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Original Research Article

IMPACT OF COVID-19 ON RADIATION ONCOLOGY IN PAKISTAN

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Abstract: *The survey study was conducted in the Radiology Departments of different centers in Pakistan from June 2020 to October 2020 to assess the impact of COVID-19 on radiation therapy in Pakistan. Data about courses in external beam radiography and attendees were extracted from the hospital record. The percentage change in radiotherapy activity for each month between June to October 2020 was calculated and individually compared from June 2019 to October 2019. Results showed that lockdown was significantly associated with a reduction in radiotherapy courses (P<.0001). The mean weekly number of radiotherapy courses decreased by 108 (-19.9%) in June 2020 from 543±170 in June 2019. The largest reduction in radiotherapy courses after the lockdown was reported in non-melanoma skin cancer and prostate cancer. Data analysis showed that radiation therapy services fell significantly at the onset of COVID-19. Cancers whose treatment can be safely delayed were most affected. On the other hand, cancers in which radiotherapy offered an alternative to surgery had seen a rise in treatment courses.*

Keywords: Radiation therapy, Oncology, COVID-19, Lockdown

Introduction

COVID-19 has increasingly alarming indirect consequences. In Pakistan, positive e cases increased rapidly, which called for urgent planning, action, and management. The Ministry of Health presented the "National Action Plan for Preparedness & Response to Corona Virus Disease (Covid-19) Pakistan". This plan aimed to control the spread of the virus and strengthen emergency preparedness to ensure efficient response to COVID-19-associated events(Waris et al., 2020). Globally, healthcare providers took similar steps in response to the pandemic. The impact of COVID-19 on cancer patients is particularly concerning, given the need for timely diagnosis and treatment. Radiotherapy is important in palliating symptoms and curative treatment, along with systematic anticancer therapy and surgery.

After the pandemic's onset, staff shortages and limited testing facilities constrained all three cancer treatment modalities. Surgical units were occupied due to the need for ventilation in acutely ill patients. In response to this situation, healthcare bodies worldwide issued revised guidelines for cancer care. These guidelines addressed concerns about the increased risk of infection in cancer patients and hospital infection transmission (Guidance, 2020). These guidelines included recommendations about treatment delay or omission, use of hypofractionated radiotherapy and use of radiotherapy or bridging or replacing surgery (Al-Quteimat and Amer, 2020). Rising in COVID-19 cases necessitated the evaluation of its indirect consequences.

Radiation oncology institutes in Latin America, the USA, and Europe conducted surveys to understand changes in radiotherapy practices (Martinez et al., 2020; Slotman et al., 2020; Wakefield et al., 2020). However, these studies had limited data about regime use and individual cancer. The lack of this data limits accurate modeling of the indirect consequences of the pandemic. Such information is also required to mitigate these indirect harms. Mitigation includes identifying patients whose treatment is modified and thus requires a tailored treatment plan. There is a lack of local data about the impact of the pandemic on cancer care and radiotherapy, due to which mitigation measures and long-term plans for cancer services are missing. Thus, this study aims to assess the impact of COVID-19 on radiation therapy in Pakistan.

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Methodology

The survey study was conducted in the Radiology Departments of different centers in Pakistan from June 2020 to October 2020. All tumor sites and ages were included. Data about courses in external beam radiography and attendees were extracted from the hospital record. Data including age, sex, type of cancer, clinically appropriate group (for instance, head and neck cancer), treatment intent (curative (radical or adjunct) and palliative), planned dose (Gy), planned fractionation, starting date of the radiotherapy course and attendances dates were analyzed.

SPSS version 23.0 was used for data analysis. Radiotherapy activity was defined as attendance per month and meant weekly treatment courses. The percentage change in radiotherapy activity for each month between June to October 2020 was calculated and individually compared from June 2019 to October 2019 (the first case of COVID-19 in Pakistan was reported in 2020)(Hanif et al., 2020). The difference in attendance and courses was compared with data in 2019. Lockdown and ease of lockdown were considered binary variables. Weeks with public holidays were adjusted. Change in radiotherapy activity after the lockdown was assessed through interrupted time series (ITS) analysis using multivariate linear regression models. P value < 0.05 was considered statistically significant.

Results

In 2019, there were 550± 247 mean weekly radiotherapy courses. This number decreased by 108 (-19.9%) in June 2020, from 543±170 in June 2019. Results showed that treatments attendances were greatly reduced after lockdown: fall of 980 (-28%) from 3500 ± 560 in June 1168 (-32%) from 3650± 247in July and 1178 (32%) from 3680± 250 in August 2019. According to ITS analyses, the lockdown significantly reduced radiotherapy courses (P<.0001). ITS model predicted 1050 fewer therapy courses and 4347 fewer attendances than would occur without the pandemic.

The effect of the pandemic on weekly curative radiotherapy courses and attendance in specific malignancies is shown in Table I. The largest reduction in radiotherapy courses after the lockdown was reported in non-melanoma skin cancer and prostate cancer. The number of attendances was reduced for palliative treatment, lymphoma, breast cancer, and rectal cancer.

Mean weekly treatment courses in patients above 70 years decreased by 170 (-34%) from 500±94 in June 2019. In patients below 70 years, it decreased by 30 (-7.1%) from 420 in June 2019. This impact on age was most evident in patients with breast cancer (the number of mean weekly courses fell by 57 (31.6%) from 180±25 in June 2019.

Table I Mean weekly treatment courses and attendances in each group

	Radiotherapy Courses					Attendances				
	June 2020	July 2020	August 2020	September 2020	October 2020	June 2020	July 2020	August 2020	September 2020	October 2020
Anal Cancer										
Mean	15±6	20±11	22±6	11±3	25±3	275±19	270±15	219±10	180±9	305±8
Percentage change	-4.2%	21.5%	9.7%	2.1%	-42%	11.3%	8.6%	16.5%	12.2%	-26.5%
Bladder Cancer										
Mean	17±5	15±6	25±11	19±15	11±4	215±	221±	209±	213±	251±
Percentage change	-7.2%	-1.2%	65%	81%	17.1%	-28%	3.6%	37.8%	76%	49%
Brain Cancer										
Mean	43±4	45±4	36±7	30±10	25±4	550±10	425±9	505±4	500±4	430±6
Percentage change	10.1%	-23.4%	-15.6%	-28.7%	-21.3%	10.5%	-21%	-26.5%	-25.2%	-32%
Breast Cancer										
Mean	105±34	120±24	116±30	115±30	97 ±25	989±110	908±80	1005±80	1104±105	995±100
Percentage change	1.2%	-4.2%	-4.2%	6.5%	-12.3%	2.7%	-5.3%	-32.2%	-38%	-46.5%
Cervical Cancer										
Mean	5±6	11±4	4±4	6±3	8±5	276±11	265±11	270±9	289±6	277±9
Percentage change	-.2%	4.1%	9.1%	-4.1%	-22.5%	-9.8%	-16.7%	12.3%	-19.2%	-37.6%
Head and neck Cancer										
Mean	55±5	53±3	42±6	30±10	25±5	515±55	607±43	600±50	583±63	511±54
Percentage change	-2.3%	14%	-19.3%	-25.1%	-19.1%	-6.2%	-2.8%	5.2%	3.8%	-17%
Lung Cancer										
Mean	78±10	81±15	85±16	52±21	51±5	640±13	616±45	508±30	661±30	687±41
Percentage Change	6.6%	8.2%	-1.2%	10.1%	-11.1%	8.1%	9.1%	-5.6%	-.1%	-21.3%

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Lymphoma										
Mean	21±9	24±4	15±5	21±3	10±2	230	247	309	250	287
Percentage change	5.8%	-5.5%	-18.1%	22.1%	-1.5%	12.-3%	-10.7%	-25.2%	-14.3%	-7.8%
Prostate Cancer										
Mean	110±15	98±15	95±9	85±8	82±11	389±110	400±118	350±97	451±112	464±87
Percentage change	-10%	-23%	-65%	-68.7%	-55.1%	-12.5%	-14.2%	-55.6%	-72.1%	-39.6%
Rectal Cancer										
Mean	11±5	7±3	9±4	15±2	21±2	120±45	123±45	121±34	134±50	200±47
Percentage change	-5.1%	-5.1%	15.1%	14.1%	-23%	9.6%	.2%	-8.7%	-29.4%	-55.7%
Non melanoma skin Cancer										
Mean	33±5	21±2	19±6	21±3	25±5	206	198	145	207	220
Percentage change	-12.5%	-28%	-71.5%	-65%	-31.2%	-8.6%	-24.6%	-52.6%	-56.8%	-28.7%

Mean weekly courses and attendances, the percentage change in 2020 compared to the equivalent month in 2019.

Discussion

The current study showed that the number of radiotherapy courses fell significantly after the initiation of the lockdown. ITS model predicted 1050 fewer therapy courses and 4347 fewer attendances than would occur without the pandemic. Attendances were greatly reduced after the lockdown. The mean weekly treatment courses decreased by 108 (-19.9%) in June 2020, from 543±170 in June 2019. The reduction of radiotherapy activity reported in our study aligns with previous studies conducted during the first wave of lockdown (Oncology, 2020; Spencer et al., 2021). Radiation oncology centers in Europe reported a 20% reduction in radiotherapy activity.

Contrastingly, Latin America had an 8% reduction(Martinez et al., 2020), far less than our study reported. The current study also analyzed the differential impact of age and diagnosis. Many global healthcare bodies issued a protocol for safe radiotherapy services at the start of the pandemic. A major concern was that hospitals became a reservoir of SARS-CoV-2(Yu et al., 2020), and cancer patients, particularly those aged 70 years or above, were at increased risk of infection(Williamson et al., 2020). Considering this risk, many guidelines suggested deferring treatment if potential risks outweighed the benefits. This study found that the drop in treatment courses was much more significant in patients aged 70 years or above than in those less than 70 years. It can partly be due to the deferral treatment in the high-risk group.

The highest number of course reductions were observed in non-melanoma skin cancer and prostate cancer. Randomized evidence showed that a radiotherapy course in prostate cancer could be delayed 6 months after diagnosis if low-risk patients are There is limited evidence which supports treatment deferral in non-melanoma skin cancer, though in small basal cell carcinoma treatment delay does not have much effect on prognosis(Xing et al., 2021). Additionally, the differential impact of age was most evident in breast cancer; it likely reflects an altered treatment plan based on risk assessment and following the guidelines of the PRIME-II trial(Kunkler et al., 2015). There was a rise in courses for rectal and bladder cancers during August and September 2020; in this cancer, disease biology does not allow major treatment delays. The rise in courses shows that radiotherapy was used as an alternative to invasive surgery. Studies show that the limitations of surgical services during COVID-19 are major causes of mortality in these patients(Lai et al., 2020; Sud et al., 2020). In rectal cancer, delay in surgery is mangled by radiotherapy, and in some, it may replace resection entirely. The current study showed that treatment attendance also fell significantly after the lockdown, which can be explained by guidelines advocating lesser hospital visits. As a result, hypo fractionated radiotherapy was widely used.

The limitation of this study is that it's a single center. A larger multi-centered survey is important to assess the general impact of the pandemic on radiation oncology and to formulate mitigation measures.

Conclusion

Radiation therapy services fell significantly at the onset of COVID-19. Cancers whose treatment can be safely delayed were most affected. On the other hand, cancers in which radiotherapy offered an alternative to surgery had seen a rise in treatment courses.

Conflict of interest

The authors declared an absence of conflict of interest.

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