

Impact of COVID-19 nationwide lockdown on retinoblastoma treatment and outcome: A study of 476 eyes of 326 children

Rolika Bansal, Ankita Aishwarya, Raksha Rao¹, Marem C Christy, Mrityika Sen, Harika Regani, Poonam Bagai², Vijay A Reddy³, Kaustubh Mulay, Pramila Bongoni, Santosh G Honavar

Purpose: The novel coronavirus SARS-CoV-2 (COVID-19) and the resultant nationwide lockdown and travel restrictions led to difficulty in providing timely and regular treatment to patients with childhood cancers such as retinoblastoma. This study is aimed at assessing the demography, clinical presentation, treatment strategies, and outcome of treatment defaulters due to the lockdown. **Methods:** Cross-sectional, observational study of retinoblastoma patients at a tertiary care ocular oncology center during the first wave of COVID-19 and the resulting nationwide lockdown. **Results:** Of the 476 eyes of 326 patients undergoing active management with a median age of 57 months (range: 4–214 months), 205 (63%) patients returned for follow-up after a mean delay of 45.8 ± 24.3 weeks (range: 8–80 weeks) and 121 (37%) were defaulters according to the data analyzed till June 30, 2021. Distance of residence was ≥ 1000 km for 148 patients (46%). In terms of need for active treatment, the number of emergent cases was 2 (<1%), 11 (3%) were urgent, and 313 (96%) were semi-urgent. International classification groups D (n = 107 eyes, 23%) and E (n = 173 eyes, 36%) were in majority, and 13 eyes (4%) and 4 eyes (1%) were at stages 3 and 4, respectively. Prior to lockdown, 86 eyes (18%) had active tumor, which remained unchanged (n = 26, 30%) or worsened (n = 49, 60%) after failure to follow-up. Vision (47%), eye (92%), and life salvage (98%) were achieved by individualized protocol-based management after the patients returned for further management. Five children succumbed to intracranial extension. **Conclusion:** The COVID-19-related nationwide lockdown has deprived retinoblastoma patients of optimal and timely management, leading to prolonged treatment interruptions, delays, permanent default, and death. It is of paramount importance for all the stakeholders to increase awareness, make necessary travel and logistic arrangements, and ensure continuity of care for children with retinoblastoma.

Key words: COVID-19, ocular oncology, retinoblastoma, SARS-CoV-2, treatment delay

COVID-19 pandemic has jeopardized timely availability of appropriate healthcare services and management of various diseases, including life-threatening childhood malignancies such as retinoblastoma. The WHO Global Initiative for Childhood Cancer (GICC) launched in 2018 has outlined retinoblastoma to have a very good prognosis in high-income countries and considerably curative in low and middle-income countries if appropriate standards of care are provided and treatment regimens are duly followed.^[1-3] Based on the resource stratification and advances in the treatment of retinoblastoma, prognosis has improved significantly over the years by providing regular management as per the protocols.

Among the four levels of urgency in ocular oncology, retinoblastoma cases can range from emergent to semi-urgent, requiring intervention within 24 hours to 1–2 months, respectively.^[4] Examination under anesthesia (EUA) for new and follow-up cases with appropriate systemic and radiological evaluation followed by protocol-based management and “quad-triage” have been advocated in the current COVID-19 pandemic.^[5]

Centre for Sight, Hyderabad, Telangana, India, ¹Narayana Nethralaya, Bangalore, Karnataka, India, ²CanKids KidsCan, New Delhi, Delhi, India, ³Apollo Hospitals, Hyderabad, Telangana, India

Correspondence to: Dr. Santosh G Honavar, Centre for Sight, Ashoka Capitol, Road No 2, Banjara Hills, Hyderabad, Telangana, India. E-mail: santosh.honavar@gmail.com

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The COVID-19 pandemic has created a significant void in the access and availability of treatment modalities and timely intervention for children with retinoblastoma due to the lockdown, lack of transportation, and resultant financial constraints. The widespread uncertainty and fear of COVID-19 have resulted in psychological, social, and financial perplexities in the families, thus further complicating the situation and impeding access to care. We conducted a study to assess the effect of the COVID-19-related nationwide lockdown on disruption of access to care and the impact it had over the disease in terms of tumor progression and life, eye, and vision salvage in children with retinoblastoma.

Methods

This was a cross-sectional, observational study including all enrolled retinoblastoma patients being treated at a tertiary care ocular oncology center in Southern India scheduled for a

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follow-up during the COVID-19-related nationwide lockdown from March 25, 2020 to June 30, 2020. Follow-up data were collected until June 30, 2021. The study was approved by the institute's review board.

The cases were categorized as per the recommendations by the American Association of Ophthalmic Oncologists and Pathologists (AAOOP) and the International Society of Ocular Oncology (ISOO) as emergent, urgent, and

semi-urgent.^[4] The parameters assessed included the age at the time of loss to follow-up (LFU), distance of residence from the treating center, socioeconomic status (based on modified Kuppuswamy scale), laterality, group and stage of retinoblastoma, methods used for communication, reason for LFU, COVID-19 infection status, primary treatment given, status of tumor and treatment followed before and after LFU, intervention by the regional ophthalmologist, and the need for systemic evaluation. The main outcome measures were the status of the tumor; subretinal and vitreous seeds; and vision, eye, and life salvage.

Table 1: Impact of COVID-19-related nationwide lockdown on retinoblastoma follow-up: Patient demographics

Demographics	n=326 patients (%)
Age at LFU	
Mean (median, range), months	60.3 (57, 4-214)
Region	
Local	19 (6)
<500 km	30 (9)
501-1000km	129 (39)
1001-1500km	65 (20)
>1500 km	41 (13)
International	42 (13)
Socioeconomic status*	
Upper class	52 (16)
Upper-middle class	109 (33)
Lower-middle class	32 (10)
Upper-lower class	64 (20)
Lower class	69 (21)
Gender	
Male	186 (57)
Female	140 (43)
Heredity	
Nonfamilial	308 (95)
Familial	18 (5)
Laterality of retinoblastoma	
Unilateral	176 (54)
Bilateral	150 (46)
Eye involved, n=476 eyes	
Right eye	248 (52)
Left eye	228 (48)
Levels of urgency [#]	
Emergent	2 (<1)
Urgent	11 (3)
Semi-urgent	313 (96)

*As per Modified Kuppuswamy scale. [#]As per the triage suggested by Skalet *et al.*^[4]

Table 2: Impact of COVID-19-related nationwide lockdown on retinoblastoma follow-up: Clinical features

Clinical characteristics	n=476 eyes (%)
International Classification of Retinoblastoma group at diagnosis	
Group A	10 (2)
Group B	40 (8)
Group C	27 (6)
Group D	107 (23)
Group E	173 (36)
Not assessed*	119 (25)
Staging, n=326 patients	
Stage 0	210 (64)
Stage 1	87 (27)
Stage 2	12 (4)
Stage 3	13 (4)
Stage 4	4 (1)
Status of the tumor before LFU	
Active, on treatment	86 (18)
Regressed, on observation	250 (53)
Anophthalmia	140 (29)
Ongoing treatment	
Chemotherapy	15 (3)
Focal treatment (TTT/Cryo/POT/IViT/Plaque) with chemotherapy	56 (12)
Adjuvant chemotherapy	14 (3)
Observation	5 (1)
Observation	385 (81)
Advised interval for next follow-up	
Mean (median, range), weeks	14.4 (12, 4-24)

*Patients previously treated elsewhere with no documentation of baseline grouping. TTT – Transpupillary thermotherapy; Cryo – Cryotherapy; POT – Periocular topotecan; IViT – Intravitreal topotecan



Figure 1: Retinoblastoma group E in a boy aged 2 years and 9 months: (a) Focal anterior chamber seeds with diffuse neovascularization of iris and 360° posterior synechiae were seen, and the child was categorized as “emergent” and was advised to undergo immediate enucleation. (b) After LFU of 10 months, the child came with proptosis and an anterior staphyloma. (c) After a further LFU of 3 months the child developed orbital retinoblastoma presenting as a fungating mass in the right eye and eventually succumbed to intracranial extension

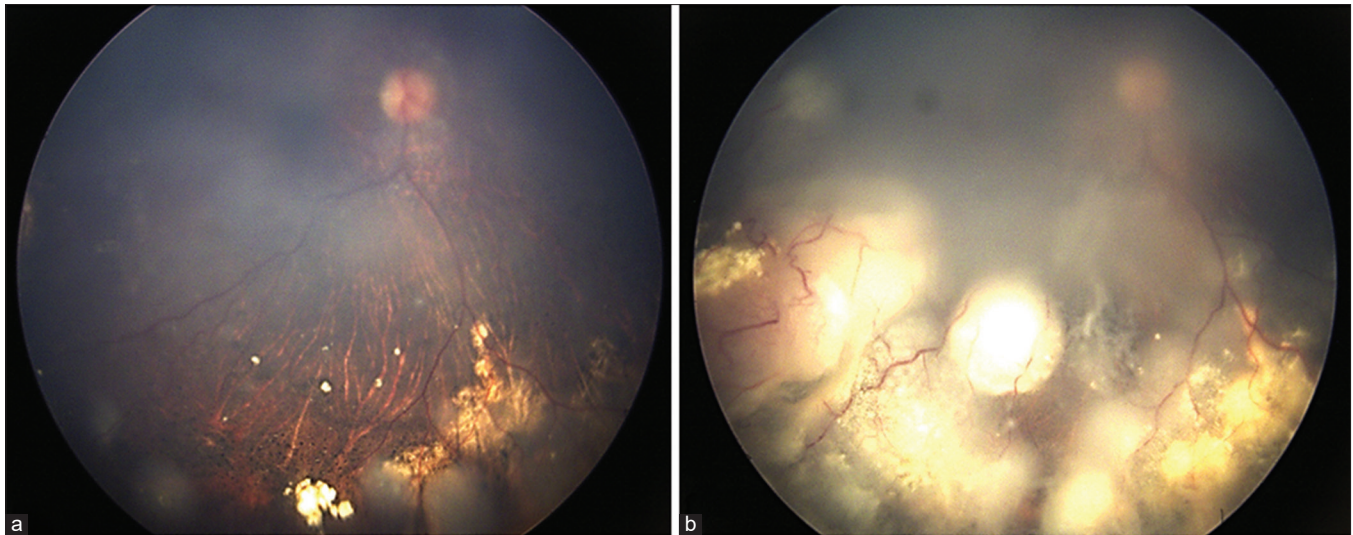


Figure 2: Retinoblastoma group D in a boy aged 3 years and 10 months: (a) Multiple small subretinal seeds occupying mainly the inferior quadrant. (b) After LFU of 1 year, the tumor size had significantly increased with recurrence in all quadrants along with multiple subretinal seeds

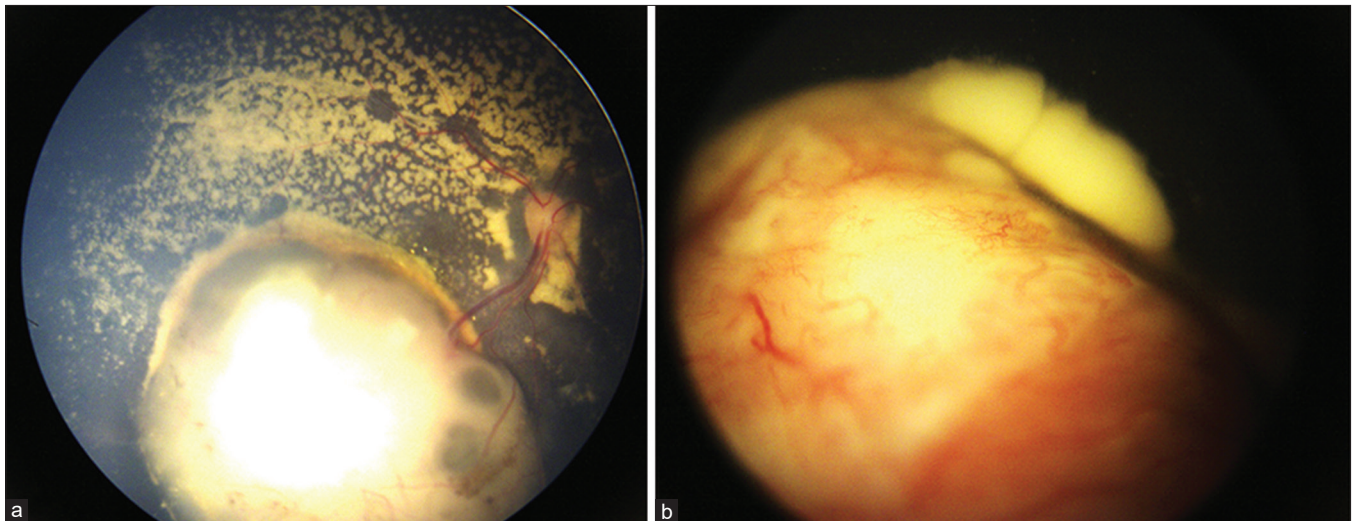


Figure 3: Retinoblastoma group E in a girl aged 2 years and 1 month: (a) Resolving tumor with multiple vitreous seeds (not seen in the image) on active treatment with IViT and TTT. (b) After LFU of 9 months, the tumor size had significantly increased, filling the entire vitreous cavity with diffuse vitreous seeds; enucleation was performed

“Quad triage” was followed after LFU, that is, COVID-19 screening and rescheduling of consultation, clinic visit with all safety measures, and detailed clinical evaluation of the children by examination under anesthesia and decision regarding further management based on the prescribed protocols. Transportation arrangements and letters facilitating their travel, along with psychological counseling of the parents by social workers and health care providers, were provided^[5].

The data were analyzed using SPSS (IBM SPSS Statistics 20, SPSS Inc., Chicago, IL, USA) and Microsoft Excel (Version 16.49).

Results

Demography

A total of 326 retinoblastoma patients who were scheduled for follow-up during the study period were adversely affected by the COVID-19-related nationwide lockdown. They constituted

77% of the children with retinoblastoma being treated at the Ocular Oncology Services [Table 1] as of March 25, 2020. The median age of the patients was 57 (range: 4–214) months with a male predominance (186 (57%)). Distance was a major deterrent to follow-up for 148 (46%) patients, including 42 (13%) international patients who resided ≥ 1000 km from the treatment center. Patients belonging to the middle ($n = 141$ patients, 43%) and lower ($n = 133$ patients, 41%) socioeconomic classes were largely affected. Two (<1%) patients categorized as emergent had intractable glaucoma and needed intervention within 24 h [Fig. 1]; 11 (3%) patients were advised enucleation and needed urgent care; and 313 (96%) were categorized as semi-urgent, undergoing active treatment, or having stable disease with the last active treatment received within the past 6 months.

Clinical features of patients

Of the 476 eyes lost to follow-up, the majority belonged to the international classification group D ($n = 107$ eyes, 23%) [Fig. 2] and

Table 3: Departmental actions taken up for assuring the provision and continuation of treatment during the COVID-19 pandemic

- Documentation and maintaining records of defaulters
- Keeping a real-time track of WHO and national updates
- Risk-analysis of children on active treatment
- Establishing high-level communication with the parents, including video calls wherever necessary
- Understanding the reason for LFU and providing optimal solutions promptly keeping in mind international, national and hospital regulations
- Providing psychological support and reasoning with the parents regarding the need of hospital visit despite of pandemic
- Rescheduling the cases as per triage protocols, keeping in mind disease activity
- Issuing travel letters for the children and parents
- Regular meetings regarding handling the situation with a multidisciplinary contribution
- Referring to local ophthalmologists and coordinating regarding status of disease as on last visit
- Providing RetCam® pictures and chemotherapy protocols wherever necessary
- Optimal COVID-19 testing at the time of visit after LFU
- Strict assessment of suspected COVID-19 cases before EUA
- Tailored re-entry level individualized treatment protocols
- Ensuring safety of hospital staff, patients, nursing staff, anesthetists, and oncologists as per the safety regulations issued by the government
- Generous contribution from nongovernmental organizations to help with economically backward families
- Regular counselling of constant defaulters
- Awareness campaigns regarding need for regular follow-up in retinoblastoma

E (n = 173 eyes, 36%) [Fig. 3]; 13 patients (4%) and 4 patients (1%) represented stages 3 and 4, respectively [Table 2]. Prior to the COVID-19-related nationwide lockdown, 86 (18%) eyes with active disease were on treatment, including chemotherapy for 15 (3%) eyes, chemotherapy with focal treatment in 14 (3%), focal treatment in 56 (12%), and adjuvant therapy in 5 (1%), while 385 (81%) eyes had stable regression for <6 months and were under observation. The patients were on a scheduled median follow-up of 12 weeks.

Patient logistics and departmental actions

Table 3 describes the actions taken for continuation of treatment during the COVID-19 pandemic. Most of the patients (266, 82%) were telephonically reached; however, 52 (16%) did not respond to any form of communication [Table 4]. Despite all the efforts, there was a median LFU duration of 48 weeks. Efforts were made to make arrangements for EUA in their respective region, and 69 (21%) patients were successfully referred to ophthalmologists, who provided protocol-based collaborative treatment under our guidance in the form of chemotherapy in three (4%) and focal treatment with or without chemotherapy in 14 (20%) [Fig. 4]. However, the facilities of EUA and treatment modalities were not available at all centers.

Impact of COVID-19-related nationwide lockdown on follow-up and treatment

Of the 476 eyes of 326 patients undergoing active management, 205 (63%) patients returned for follow-up after a mean delay of 45.8 ± 24.3 weeks (range 8–80 weeks) and 121 (37%) were defaulters according to the data analyzed till June 30,

Table 4: Impact of COVID-19-related nationwide lockdown on retinoblastoma follow-up: Patient Logistics

Features	n=326 patients (%)
Response to various modes of contact	
Telephonic conversation	266 (82)
E-mail/Postal letters	8 (2)
No response (to call/message/mail/letter)	52 (16)
Reason for LFU	
Travel restriction only	69 (21)
Travel restriction + Family restrictions	90 (28)
Travel restriction + Financial constraint	84 (26)
Travel restriction + Fear of hospitals	81 (25)
Travel restriction + COVID-19 positivity	2 (<1)
LFU duration	
Mean (median, range), in weeks	45.8 (48, 8-80)
Consulted a local ophthalmologist	
Yes	69 (21)
No	205 (63)
Not known	52 (16)
Treatment by the local ophthalmologist, n=69 patients	
Chemotherapy	3 (4)
Focal treatment + /-Chemotherapy	14 (20)
Observation	52 (75)
Follow-up after LFU, n=476 eyes	
Yes (205 patients, 63%)	301 (63)
No (121 patients, 37%) [Defaulters]	175 (37)
Treatment reinitiation, n=301 eyes	
Chemotherapy	19 (6)
Focal treatment (TTT/Cryo/POT/IVit/Plaque) with chemotherapy	43 (14)
Adjuvant chemotherapy	18 (6)
Enucleation	5 (2)
Observation	6 (2)
Observation	210 (70)
Additional management on consecutive visits, n=231 eyes	
Imaging	14 (6)
Bone marrow biopsy and cerebrospinal fluid cytology	9 (4)
Chemotherapy	38 (16)
Additional treatment modalities till the last follow-up, n=231 eyes	
Periocular chemotherapy (POT)	11 (5)
Intravitreal chemotherapy (IVit)	17 (7)
Intraarterial chemotherapy	8 (3)
Plaque brachytherapy	3 (1)
Enucleation	12 (5)

TTT – Transpupillary thermotherapy; Cryo – Cryotherapy; POT – Periocular topotecan; IVitT – Intravitreal topotecan

2021. The disease activity remained unchanged 26 (30%) or worsened 49 (60%) in the active cases (n = 86) [Table 5]; additionally, 10 (4%) of the previously regressed cases became active after LFU [Fig. 5]. Subretinal seeds and vitreous seeds were active in 16 (14%) and 19 (17%) eyes, respectively, at the time of LFU, which continued to be active in 10 (9%) and 8 (7%) eyes, respectively [Table 6]. The patients with regressed seeds were the ones who were duly followed up with focal treatment by local ophthalmologists and the rest were defaulters.

Immediate reinitiation of treatment after LFU (n = 301 eyes) was in the form of chemotherapy in 19 (6%), chemotherapy

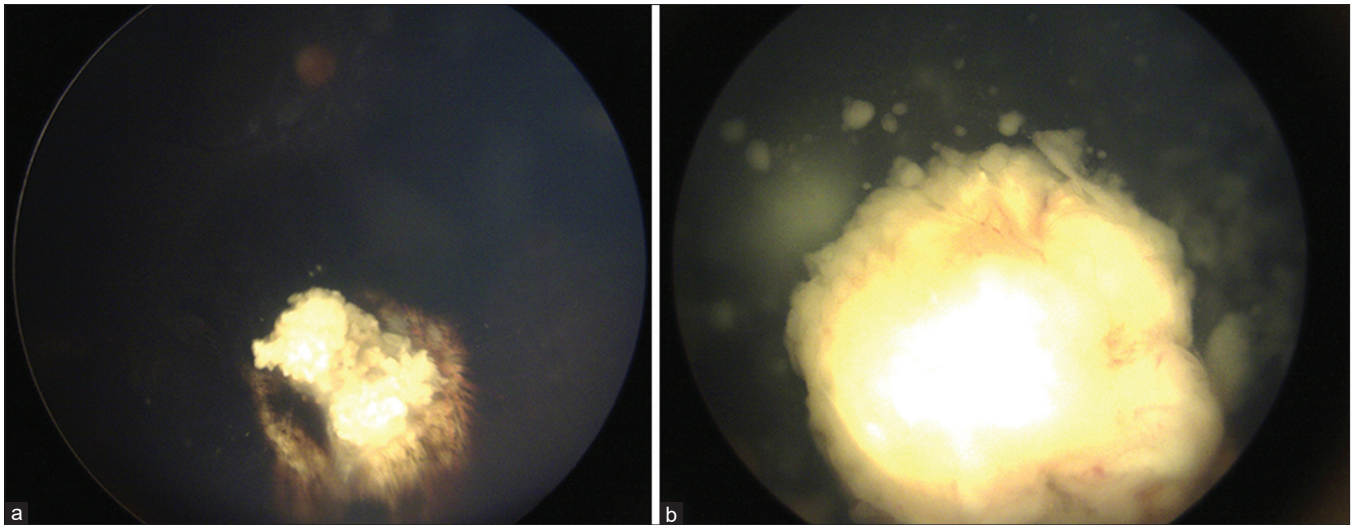


Figure 4: Retinoblastoma group D in a boy aged 2 years and 11 months: (a) Stable regression of peripheral tumor was seen. The child was examined by a local ophthalmologist regularly by indirect fundoscopy. (b) After LFU of 6 months, the child presented with a large retinal tumor and clumps of vitreous seeds. The recurrence was managed by intraarterial chemotherapy and IViT

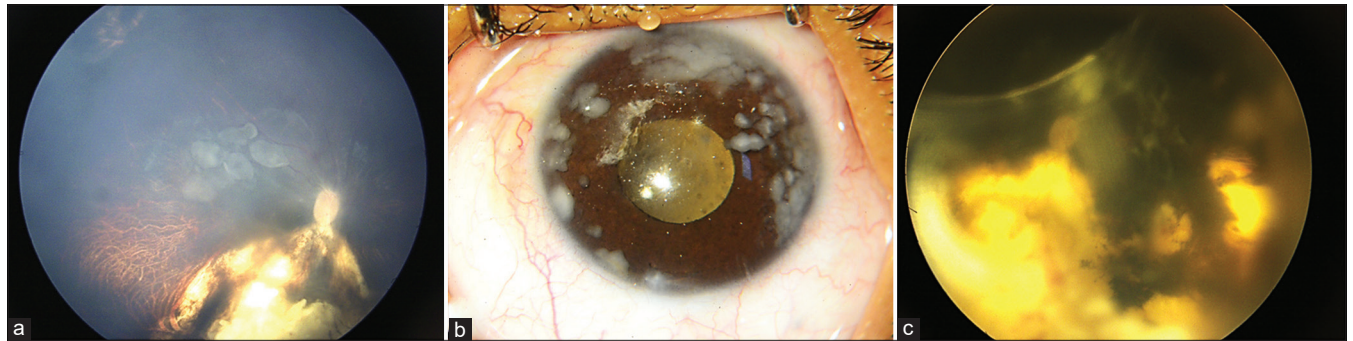


Figure 5: Retinoblastoma group D in a girl aged 10 years and 4 months: (a) Regressed flat scar seen inferiorly on observation. (b) After LFU of 10 months, the child developed diffuse anterior seeds. (c) The tumor recurred with diffuse clumps of vitreous seeds, which were resistant to chemotherapy; enucleation was advised

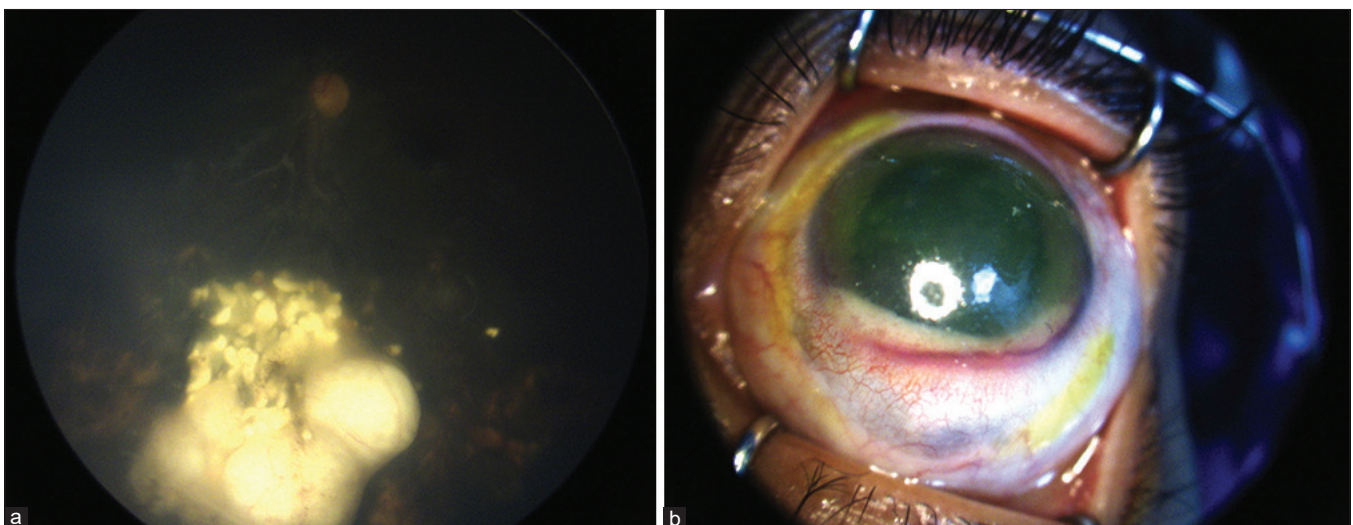


Figure 6: Retinoblastoma group E in a girl aged 4 years and 1 month: (a) The tumor with active vitreous seeds inferiorly was being managed by TTT and IViT. (b) After LFU of 9 months, the child presented with proptosis, pseudo-hypopyon, vitreous hemorrhage, and diffuse congestion, and the child had to undergo enucleation with adjuvant therapy for the histopathological high-risk factors

Table 5: Impact of COVID-19-related nationwide lockdown on retinoblastoma follow-up: Main tumor regression

GROUPS	BEFORE LFU		AFTER LFU			
	Status		Active	Regressed	Anophthalmic	Defaulter
A n=10 eyes	Active	0	-	-	-	-
	Regressed	10	0	7	0	3
	Anophthalmic	0	-	-	-	-
B n=40 eyes	Active	7	5	1	-	1
	Regressed	31	0	22	0	9
	Anophthalmic	1	0	0	0	1
C n=27 eyes	Active	5	5	0	0	0
	Regressed	22	1	10	0	11
	Anophthalmic	0	-	-	-	-
D n=107 eyes	Active	27	23	1	-	3
	Regressed	69	4	47	-	18
	Anophthalmic	11	-	-	5	6
E n=173 eyes	Active	39	32	1	-	6
	Regressed	43	2	24	-	16
	Anophthalmic	91	-	-	46	45
Not classified* n=119 eyes	Active	8	8	-	-	-
	Regressed	74	3	34	-	37
	Anophthalmic	37	-	-	19	18

*Patients previously treated elsewhere with no documentation of baseline grouping

Table 6: Impact of COVID-19-related nationwide lockdown on retinoblastoma follow-up: Subretinal seed and vitreous seed regression

Features	Before LFU	After LFU		
		Active	Regressed	Defaulter
Subretinal seeds, n=112 eyes				
Regressed	96	11	51	40
Active	16	10	2	4
Vitreous seeds, n=112 eyes				
Regressed	93	12	39	42
Active	19	8	3	8

Table 7: Impact of COVID-19 nationwide lockdown on retinoblastoma follow-up: Overall outcomes

Features	n=231 eyes (%)*
Vision salvage	109 (47)
Eye salvage	213 (92)
Life salvage, n=274 patients#	269 (98)
Death, n=274 patients#	
Central nervous system metastasis	5 (<2)
Skeletal metastasis	5 (<2)
	0 (0)

*Excluding the anophthalmic sockets after LFU. #Includes all the patients who could be reviewed after LFU either in-person or telephonically

with focal treatment in 18 (6%), focal treatment in 43 (14%), adjuvant chemotherapy in 5 (2%), and enucleation in 6 (2%) eyes [Fig. 6], whereas 210 (70%) eyes continued to be under observation. By the latest follow-up, an additional 12 (5%) eyes had to be enucleated due to suboptimal response to the reinitiated treatment.

Outcome

Of the 121 patients who were defaulters until June 30, 2021, 58 (48%) were regressed, 55 (45%) were anophthalmic, and

8 (6%) were on active treatment [3 (2%) on neoadjuvant chemotherapy; 5 (4%) on focal treatment] at the last-available follow-up. As seen in Table 7, out of the 205 (63%) patients (301 eyes) that returned after LFU, 70 were anophthalmic = with no recurrence and out of the rest of the 231 eyes, vision salvage was achieved in 109 (47%) and eye salvage in 213 (92%). Aggressive and tailored management protocols aided in attaining a life salvage in 98% (269 of 274 patients), whereas five children succumbed to intracranial extension.

Discussion

The World Health Organization (WHO) declared COVID-19 as a pandemic on March 11, 2020. In view of the fear of the unknown and for safety reasons, many countries around the globe declared a snap lockdown with stringent closure of all international, national, and regional borders. India went into a complete lockdown from March 24, 2020 until June 30, 2020, leading to unavailability of transport modalities as well as limited access to health care services.

Several patients with life-threatening diseases, including adults and children with hematological cancers, stem-cell transplant recipients, pediatric solid tumors, brain tumors, and ocular cancers such as retinoblastoma, were adversely

affected due to the inability to reach their respective health care providers.^[6-17]

The International Society for Pediatric Oncology (SIOP), Children's Oncology Group (COG), St. Jude Global program, and Childhood Cancer International contributed significantly with a major role played by the Pediatric Oncology in Developing Countries (PODC) and Committee of the SIOP by promptly providing a framework for health care teams treating the six most curable cancers as a part of the WHO GICC, with retinoblastoma being one of them.^[2,3] Since June 2019, the stakeholders of the pediatric oncology community—Pediatric Hematology Oncology (PHO) Chapter of Indian Academy of Pediatrics (IAP) and Indian Pediatric Oncology Group (InPOG) as well as civil society and patient groups (Cankids, Kidscan)—have targeted curing more than 60% of children with cancer in India by 2030, and they left no stone unturned in relentlessly providing optimal care and logistical support through the lockdown and to combat its aftereffects. Although measures and protocols were in place to tackle anticipated late diagnoses and treatment gaps due to the COVID-19-related lockdown^[5,18-20], several patients were unable to access the treatment centers.

Sullivan *et al.*^[2] contemplated that the possibility of the burden of adverse outcomes of the COVID-19-related lockdown would be mainly faced by the low- and middle-income countries and they advised regarding preparing for the recovery period. Magrath *et al.* stated that more than 90% of global childhood deaths from cancer occur in low- and middle-income countries with a striking disparity of cancer survival rates as compared to high-income countries with a mean 5-year survival rate of 20%.^[21,22] Pediatric cancers have been seen to affect the middle and lower socioeconomic class more significantly,^[23] which was similar to our observations, wherein the middle class (43%) and lower class (41%) were affected more than the upper class (16%).

The multifactorial reasons for treatment delay, according to the published literature, include delayed diagnosis, lack of access, poor investment into services, illness of family members, financial issues, transport-related problems, and no caregiver to accompany.^[21,24,25] Further, 14% missed appointments were reported before lockdown in retinoblastoma children with 10% due to transport-related problems,^[25] whereas due to the current pandemic, 42.3% of families have been reported to be restricted from traveling.^[18] All of our patients had transport issues with contributing factors such as family restrictions, fear of hospital visits, COVID-19 positivity, lack of education and awareness especially among the lower socioeconomic class, loss of jobs during the COVID-19-related nationwide lockdown, and additional financial constraints amplified during the pandemic.

Considering the high-risk and immunocompromised status and emergent to semi-urgent categorization of patients with retinoblastoma,^[4] all possible efforts were taken up to provide support for these families [Table 3], which included real-time tracking and documentation of defaulters, regular telephonic conversations, issuing travel letters, e-mails and letters, maximizing the reach and optimizing the follow-up visits, providing psychological counseling to the families by trained social workers and health care professionals, referring to regional ophthalmologists and coordinating regularly regarding treatment protocols, contribution from nongovernmental organizations to provide financial support to economically backward families, and ensuring patient and hospital staff safety and creating awareness regarding

regularity and need for follow-ups. Out of the 326 children, 205 (63%) were able to return for follow-up with a delay ranging from 8 to 80 weeks.

Gupta *et al.*^[25] stated that the median age group of children lost to follow-up during non-COVID-19 times was 29 months (range: 22.5–51.5 months) with a median length of delay of 14 days (range: 7–20.75 days), whereas as per our observations during the COVID-19-related lockdown, in a similar study duration, the median age of children was 57 months (range: 4–214 months) with a median length of delay of 336 days (range: 56–560 days), which is significantly different. The median advised interval for the next follow-up in our study was 12 weeks. More than 50% of the families resided in areas >500 km as per the previous study, whereas in our study, such patients accounted for 85% (277), which could also be a variation based on referral centers.

Fabian *et al.*^[18] conducted a survey across 194 centers from 94 countries and assessed the preparedness of referral centers and reasons for treatment disruption of retinoblastoma and concluded that 53.6% of the centers faced troubles while managing retinoblastoma children during the pandemic. The availability of life-saving treatment modalities such as EUA, enucleation, intravenous chemotherapy (IVC), and intraarterial chemotherapy (IAC) dropped down from 95.9% to 55.2%, 100% to 89.6%, 96.9% to 93.8%, and 49.7% to 37.8%, respectively, before and after the pandemic.^[18]

"Quad-triage" protocol was followed up for retinoblastoma wherein a schematic approach was followed for rescheduling the children based on the group, stage, and status in terms of tumor activity.^[5] Attempts were made to arrange EUA for the children in their region to ensure continuation of treatment; however, only 21% (69) children could be seen by ophthalmologists locally. Wherever necessary, previous fundus pictures, chemotherapy, and focal therapy protocols were shared with the regional doctors and optimal care was ensured.

On return after LFU, detailed EUA along with imaging and systemic evaluation wherever necessary was performed and with reinitiation of intensive treatment, vision (47%), eye (92%), and life salvage (98%) were achieved. Unfortunately, five children (<1%) succumbed to intracranial extension, out of which the demise of two children was informed by the defaulting families on telephonic follow-up.

The COVID-19 pandemic and the nationwide lockdown have created a negative impact on ocular cancer management. Balanced, stringent recovery strategies are mandatory for the ocular oncology services to craft strategical management of retinoblastoma defaulters. It is also imperative to establish a strong and intricate hub-and-spoke network of multispecialty ocular cancer centers nationwide to provide facilities for early diagnosis as well as prompt treatment based on the standard protocols to make the services accessible to all, keeping in mind the psychological impact of the pandemic or any future disasters on the families.

Conclusion

Our study shows that COVID-19-related lockdown resulted in prolonged treatment interruptions and delay or default in accessing care in children with retinoblastoma, affecting eye and life salvage. Our measures in providing collaborative care at regional centers and logistical support enabled 63% of patients to receive emergent or urgent care and return for follow-up; however, 37% of patients defaulted despite

our best efforts. Our observations advocate that meticulous planning, public education, psychological support, collaborative care, and involvement of nongovernmental organizations are important contributory factors to provide a well-designed management strategy in such global pandemics in the future.

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Conflicts of interest

There are no conflicts of interest.

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