitro effectiveness of Delta VOC and is less affected by numerous Omicron S mutations.[13]

Statement 4: A three-dose full immunization for the patient's family should be recommended as early as four months after Dose 2. Furthermore, when in close, regular contact with immune-compromised parents, the majority of Scientific Paediatric Societies, as well as the US (Food and Drug Administration) and European Medicines Agency (EMA) Health Agency recommend immunizing children between the ages of 5 and 11.[14]

Statement 5: Patients should use a high-protection mask (N95) with a filtering facepiece type 2 (FFP2). Such masks should be mandatory in congested areas, whether on public or private transportation (when shared). Recent comparison research shows that these masks provide better personal protection than surgical masks.[15]

Challenges in Cancer Care Delivery During the Pandemic

Prime-boost theories suggest that COVID-19 vaccines can be safe and effective for cancer patients, including those receiving cancer treatment. The Delta form of the vaccine is considered efficacious against most viral variants, but certain variants may promote disease in vaccinated individuals. The Omicron form, for example, is more pathogenic and may produce recurrent infections in vaccinated patients. Booster dosages are crucial in lowering the chance of recurring illness. A trial with the Pfizer COVID-19 vaccine in Israel found that almost 86% of cancer patients demonstrated sufficient neutralizing antibodies against SARS-CoV-2 after the second dose. Experts agree that COVID-19 immunization is appropriate for cancer patients, survivors, and those receiving cancer treatment, including chemo immunotherapy.[16]

The chances of dying or having serious problems with COVID-19 are approximately two times higher for cancer patients. Nanotechnology must be used to increase the effectiveness of the vaccine in immunocompromised cancer patients. A study found that 79% of vaccine-treated cancer patients displayed a T-cell response, and similar findings were observed in patients with solid tumours and blood cancers. A comparative efficacy study found that 50% of cancer patients lost protection after six months of immunization. These findings could aid in developing the optimal boosting immunization regimen, particularly for immunocompromised individuals. Fendler et al. conducted CAPTURE research, which showed that previous SARS-

CoV-2 infection boosted the nAb response, including against VOC, and anti-CD20 treatment was associated with undetectable nAbT.[17,18]

A study by Sheeba Irshad et al. involved 151 cancer patients and found no vaccine-related fatalities. The BNT162b2 vaccination was found to be ineffective in cancer patients, but immunogenicity was significantly enhanced in solid tumor patients after 2 weeks of a booster dose. The Omicron variant of SARS-CoV-2 is more hazardous in cancer patients, but the death rate is lower than in previous variants. Further research is needed to improve vaccination efficacy and identify new treatment options.[19]

Cancer Care in Rural and Underserved Areas during COVID 19

The COVID-19 pandemic has significantly impacted various sectors, including the health care system, particularly in developing countries like India. With 95% of cancer centers located in urban areas and 70% of the population living in rural areas, cancer patients are forced to move from villages to big cities or different states for proper treatment. This is nearly impossible due to travel restrictions and countrywide lockdowns.[20]

Currently, India has approximately 4.5 million cancer patients, with over 1.5 million new cancer patients registered every year and approximately 780,000 dying from cancer, making it the second leading cause of death after cardiovascular diseases. Nationwide lockdowns were imposed in late March to curb the spread of the infection, but this has disrupted cancer care delivery services, leading to delays in diagnosis, treatment initiation, and treatment interruptions, resulting in disease progression and poor survival.[21]

Increased Financial Burden on Cancer Patients:

The financial crisis due to lack of household earnings and losses incurred by small businesses has also contributed to treatment interruptions. Many patients who undergo treatment in big cities away from home relocate to shelters or dharamshalas near hospitals, making lodging for these patients and their caregivers a major issue during the COVID-19 pandemic.[22]

Cancer care requires a multimodal approach, with radiotherapy being an essential component. Around half of diagnosed cancer cases require radiotherapy treatment in one form or another. Government-run medical colleges and private hospitals provide cancer care facilities in India, but the general population prefers government institutions where treatments are either free or subsidized. Private hospital services are accessed by patients who can afford their own treatment expenses or have insurance or other coverages.[22]

The pandemic has broadened inequality and disparity gaps in cancer care delivery associated with inadequate cancer care infrastructure that cannot handle the current cancer burden. Barriers such as long-distance traveling, accumulation of cancer patients, and the already strained healthcare system contribute to delayed diagnosis and treatment.[23]

Each institution has either formulated its own evidence-based guidelines or is following national or international guidelines for effective cancer management during the COVID-19 pandemic. Prioritization of patients according to expected outcomes has been recommended. Radiotherapy schedules are being changed from conventional to hypo fractionated schedules, and chemotherapy schedules are being considered to decrease immunosuppression and reduce hospital visits. Nonurgent surgeries are postponed, and patients with haematological malignancies who require frequent blood transfusions are being admitted.[24]

COVID-19-related healthcare changes may worsen patients' clinical conditions and have economic implications for providers. Delayed surgery increases the likelihood of post-operative ICU stays, while increased demand for respiratory assistance limits healthcare providers' options. Telemedicine's introduction and expansion have mixed effects on providers and payers, with some stating it saved time and money but may not be financially suitable for all care. The high prevalence of anxieties and fears has led to increased demand for support services and information.[25]

COVID-19 has significantly impacted healthcare systems and patients, leading to increased stress and financial concerns. Cancer survivors and patients have adopted coping strategies such as connection to family, spirituality, music therapy, emotional support, and daily routines. These strategies have been shown to improve quality of life and health behaviors. Maintaining or resuming support services, such as psychological and peer group support, has been associated with less anxiety and distress.[26]

Psychosocial and Emotional Impact of COVID-19 on Cancer Patients

Theme 1: Emotional aspects and Quality of Life

Studies on emotional aspects and quality of life have shown increased levels of anxiety and depression among cancer patients, with some studies finding no difference in distress levels compared to the general population. The European Organization for Research and Treatment of Cancer (EORTC) scales were used to assess quality of life, which was negatively impacted during the pandemic. Factors contributing to worsening emotional status include being younger and female, having advanced disease, and delays in oncology care. However, an internal locus of control and strong family resilience mitigated the negative

impact.[27,28]

Theme 2: Psychosocial impact

The COVID-19 pandemic has significantly impacted cancer patients' psychosocial aspects, including employment, financial difficulties, loneliness and isolation, social support, and uncertainty about the future. Many cancer patients return to work during treatment, causing anxiety and financial hardship. The pandemic has also heightened loneliness and isolation, emphasizing the importance of social support and the uncertainty surrounding the future. [29,30]

Theme 3: COVID-19 related fear

The studies focus on participants' personal fears and health risks related to COVID-19, as well as its impact on society's resources. Fear is expressed as a response to the perceived ability of cancer patients to respond to infection or continue treatment. People with cancer are already living with heightened awareness of infection prevention, with positive changes in behaviour such as increased hand hygiene and self-isolation. Vulnerability refers to the inability to withstand hostile environments, often physical, rather than emotional. [31,32]

Theme 4: fear of cancer recurrence

The fear of COVID-19 has increased anxiety, depression, and distress in cancer patients, particularly those affected by treatment delays or cancellations. Fear of cancer recurrence is a common concern, but it can be harmful when faced with disruptions. The pandemic has impacted the emotional, psychosocial, self-, and cancer experiences, emphasizing the importance of addressing the fear of cancer recurrence. [33,34,35]

Cancer Patients as High-Risk Populations during COVID 19

The COVID-19 pandemic has made cancer patients highly vulnerable due to weakened immune systems and the need for regular anticancer therapy. Studies have shown that lung cancer is the most frequent cancer histology in infected patients, followed by gastrointestinal and breast cancer.[36] Stage IV disease patients are also more susceptible to SARS-CoV-25. Patients with cancer have a higher risk of severe clinical events, including admission to the intensive care unit, need for invasive ventilation, or death. Anti-cancer treatment within 14 days before diagnosis is more frequently associated with severe clinical events due to SARS-CoV-2 infection.[37] Patients with haematological malignancies and metastatic solid tumours have a higher risk of severe symptoms. Cancer survivors infected with SARS-CoV-2 also develop increased severity of COVID-19 symptoms compared to non-cancer patients as mentioned in Table 1 . The older age of many cancer patients is an additional risk factor for severe COVID-19 disease. [38] Cancer patients develop COVID-19 severe symptoms more rapidly than those without cancer and have more prolonged hospital stays. However, more rigorously designed studies are needed to confirm whether cancer patients develop more severe COVID-19 symptoms upon infection with SARS-CoV-2.[39]

Table 1: Clinical features in non-cancer and cancer patients with COVID-19

Clinical features	**Non-cancer patients with COVID-19**	**Cancer patients with COVID-19**
Clinical characteristics	Fever (88.7%)	Fever (78% to 82.1%)
	Cough (67.8%)	Dry cough (74% to 81%)
	Nausea or vomiting (5%)	Nausea or vomiting (5.71%)
	Diarrhoea (3.8%)	Diarrhoea (12%)
	Fatigue (38.1%)	Fatigue (64.3%)
	Dyspnoea (21.9%)	Dyspnoea (50%) tachypnea (14.3%)
	From onset to dyspnea was 8 days	From onset to dyspnea was 1 or 5 days for lung cancer or other cancer patients, respectively
Radiographical findings (Chest CT imaging)	Ground-glass opacity (65%)	Ground-glass opacity (65%)
	Patchy consolidations (50%)	Patchy consolidations (50%)
	Air bronchogram (47%)	Air bronchogram (47%)

	Interlobular septal thickening (35%) Adjacent pleura thickening (32%)	Interlobular septal thickening (35%) Adjacent pleura thickening (32%)
	Bilateral lung involvement (51.8%)	Bilateral lung involvement (51.8%)
Laboratory findings	Lymphopenia (83.2%)	Lymphopenia (82.1%)
	Leukopenia (33.7%)	Leukopenia (32.1%)
	Elevated CRP (86%)	Elevated CRP (82.1%)
	Elevated myoglobin (15%)	Elevated serum globulin (39.3%)
	Elevated D-Dimer (36%)	Elevated D-Dimer (39.3%)
	Low level of serum albumin (98%)	Low level of serum albumin (89.3%)
	Anemia (51%)	Anemia (75%)
	Elevated LDH (76%)	Elevated LDH (50%)
	Elevated ESR (85%)	Elevated ESR (57.1%)

Telemedicine and Virtual Care in Cancer during COVID 19

Telemedicine is gaining momentum in cancer care and management due to advancements in science and technology. It allows timely, accessible, and cost-effective healthcare delivery, making it a practical solution to COVID-19-induced constraints [40]. Virtual reality devices have been found useful for training healthcare professionals, especially in underserved geographically remote populations. Emerging technologies like artificial intelligence (AI) have great potential in facilitating cancer screening [41]. AI-based telemedicine tools have the future potential to assist patients and healthcare practitioners with cancer screening and improve screening accuracy. To successfully implement telemedicine in cancer care and primary care, education and training should be made available to both patients and healthcare practitioners [42]. As technology advances, telemedicine education and training programs should be updated regularly to ensure practitioners are up-to-date with telemedicine opportunities. Technology competence might be an integral part of effective patient-provider communication [43].

2. DRAW BACKS OF TELECOMMUNCATION

The COVID-19 pandemic has led to telemedicine becoming increasingly prevalent in oncological practice and management [44]. This real-time audio-visual interaction between patients and providers has been deemed preferable over in-person consultations. However, telemedicine has limitations such as jurisdictional boundaries, limited access to telemedicine platforms, and impracticality for populations with impaired hearing, vision, or cognition [45]. Patient satisfaction is also affected, with some patients reporting nervousness and anxiety. Oncologists are generally undecided about virtual patient management, with only 46% preferring to manage cases virtually. Guidelines on oncological surveillance over the phone or video are scarce, and diagnosis and management are based on symptomatology and subtleties [46]. The rapid adaptation of telemedicine can bring unique challenges to patients and providers, raising questions about preparedness, training, and telecommunication infrastructure. Only the education level of the patient has a statistically significant relationship with the favourability rate of telemedicine utilization [47].

Further direction of telemedication:

Telemedicine in cancer care has significant potential, especially during and after the COVID-19 pandemic [48]. Researchers are studying patients' outcomes and detecting cohorts benefiting from altered treatment protocols. Advances in technology, such as portable cameras and computer-based tools, can improve health information exchange and patient care [49]. Tele-oncology can lead to improved coordination, lower costs, early detection, and personalized access to care. However, proper training and education are needed for healthcare professionals [50].

Cancer Screening and Prevention Programs

Health care professionals should adopt integrated marketing campaigns, such as social media campaigns, to increase screening awareness and adoption rates in patients. These campaigns use evidence-based, tailored communication strategies to change attitudes and behaviour to improve health. Social media campaigns can be particularly useful for promoting cancer

screening services to at-risk populations, as they can be distributed remotely with limited costs. Promising results show that social media campaigns on lung cancer screening using Google and Facebook yielded click-through rates above industry standards, addressing the widening cancer disparities exacerbated by COVID-19. [51,52,53,54,55]

Cancer prevention and screening professionals must innovate to reduce community cancer burden. Short-term and long-term plans should consider cancer's capricious nature and its intersection with other health issues. Recommendations include breast cancer screening: mobile mammography units, cervical cancer screening: pap smears, and colon cancer screening enhanced workflows for FIT or Cologuard with appropriate patients. General solutions include proactive outreach, social media communication, telemedicine appointments, and precautions.

How do we prepare for the next pandemic or International emergency as an International Community

The COVID-19 pandemic has brought both challenges and opportunities to improve patient access to high-quality cancer care and research. Vaccines have been discovered and are now accessible to healthcare professionals, as seen in NCC Singapore's aggressive vaccination program. [56] The Asian region needs to provide a roadmap to improve access to affordable and equitable care and clinical research, streamline regulatory requirements, and achieve improved outcomes for cancer patients. However, there are still gaps in knowledge among Asian major ca ncer centers about COVID-19's impact on cancer care, including cancer treatment options, drug safety, and outcomes. Oncologists must remember the lessons learned and overcome obstacles in providing cancer care services. Collaboration among key players in the field of cancer amidst COVID-19 is essential to ensure safer, more effective, and higher-quality care and research. Healthcare providers, including medical institutions, local working groups, payers, patients, and decision-makers must collaborate and prioritize policy reforms to improve cancer care delivery services in the long term. The pandemic has increased awareness about the shortcomings of the cancer care delivery system in Asia and the importance of mitigating them by optimizing collaboration among cancer centers to establish more centers, especially in LMICs, to minimize disparities and inequalities in access to cancer care. [57] The strategy calls for developing telemedicine services, bolstering the infrastructure for cancer care in underserved and rural areas, researching the effects of COVID-19 on cancer treatment, putting financial and emotional support plans for cancer patients into place, and promoting international cooperation in the event of a global health emergency.

3. CONCLUSION

Treatment delays, increased susceptibility of cancer patients, and psychological difficulties are just but a few of the significant and varied effects of the COVID-19 pandemic on cancer care. It has expedited the introduction of telemedicine, which is associated with both advantages and disadvantages. For better outcomes for cancer patients worldwide, the gaps in infrastructure for cancer treatment will need to be closed, especially in deprived regions, with increased access to vaccinations and robust healthcare systems in place for the future pandemics.

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