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RESEARCH ARTICLE

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Preparedness of the cancer hospitals and changes in oncosurgical practices during COVID-19 pandemic in India: A cross-sectional study

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Abstract

Background and Objectives: Coronavirus disease-2019 (COVID-19) pandemic has impacted cancer care across India. This study aimed to assess (a) organizational preparedness of hospitals (establishment of screening clinics, COVID-19 wards/committees/intensive care units [ICUs]/operating rooms [ORs]), (b) type of major/minor surgeries performed, and (c) employee well-being (determined by salary deductions, paid leave provisions, and work in-rotation).

Methods: This online questionnaire-based cross-sectional study was distributed to 480 oncosurgeons across India. We used χ^2 statistics to compare responses across geographical areas (COVID-19 lockdown zones and city tiers) and type of organization (government/private, academic/nonacademic, and dedicated/multispecialty hospitals). $P < .05$ was considered significant.

Results: Total of 256 (53.3%) oncologists completed the survey. About 206 hospitals in 85 cities had screening clinics (98.1%), COVID-19 dedicated committees (73.7%), ward (67.3%), ICU's (49%), and OR's (36%). Such preparedness was higher in tier-1 cities, government, academic, and multispecialty hospitals. Dedicated cancer institutes continued major surgeries in all oncological subspecialties particularly in head and neck ($P = .006$) and colorectal oncology ($P = .04$). Employee well-being was better in government hospitals.

Conclusion: Hospitals have implemented strategies to continue cancer care. Despite limited resources, the significant risk associated and financial setbacks amidst nationwide lockdown, oncosurgeons are striving to prioritize and balance the oncologic needs and safety concerns of cancer patients across the country.

KEYWORDS
COVID-19, preparedness, surgical oncology practice

1 | INTRODUCTION

Coronavirus disease-2019 (COVID-19) pandemic has resulted in over 0.9 million cases and over 23 000 deaths in India as on 14th July 2020.[1] India was under a total lockdown for 68 days from 24th March 2020. This had an unprecedented effect on the health care system, especially on oncological care as resources were reallocated to patients with COVID-19.[2] The routine challenges in the management of cancers include: difficulties in managing aggressive malignancies resulting in comparatively higher mortality rates (3%-7%)[3]; prolonged time-to-initiate-treatment affecting survival and increasing anxiety among patients[4] and finally a long drawn course of oncological treatment, that can get significantly affected during the pandemic. The resultant immune suppression[5] poses a greater risk to COVID-19 infection, more so if they have received treatment within the previous month.[6] An estimated 192 000 patients are likely to have delays in the timely diagnosis of cancer as projected by the Indian Council of Medical Research,[7] adding to the backlog of patients who await treatment at many oncology institutes. With a mere 2.2% of the gross domestic product being invested in public health,[8,9] a country like India with a population of more than 1.3 billion will have to surmount the challenge of controlling the pandemic and restoring cancer care to normalcy. This study aims to understand how rapidly the oncology hospitals adapted to the pandemic and the needs of the patients to provide for the necessary oncology services particularly with regards to surgery for cancer and preparedness of the hospitals across the various cities and importantly COVID-19 zones.

Oncosurgical care during the pandemic was assessed based on (a) preparedness of the hospital by establishment of COVID-19 screening clinics, COVID-19 wards/committees/intensive care units (ICUs)/operating rooms (OR), (b) major and minor surgeries being performed, and (c) employee well-being determined by deductions in salary, provisions for paid leave and to work in-rotation. We compared these across geographical hospitals (ie, COVID-19 lockdown zones and city tier) and administrative organization of the facility (ie, government vs private, academic vs nonacademic, and dedicated hospitals vs multispecialty hospitals).

2 | MATERIALS AND METHODS

Oncosurgeons (consisted of surgical oncologists, gynec-oncologists, and head and neck oncosurgeons) practicing in India across various oncology hospitals were invited to participate in an anonymous online questionnaire-based cross-sectional study (Supplemental File 1), between 18 and 27th May 2020 (during the nationwide lockdown), where the data were collected with no identifiers recorded from the participating individuals. Participants were recruited through social networking websites, personal messages, and emails. The questionnaire was designed to include sections on (a) demography, (b) hospital preparedness, (c) surgical practices, and (d) remarks section to record the issues not covered by the survey.

Definitions used in the survey regarding lockdown zones,[10] adequate personal protective equipment[11] (PPE), and major surgeries are as shown in Table 1. The cities were classified as tier-1, 2, and 3.[12]

We assessed the following in the survey

1. Hospital preparedness determined by the establishment of screening procedures for COVID-19 and dedicated committees/wards/ICUs/ORs for COVID-19.
2. The proportion of oncosurgeons providing continued care with required major and minor surgeries during the pandemic.
3. The proportion of oncosurgeons reporting deduction in salaries, provision for paid leave and to work in rotation with colleagues, as a measure of employee well-being.
4. The proportion of oncosurgeons who experienced a difficulty in (a) getting investigations for staging cancers, (b) finding gastroenterologists for endoscopy/microvascular surgeon, and (c) the availability of PPE.
5. The proportion of oncosurgeons who had to defer (a)surgery after a good response to neoadjuvant chemotherapy (NACT), (b) radiotherapy (RT)/chemotherapy if there is only marginal benefit to patients, and (c) treatment for preinvasive diseases.
6. The aforementioned changes in oncosurgical practice were finally compared among different geographical hospitals (ie, COVID-19 lockdown zones and city tier) and administrative organization of

TABLE 1 Definitions used in manuscript

Red zone	Red zones/hot spots are defined by taking into account the number of active of cases, doubling the rate of confirmed cases, extent of testing, and surveillance feedback. There is severe restriction of activity of the people that live within the defined zone.
Orange zone	Red zones are converted to orange after there are no new cases for at least 21 days. Some movement with social distancing norms is allowed with caution so as to limit the spread of coronavirus in this area.
Green zone	Area defined by the absence of any confirmed cases or an orange zone that has not reported any new cases for 21 days. May allow movement with due caution so that area remains COVID-19 free. Mild restriction of activities with social distancing are to be followed so that the area remains COVID-19 free.
Major oncologic surgery	Requiring at least one of the following: postoperative ICU care and monitoring, blood loss more than 400 mL or requiring multiple transfusions, or performing soft tissue reconstruction.
Adequate PPE	As PAPR or single use N95 mask and goggles or face shield, impermeable gown with double gloves be needed as a minimal adequate PPE for high-risk /aerosolizing procedure.
HIV Kit (single use only)	Has the following: Gown that is disposable, sterile, made up fabric that is impervious to blood and body fluids. This kit also has a surgical cap, surgical mask, goggles, two pairs of gloves, and leggings.

Abbreviations: COVID-19, coronavirus disease-2019; HIV, human immunodeficiency virus; ICU, intensive care units; PPE, personal protective equipment; PAPR, powered air-purifying respirators.

the facility (ie, government vs private, academic vs nnonacademic, and dedicated hospitals vs multispecialty hospitals).

2.1 | Statistical analysis

All responses were grouped into categorical variables (nominal or ordinal). Once the responses were paired, the data were analyzed using χ^2 tests to answer the pertinent questions. Conditional formatting was used to sort layered responses. Two-tailed $P < .05$ was considered significant.

3 | RESULTS

Of the 480 oncosurgeons, 256 (53.3%) from 206 hospitals in 85 cities completed the survey. Ten oncosurgeons declined participation (five had their hospital completely shut down due to pandemic; three worked in set-ups with limited beds; and two were on maternity leave). The mean age was 37 ± 7years, (range, 31-66 years). The demographic details are enumerated in Table 2.

3.1 | Adaptation of hospitals to pandemic

Hospitals adopted organizational changes to combat the pandemic. Routine screening for COVID-19 infection included temperature, symptom check, and detailed contact history before entry into the hospital (98% of the hospitals). Dedicated COVID-19 committee to streamline operations were formed in 73.7% of the hospitals. Dedicated COVID-19 ward, ICU, and OR for patient care were established in 67.3%, 49%, and 36% of the hospitals, respectively. Such preparedness was higher in hospitals in tier-1 cities, government, and academic institutes (Table 3).

3.2 | Impact on routine outpatient services

This pandemic has impacted the evaluation of patients and the delivery of care in outpatient clinics. Almost 50% of the oncosurgeons had suspended cancer screening, more in tier-1 (56.9% vs 35.9%, $P = .03$), and red zones (57.1% vs 32.1%, $P = .005$) as compared with tier-3 and green zones while 80.6% continued cancer surveillance in patients. Follow-up consultations (72.2%) were done by telemedicine. Higher proportion of oncosurgeons in tier-1 compared with other cities (79.8% vs others, $P = .028$), private hospitals (76.5% vs 61.4%, $P = .015$), and multispecialty hospitals (80.4% vs 56%, $P < .001$) used telemedicine. Newly diagnosed cancers were continued to be evaluated by most of the oncosurgeons (96.1%) (Figure 1A and Supplemental File 2).

3.3 | Investigations for staging cancers

Oncosurgeons reported difficulty in obtaining investigations (ie, computed tomography [CT], magnetic resonance imaging, or positron emission tomography) for staging cancers (70%) during the lockdown. Gastroenterologists were unavailable for endoscopies (68.7%).

TABLE 2 Demographic details

Age	39 ± 7 y (range, 31-66 y)	
Gender	Male	226 (88.3%)
	Female	30 (11.7%)
Surgical oncology subspecialties	Surgical oncology	213 (83.2%)
	Head and neck oncology	24 (9.4%)
	Gynec-oncology	19 (7.4%)
City	Tier 1	99 (48.1%)
	Tier 2	76 (36.9%)
	Tier 3	31 (15%)
Type of sector	Government	26 (12.6%)
	Private	159 (77.2%)
	Mixed government and private sector	6 (2.9%)
	Nongovernment organization/charitable organization	15 (7.3%)
Academic center	Yes	117 (56.8%)
	No	89 (43.2%)
Hospital set up	Dedicated oncology	67 (32.5%)
	Oncology with other specialties	139 (67.5%)
Zones	Red	117 (56.8%)
	Orange	64 (31.1%)
	Green	25 (12.1%)

TABLE 3 General hospital organization and major surgeries

	Numbers	Tier-1 vs tier-2 vs tier-3 (n [%], *P* value)	Government vs private vs mixed sector vs NGO (n [%], *P* value)	Academic vs nonacademic center (n (%), *P* value)	Red zone vs orange vs green zones (n [%], *P* value)	Dedicated cancer vs multispecialty center (n [%], *P* value)
Hospital organization (N = 206)						
COVID screening	202 (98.1)	97 (98) vs 75 (98.7) vs 30 (96.8) *P* = .8	26 (100) vs 156 (98.1) vs 6 (100) vs 14 (93.3) *P* = .49	116 (99.1) vs 86 (96.6), *P* = .19	114 (97.4) vs 64 (100) vs 24 (96), *P* = .35	65 (97) vs 137 (98.6), *P* = .45
COVID committee	151 (73.7)	78 (78.8) vs 56 (73.7) vs 17 (56.7), *P* = .01	26 (100) vs 109 (69) vs 4 (66.7) vs 12 (80), *P* = .05	102 (87.2) vs 49 (55.7), *P* < .001	90 (76.9) vs 40 (63.5) vs 21 (84), *P* = .067	46 (69.7) vs 105 (75.5), *P* = .128
COVID ward	136 (67.3)	74 (76.3) vs 46 (60.5) vs 16 (55.2), *P* = .10	20 (76.9) vs 104 (66.7) vs 4 (80) vs 5 (53.3), *P* = .71	95 (81.9) vs 41 (47.7), *P* < .001	79 (68.1) vs 39 (62.9) vs 18 (75), *P* = .59	30 (45.5) vs 106 (77.9), *P* < .001
COVID ICU	99 (49)	64 (66) vs 26 (34.7) vs 9 (30), *P* < .001	15 (57.7) vs 76 (49) vs 4 (66.7) vs 4 (26.7), *P* = .09	75 (64.7%) vs 24 (27.9), *P* < .001	62 (53.4) vs 25 (40.3) vs 12 (50), *P* = .56	12 (18.2) vs 87 (64), *P* < .001
COVID ORs	68 (36)	43 (46.7) vs 20 (28.2) vs 5 (19.2), *P* = .008	11 (42.3) vs 51 (35.2) vs 2 (40) vs 4 (30.8), *P* = .8	55 (50) vs 13 (16.3), *P* < .001	41 (39) vs 18 (29.5) vs 9 (39.1), *P* = .44	14 (21.9) vs 54 (43.2), *P* = .004
Major surgeries peformed by oncosurgeons						
Breast oncology	109 (52.4)	50 (49) vs 42 (56.8) vs 17 (53.1), *P* = .08	10 (35.7) vs 85 (53.8) vs 3 (60) vs 11 (64.7), *P* = .015	63 (53.4) vs 46 (51.1), *P* = .152	65 (53.3) vs 35 (58.3) vs 9 (34.6), *P* = .19	38 (50.7) vs 71 (53.4), *P* = .7
Head neck oncology	178 (76.7)	81 (72.3) vs 68 (84) vs 29 (74.4), *P* = .39	22 (62.9) vs 137 (79.2) vs 5 (83.3) vs 14 (77.8), *P* = .020	105 (77.2) vs 75 (76), *P* = .41	102 (75) vs 54 (79.4) 22 (78.6), *P* = .94	72 (88.9) vs 106 (70.2), *P* = .006
Colorectal oncology	168 (80.8)	80 (78.4) vs 60 (81.1) vs 28 (87.5), *P* = .26	20 (71.4) vs 131 (82.9) vs 4 (80) vs 13 (76.5), *P* = .42	91 (77.1) vs 77 (85.6), *P* = .30	99 (81.1) vs 48 (80) vs 21 (80.8), *P* = .769	67 (89.3) vs 101 (75.9), *P* = .041
Gynec-oncology	182 (80.2)	87 (77.7) vs 66 (80.5) vs 29 (87.9), *P* = .002	29 (70.3) vs 135 (80.8) vs 5 (83.3) vs 16 (94.1), *P* = .4	107 (79.9) vs 75 (80.6), *P* = .47	104 (78.8) vs 56 (83.6) vs 22 (78.6), *P* = .83	69 (86.3) vs 113 (76.9), *P* = .187
HPB	128 (61.5)	70 (68.6) vs 39 (52.7) vs 19 (59.4), *P* = .26	17 (60.7) vs 93 (58.9) vs 5 (100) vs 13 (76.5), *P* = .34	78 (66.1) vs 50 (55.6), *P* = .15	76 (62.3) vs 36 (60) vs 16 (61.5), *P* = .167	51 (68) vs 77 (57.9), *P* = .139
Thoracic oncology	120 (57.7)	61 (59.8) vs 40 (54.1) vs 19 (59.4), *P* = .71	16 (57.1) vs 89 (56.3) vs 4 (80) vs 11 (64.7), *P* = .62	76 (64.4) vs 44 (48.9), *P* = .08	71 (58.2) vs 32 (53.3) vs 17 (65.4), *P* = .55	48 (64) vs 72 (54.1), *P* = .38

Abbreviations: COVID, coronavirus disease; HPB, hepato-pancreato-biliary; ICU, intensive care units; NGO, nongovernment organization; ORs, operating rooms.

Oncosurgeons were compelled to consider surgery for inadequately staged patients (16%). All lockdown zones were equally affected by such concerns (Supplemental File 2).

3.4 | PPEs for oncosurgeons and surgical teams during high-risk surgeries

Oncosurgeons are faced with the problem of inadequate supply of PPEs. Oncosurgeons used N95 respirators (94.2%) or surgical masks (78.1%) or powered air-purifying respirators (PAPR; 28.9%) for respiratory protection. However, the exclusive use of these was very infrequent (N95: 15%, surgical masks: 4.2%, and PAPR < 1%). Oncosurgeons used gowns designed either for COVID-19 (51.7%) or HIV protection kit (Table 1) (73.2%) or regular surgical gowns (56.5%). Exclusive use of the three suit designs was also infrequent (COVID-19 suits: 11.7%, HIV kit gowns: 18%, and regular surgical gowns: 11%). PAPR and gown designed for COVID-19 were used more often in tier-1 cities compared with tier-2/3 (PAPR: 36.4% vs 20% vs 27.8%, *P* = .04; COVID gowns: 58.3% vs 39.3% vs 59.5%, *P* = .018).

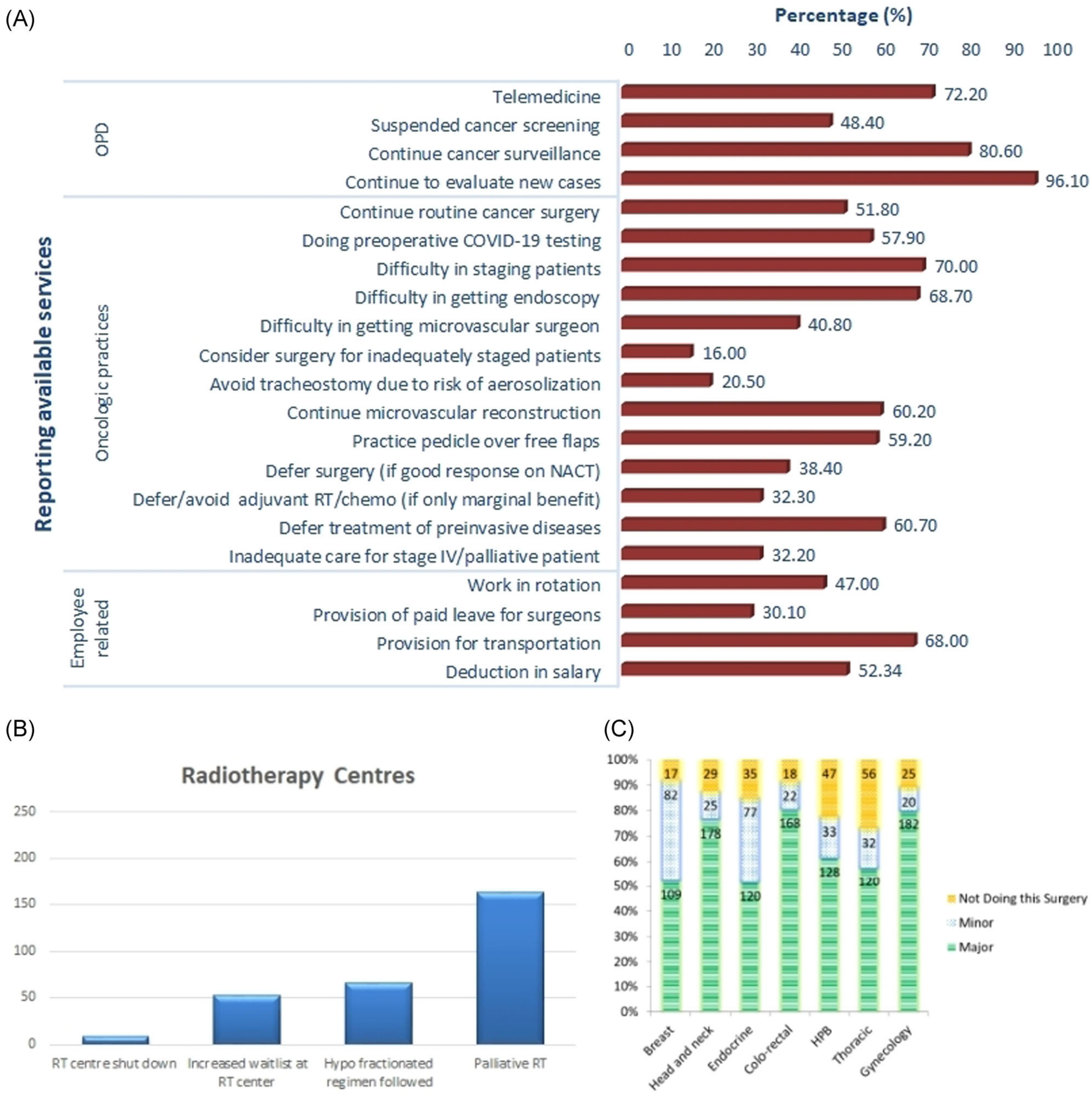

FIGURE 1 A, OPD practices, oncology practices, and employee welfare. B, Provisions at the radiotherapy (RT) centers. C, Oncological subspecialties: major and minor surgeries. COVID-19, coronavirus disease-2019; NACT, neoadjuvant chemotherapy; OPD, outpatient department [Color figure can be viewed at wileyonlinelibrary.com]

Face shields to protect from aerosols were used by 90% of oncosurgeons, particularly in red zones compared with orange/green (93.7% vs 87.5% vs 80%, $P = .049$) (Supplemental File 2).

Oncosurgeons reported adequate availability of PPE among their colleagues in anesthesia (88.3%), scrub nurses (86.7%), and surgical assistants (89.1%). We specifically did not collect information on which component was unavailable. Tier-3 cities, nonacademic institutions, and green zones as compared with tier-1, academic institutes, and red zones did not have an adequate supply of PPE for the surgical team (Supplemental File 2).

3.5 | Preoperative testing and oncological surgeries

Routine preoperative COVID-19 testing was practiced by 57.9% of oncosurgeons. Testing was done more frequently in the tier-1 (80%, $P < .001$), academic (62.6%, $P = .05$), red zones (63.5%, $P = .06$), and multispecialty hospitals ($P = .013$) as compared with tier-3, nonacademic, green zones, and dedicated hospitals. Almost 80% of oncosurgeons continued major surgeries across all subspecialties of oncology but for hepato-pancreato-biliary (HPB), thoracic oncology, and cytoreductive surgeries (CRS)/hyperthermic intraperitoneal chemotherapy (HIPEC), which were reduced to 61%, 57%, and 32%, respectively (Figure 1C). Dedicated oncology hospitals (74.1% vs 44.1%, $P < .001$) and hospitals in green zones (60% vs 44.5%, $P = .023$) continued their elective cancer surgeries compared to multispecialty hospitals and red zones despite the lockdown, respectively. These dedicated hospitals continued more surgeries across all subspecialties, particularly in head and neck (HN) (88.9% vs 70.2%, $P = .006$), and colorectal oncology (89.3% vs 75.9%, $P = .04$) more than multispecialty hospitals. Oncosurgeons preferred open surgeries (64.1%) over minimally invasive surgeries (MIS) (10%), particularly more in surgeons practicing in tier-3 compared with tier-1 (75% vs 59.6%, $P = .043$). Only 60% of oncosurgeons continued to perform microvascular reconstruction. A higher proportion of private hospitals performed microvascular reconstruction more than government hospitals (63.9% vs 40.7%, $P = .017$), while the practice of pedicle flaps over free flaps did not differ with hospitals. However, the decision to perform a tracheostomy was the same across all oncosurgeons and was determined by the extent of primary resections. The types and extent of surgeries performed did not differ between the tier of the city and zones (Table 1 and Supplemental File 2)

3.6 | Adjuvant and neoadjuvant treatment and facilities available at the RT units

Those patients in whom tumor showed a good response to NACT, surgeries were deferred by 38.4% of oncosurgeons due to fear of patients contracting COVID-19 infection. Dedicated cancer institutes preferred surgery after NACT more often compared with multispecialty hospitals in patients who completed all cycles of chemotherapy (73.2% vs 55.6%, $P = .008$) (Figure 1A).

Oncosurgeons (32.3%) deferred/avoided adjuvant treatment (RT and chemotherapy) if only a marginal benefit was expected while the risk of contracting COVID-19 was higher for the patients. This was majorly practiced more often in government hospitals (51.3% vs 27.8%, $P = .03$)

Treating preinvasive disease was at a low priority among oncosurgeons (60.7%), majorly in the government hospitals compared with private (76.9% vs 57.3%, $P = .058$) and hospitals in red zones (61.5% vs 38.5%, $P = .03$)

Oncosurgeons reported shut down (5.1%) and increased waitlist (26.9%) at RT units, particularly in government institutes and tier-3 cities. Dedicated hospitals particularly used hypofractionated regimens (40% vs 32.8%, $P = .05$) and delivered palliative RT (88.4% vs 73.9%, $P = .016$) to the patients as compared with multispecialty hospitals. Private hospitals also continued providing palliative RT for the metastatic patients compared to the government hospitals (82% vs 68.3%, $P = .038$) (Supplemental File 2 and Figure 1B).

3.7 | Care for palliative patients/stage-IV and psychological impact on patients

Oncosurgeons reported that their patients were anxious (60%) about getting the appropriate treatment during the pandemic. This concern was higher in tier-3 cities (77.1% vs 60.5%, $P = .029$) and government hospitals (82.7% vs 55.4%, $P = .006$). Oncosurgeons also felt that stage-IV patients/palliative patients may not get the appropriate care (32.2%), particularly in government (47.6% vs 29.3%, $P = .07$) and tier-3 hospitals (46.2% vs 28.3, $P = .11$).

3.8 | Employee well-being

Oncosurgeons in private hospitals (54%) reported salary cuts ranging from 10% to 95% (<20% deduction: 6.4%, 20%-50% deduction: 21.4%, >50%: 22.5%) working in the private hospitals ($P < .001$) while 34.1% were affected in the government hospitals. Oncosurgeons (68%) had the provision of transportation to work, more in academic hospitals as compared with nonacademic hospitals (72.7% vs 60.8%, $P = .004$). Oncosurgeons were allowed to work in rotation (47%), particularly in tier-1 cities (58.7% vs others, $P = .003$), in government hospitals (71% vs others, $P = .001$) (Supplemental File 2 and Figure 1A).

4 | DISCUSSION

The results of this study indicate that there were major setbacks to cancer care in tier-1 cities and these hospitals had adopted strategies to combat the pandemic. Hospitals in red zone deferred more surgeries in response to NACT, deferred RT/chemotherapy if only marginal benefit and treatment of preinvasive diseases than in the green zones. The nature of surgeries was not influenced by red zones. Complex reconstruction and use of technologies were seen more in private hospitals, government hospitals had better preparedness and preserved employee welfare while dedicated hospitals continued better comprehensive care.

Due to widespread lockdown in the country, the oncologists faced difficulty to adequately stage cancers. Scan centers may be overwhelmed especially in tier-1 cities and red zones in India due to the nonavailability of the technicians, radiology staff, radioisotopes, and fewer functioning CT machines. Private hospitals and nonacademic hospitals had more problems in imaging indicating the huge reliance of these hospitals on the diagnostic centers. Kamarajah et al[13] also reported similar problems in staging in treating esophagogastric cancers.

While oncology has been prioritized over non-oncologic diseases, most of the guidelines have not addressed the issues regarding staging investigations. With India entering into a phase of community transmission, staging may become more difficult.

Historically, the International Federation of Gynecology and Obstetrics staging[14] used in gynecology malignancies is predominantly based on clinical examination. Similar staging may be considered for cancers at sites amenable for detailed clinical examination like oral cavity, breast, and so forth when there is limited radiological/pathological backing after a multidisciplinary discussion.

Considering surgery for inadequately staged patients can have an impact on prognosis and further treatment, shared decision making with the patients and relatives may help to balance the risk-benefit ratio.

Preoperative COVID-19 testing has not been recommended in many guidelines given low the positive predictive value of swab testing is 47.3% to 84.3%.[15] Hence, standard precautions are mandatory even if the patient tests negative. However, a COVID-19 positive patient has higher postoperative mortality and morbidity,[16] hence many hospitals recommend preoperative testing. Testing is aptly suited for major and prolonged surgeries, those involving aerosol-generating procedures or having higher morbidity like pancreatic surgery. As expected, due to the fast rates doubling rates of infection the preoperative testing was done more in tier-1 ($P < .001$), the red zones ($P = .06$), and academic institutes ($P = .057$) as compared with tier-3, green, and nonacademic institutes.

In the paucity of an accurate investigation to diagnose this infection with certainty, adequate PPE is paramount, especially in high-risk cases. The N95 respirators mask is recommended for high-risk procedures by the Centers for Disease Control and Prevention of United States[17] and China.[18] In our study, exclusive use of N95 respirators for all surgeries was seen in only 15%, however, the entire surgical team at MD Anderson Cancer Hospitals[19] used N95 respirators for surgeries of the aero-digestive tract. There is a global shortage of PPE and hence decontamination procedures have been described[20] to circumvent this problem. Given that COVID-19 can be transmitted through body fluids and aerosols that are generated during procedure,[21] impermeable gowns are recommended as part of PPE.[22] We noted only a small proportion of the surgeons used impermeable gowns (30%) routinely. Therefore, regular surgical gowns and regular surgical masks seem inadequate to venture into high-risk surgeries. We also saw PPE shortage for the entire surgical team. This is a matter of concern as a small breach can lead to disruption of services.

Breast, HN, gynecology, and colorectal oncology formed the major chunk of oncologic work in India, in agreement with the results of Shrikhande et al.[23] Major surgeries in HPB, CRS/HIPEC, and thoracic oncology are resource-intense procedures with perspectives of PPE use, critical care support, and blood blank supplies, hence we observed that oncosurgeons were reluctant to operate such cases.

Concerns have been raised in MIS due to the isolation of viral particles in plumes of cautery. However, no transmission of infection has been documented through the smoke. Use of high-efficiency particulate air filters, low intra-abdominal pressures during surgery, minimal usage of energy devices, small port sizes, and evacuation of gases before the extraction of the specimen have been recommended.[24] This concern was seen across all the oncosurgeons in our study with a decrease in MIS cases in agreement with the results of Shrikhande et al.[23]

Telemedicine options are being explored by many hospitals to maintain the continuum of care, especially for oncologic surveillance. Being a resource centered project, private and hospitals in tier-1 cities used telemedicine for cancer surveillance and patient care. Also, telemedicine focuses on patient's capabilities to use digital health services which may be limited in tier-2/3 due to poverty and illiteracy in a developing country.

We propose a "FREE" corridor similar to "GREEN" corridors which are established for an organ transplant. This free corridor shall be a cleared-out route with special permission during lockdown for cancer patients and health care workers to use public/private transport to reach the destined hospital. In this study, we noted that the majority of the cancer hospitals are located in tier-1, which are the red zones. Consequently, this can transmit the infection from a high-risk zone to low-risk zones. This can be overcome by the "DECENTRALISATION" of cancer care. Decentralization would allow cancer care to be within reach of every individual providing additional financial and social security to the patients. We understand that decentralization is a long-drawn process and has political, administrative, and financial connotations.

Finally, surgeons have adapted well to the pandemic by embracing telemedicine, PPE, judiciously using the surgical approach, reconstructive options, and human and hospital resources to provide cancer care. Hospitals adapted by creating COVID-19 committees, dedicated wards, ICUs, and ORs to separate the patients of COVID-19 and others. They also provided transportations and paid leaves at the time of the lockdown, although the facilities widely varied across institutes.

4.1 | Strengths of the study

To the best of our knowledge, it is the largest survey (256 oncologists) with a specialist surgical discipline exclusively dealing with cancer at the time of pandemic. The survey was pan-India encompassing more than 206 cancer hospitals in 85 cities (Figure 2), giving a more holistic view of the situation across the country. Our study also highlights the well-being of the oncologists in these unusual times.

The limitations include the cross-sectional nature of the study and does not capture the resumption of cancer care in India.

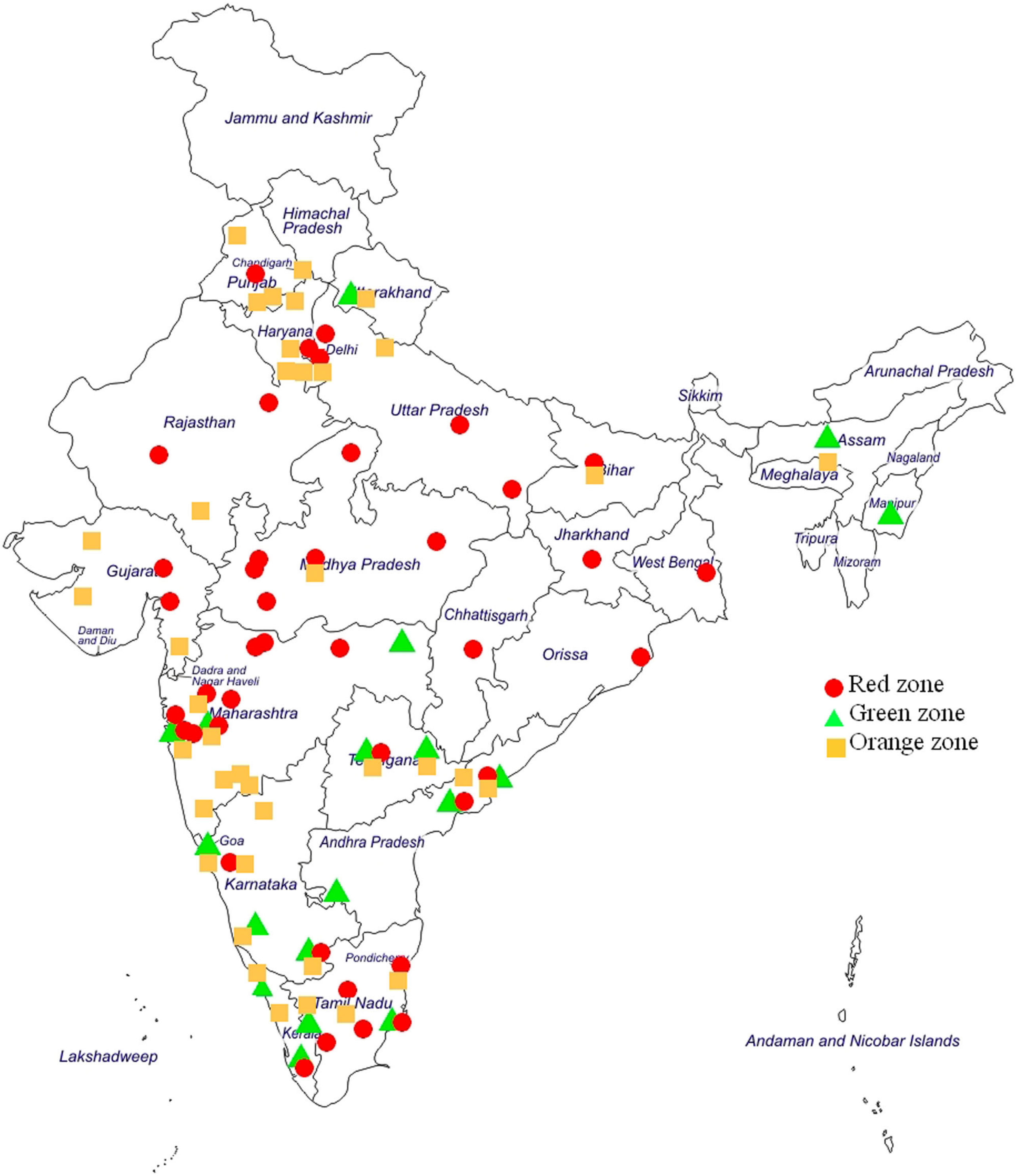

FIGURE 2 Map showing the geographical distribution of oncosurgeons who participated in the study across India. Red (circle), orange (square), and green (triangle) zones have been represented with respective colors [Color figure can be viewed at wileyonlinelibrary.com]

This study of oncology care is entirely from a surgeon's perspective; medical oncologists, and radiation oncologists were excluded.

New challenges will emerge as pandemic evolves into community transmission and also in the postpandemic era to clear the backlog of the cases. However, there is uncertainty about the duration of the pandemic until a vaccine gives a breakthrough.

5 | CONCLUSION

While the COVID-19 pandemic had significantly disrupted cancer care across the country during the early months, a major proportion of the cancer hospitals quickly adapted to the changing circumstances and have implemented appropriate strategies to continue the cancer care. Despite limited resources, the significant risks associated, and financial setbacks amidst nationwide lockdown, oncosurgeons are striving to prioritize and balance the oncologic needs and safety concerns of cancer patients across the country. The oncosurgeons and hospitals will have to continue to adapt to the evolving pandemic for uninterrupted quality cancer care.

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CONFLICT OF INTERESTS

All the authors declare that there are no conflict of interests.

AUTHOR CONTRIBUTIONS

DN: Conception of idea and design of work, critical revision of the work, and final approval; HKS: design of work, acquisition and interpretation of data, drafting the work, final approval, and agreement to be accountable for all aspects of the work; VRP: design of the concept, critical revision of work, final approval, and agreement to be accountable for all aspects of the work; GC: data analysis and interpretation, critical revision of work, and final approval.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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APPENDIX

	Number (%)	Tier-1 vs Tier-2 vs Tier-3 (n [%], P value)	Government vs private vs mixed sector vs NGO (n [%], P value)	Academic vs nonacademic centres (n [%], P value)	Red zone vs orange zones vs green zones (n [%], P value)	Dedicated cancer vs multispecialty centre (n [%], P value)
Out-patient services						
Suspended cancer screening	118 (48.4)	66 (56.9) vs 38 (42.7) vs 14 (35.9), P = .031	21 (50) vs 88 (49.4) vs 2 (28.6) vs 7 (41.2), P = .665	69 (46.6) vs 49 (51), P = .5	80 (57.7) vs 29 (38.2) vs 9 (32.1), P = 0.005	44 (51.2) vs 74 (46.8), P = .518
Follow-up cases	203 (80.6)	96 (78) vs 71 (79.8) vs 36 (90), P = .24	36 (83.7) vs 148 (80.4) vs 4 (57.1) vs 15 (83.3), P = .421	119 (77.8) vs 84 (84.8), P = .166	113 (77.9) vs 62 (80.5) vs 28 (93.3), P = 0.152	70 (82.4) vs 133 (79.6), P = .60
New cases	244 (96.1)	177 (93.6) vs 88 (98.9) vs 39 (97.5), P = .21	39 (90.7) vs 181 (97.3) vs7 (100) vs 17 (94.4), P = .21	148 (96.1) vs 96 (96), P = .96	140 (95.2) vs 74 (96.1) vs 30 (100), P = 0.47	84 (97.7) vs 160 (95.2), P = .345
Telemedicine	182 (72.2)	99 (79.8) vs 57 (64) vs 26 (66.7), P = .028	27 (61.4) vs 143 (77.3) vs 4 (66.7) vs 8 (47.1), P = .015	118 (76.6) vs 64 (65.3), P = .051	111 (76) vs 49 (64.5) vs 22 (73.3), P = .188	47 (56) vs 135 (80.4), P < .001
Oncology practices						
Nonavailability of staging investigations	177 (70)	88 (70.4) vs 63 (71.6) vs 26 (65), P = .7	27 (61.4) vs 130 (70.7) vs 7 (100) vs 13 (72.2), P = .20	100 (64.1) vs 77 (79.4) P = .01	105 (71.9) vs 52 (67.2) vs 20 (66.7), P = .72	62 (72.9) vs 115 (68.5), P = .46
Some difficulty in getting endoscopy	171 (68.7)	89 (73) vs 53 (60.9) vs 29 (72.5) P = .15	31 (73.8) vs 123 (67.6) vs 6 (85.7) vs 11 (61.1), P = .5	99 (64.7) vs 72 (75), P = .08	101 (70.6) vs 50 (65.8) vs 20 (66.7), P = .73	57 (67.1) vs 114 (69.5), P = .6
Difficulty in finding microvascular surgeon	93 (40.8)	41 (35.7) vs 31 (40.3) vs 21 (58.3), P = .05	18 (48.6) vs 65 (38) vs 3 (75) vs 4 (43.8), P = .32	46 (32.9) vs 47 (53.4), P = .002	54 (40.6) vs 30 (44.8) vs 9 (32.1), P = .52	30 (39.5) vs 63 (41.4), P = .77
Operate inadequately staged patient	39 (16)	15 (12.5) vs 18 (20.9) vs 6 (15.4) P = .27	9 (22) vs 28 (15.6) vs 1 (16.7) vs 1 (5.6) P = .46	21 (14.3) vs 18 (18.6) P = .37	25 (17.5) vs 11 (15.1) vs 3 (10.7), P = .64	12 (14.3) vs 27 (16.9), P = .60
Avoiding tracheostomy due to risk of aerosolization	42 (20.5)	19 (20.2) vs 15 (20) vs 8 (20), P = .96	9 (28.1) vs 28 (18.1) vs 1 (25) vs 4 (28.6), P = .50	23 (19.3) vs 19 (22.1), P = .62	23 (19.3) vs 13 (21.7) vs 6 (23.1), P = .88	14 (18.2) vs 28 (21.9), P = .52
Continue microvascular reconstruction	121 (60.2)	58 (61.7) vs 46 (60.5) vs 17 (54.8), P = .73	11 (40.7) vs 99 (63.9) vs 5 (100) vs 6 (42.9), P = .017	74 (63.2) vs 47 (56), P = .29	72 (60.5) vs 34 (59.6) vs 15 (60), P = .99	48 (66.7) vs 73 (56.6), P = .16
Practice pedicle flaps over free flap	116 (59.2)	52 (56.6) vs 44 (61.1) vs 20 (62.5), P = .769	16 (66.7) vs 88 (57.5) vs 3 (75) vs 9 (60), P = .765	62 (54.9) vs 54 (65.1), P = .15	72 (61.5) vs 32 (57.1) vs 12 (52.2), P = .6	40 (56.3) vs 76 (60.8), P = .54
Defer surgery (if NACT has good response)	93 (38.4)	51 (42.9) vs 30 (34.5) vs 12 (33.3), P = .37	22 (52.4) vs 65 (36.3) vs 1 (16.7) vs 5 (33.3), P = .16	59 (39.1) vs 34 (37.4), P = .79	62 (43.7) vs 23 (32.4) vs 8 (27.6), P = .124	22 (26.8) vs 71 (44.4), P = .008
Defer adjuvant RT/Chemotherapy (only if there is marginal benefit)	76 (32.3)	41 (36) vs 25 (28.4) vs 10 (30.3), P = .5	20 (51.3) vs 49 (27.8) vs 1 (20) vs 6 (40), P = .03	53 (36.6) vs 23 (25.6), P = .08	42 (30.7) vs 27 (38) vs 7 (25.9), P = .42	28 (34.1) vs 48 (31.4), P = .6
Defer treatment of preinvasive disease	139 (60.7)	72 (64.9) vs 47 (55.3) vs 20 (60.6), P = .37	30 (76.9) vs 98 (57.3) vs 1 (25) vs 10 (66.7), P = .58	86 (61.5) vs 53 (58.9), P = .652	83 (61.5) vs 46 (67.6) vs 10 (38.5), P = .033	47 (58.8) vs 92 (61.7), P = .65

PPE for high-risk surgery						
N95 respirator	229 (94.2)	113 (95.8) vs 78 (90.7) vs 38 (97.4), $P = .199$	39 (95.1) vs 170 (94.4) vs 5 (100) vs 15 (88.2), $P = .681$	140 (95.9) vs 89 (91.9), $P = .175$	133 (93.7) vs 70 (95.9) vs 26 (92.9), $P = .759$	81 (96.4) vs 148 (93.1), $P = .20$
Surgical mask	185 (78.1)	93 (83) vs 61 (70.1) vs 31 (81.6), $P = .078$	27 (73) vs 142 (79.8) vs 5 (100) vs 11 (64), $P = .2$	112 (80.6) vs 73 (74.5), $P = .265$	109 (80.1) vs 56 (78.9) vs 20 (66.7), $P = .266$	68 (84) vs 117 (75), $P = .114$
PAPR	66 (28.9)	39 (36.4) vs 17 (20) vs 10 (27.8), $P = .044$	10 (27) vs 53 (31.4) vs 0 vs 3 (17.6), $P = .3$	39 (30) vs 27 (27.6), $P = .68$	39 (29.1) vs 15 (22.7) vs 12 (42.9), $P = .44$	20 (25.6) vs 46 (30.7), $P = .427$
Regular surgical gown	131 (56.5)	56 (50) vs 55 (64.7) vs 20 (57.1), $P = .119$	20 (54.) vs 96 (55.8) vs 4 (66.7) vs 11 (64.7) $P = .8$	74 (55.2) vs 57 (58.2), $P = .65$	69 (50.4) vs 42 (63.6) vs 20 (69), $P = .67$	49 (62) vs 82 (53.6), $P = .22$
HIV protection kit	169 (73.2)	81 (73) vs 61 (73.5) vs 27 (73) $P = .996$	28 (71.8) vs 123 (72.4) vs 4 (80) vs 14 (82.4), $P = .81$	98 (72.6) vs 71 (74), $P = .81$	99 (73.9) vs 51 (73.9) vs 19 (67.9) $P = .79$	55 (69.6) vs 114 (75), $P = .38$
Suit for COVID-19	122 (51.7)	67 (58.3) vs 33 (39.3) vs 22 (59.5), $P = .018$	19 (48.7) vs 89 (50.6) vs 4 (80) vs 10 (62.5) $P = .46$	74 (52.5) vs 48 (50.5) $P = .76$	74 (53.6) vs 36 (50.7) vs 12 (44.4), $P = .67$	32 (39) vs 90 (58.4), $P = .004$
Face shield	220 (90.2)	113 (96.6) vs 72 (82.8) vs 35 (87.5), $P = .004$	38 (92.7) vs 160 (88.9) vs 6 (100) vs 16 (94), $P = .665$	135 (93.1) vs 85 (85.9), $P = .06$	133 (93.7) vs 63 (87.5) vs 24 (80), $P = .049$	78 (90.5) vs 144 (90), $P = .906$
Adequacy of PPE for the surgical team						
PPE for anesthetist	211 (88.3)	110 (94.8) vs 71 (83.5) vs 30 (78.9), $P = .007$	36 (90) vs 153 (86.4) vs 5 (100) vs 17 (100), $P = .30$	130 (91.5) vs 81 (83.5), $P = .058$	127 (92) vs 60 (83.3) vs 24 (82.9), $P = .10$	70 (85.4) vs 141 (89.8), $P = .31$
PPE for scrub nurse	208 (86.7)	107 (92.2) vs 71 (82.6) vs 30 (78.9), $P = .042$	35 (87.5) vs 152 (85.4) vs 5 (100) vs 16 (94.1), $P = .60$	129 (90.2) vs 79 (81.4), $P = .05$	128 (92.1) vs 56 (77.8) vs 24 (82.8), $P = .012$	69 (84.1) vs 139 (88), $P = .40$
PPE for the surgical assistant	213 (89.1)	110 (94.8) vs 72 (84.7) vs 31 (81.6), $P = .02$	36 (90) vs 155 (87.6) vs 5 (100) vs 17 (100) $P = .368$	132 (92.4) vs 81 (84.4), $P = .05$	128 (92.8) vs 60 (83.3) vs 25 (86.2), $P = .09$	72 (88.9) vs 141 (89.2), $P = .934$
Functioning of radiotherapy units						
RT centre shut down	9 (5.1)	4 (4.7) vs 2 (3.2) vs 3 (10.3), $P = .015$	4 (11.4) vs 4 (3.1) vs 1 (25) vs 0, $P = .03$	6 (5.6) vs 39 (4.2), $P = .8$	6 (5.7) vs 2 (3.7) vs 1 (5.3), $P = 0.4$	1 (1.8) vs 8 (6.5), $P = .15$
Increased waitlist at RT centre	52 (26.9)	19 (19.4) vs 19 (29.2) vs 14 (46.7), $P < .001$	22 (57.9) vs 29 (20.7) vs 1 (25) vs 0, $P < .001$	35 (30.4) vs 17 (21.8), $P = .24$	30 (26.1) vs 18 (32.1) vs 4 (18.2), $P = 0.49$	18 (28.6) vs 34 (26.2), $P = .46$
Hypo fractionated regimen followed	66 (35.1)	38 (40.4) vs 20 (30.8) vs 8 (27.6), $P = .048$	11 (30.6) vs 51 (37) vs 1 (25) vs 3 (30) $P = .069$	45 (38.1) vs 21 (30), $P = .28$	45 (40.2) vs 16 (29.1) vs 5 (23.8), $P = 0.2$	24 (40) vs 42 (32.8), $P = .05$
Palliative RT	163 (78.7)	72 (72) vs 62 (86.1) vs 29 (82.9), $P = .025$	28 (68.3) vs 123 (82) vs 2 (50) vs 10 (83.3) $P = .038$	98 (76.6) vs 65 (82.3), $P = .5$	91 (76.5) vs 53 (81.5) vs19 (82.6), $P = .83$	61 (88.4) vs 102 (73.9), $P = .016$

Employee well-being						
Work in rotation	108 (47)	64 (58.7) vs 30 (35.7) vs 14 (37.8), $P = .003$	30 (71.4) vs 65 (39.2) vs 5 (83.3) vs 8 (50), $P = .001$	82 (57.7) vs 26 (29.5) $P < .001$	68 (51.9) vs 26 (36.6) vs 14 (50), $P = .10$	42 (50.6) vs 66 (44.9), $P = .4$
Provision of paid leave for surgeons	68 (30.1)	32 (29.6) vs 23 (28) vs 13 (36.1), $P = .7$	20 (46.5) vs 41 (25.3) vs 2 (33) vs 5 (33.3), $P = .20$	48 (33.6) vs 20 (24.1), $P = .32$	31 (24.2) vs 28 (40.6) vs 9 (31), $P = .074$	31 (38.3) vs 37 (25.5), $P = .13$
Provision for daily transportation	168 (68)	88 (71.5) vs 59 (67) vs 21 (58.3), $P = .28$	25 (59.5) vs 127 (70.2) vs 5 (83.3) vs 11 (61.1), $P = .36$	109 (72.7) vs 59 (60.8), $P = .004$	99 (67.8) vs 46 (63) vs 23 (82.1), $P = .38$	52 (61.9) vs 116 (71.2), $P = .11$
Deduction in salary	122 (47.7)	57 (44.9) vs 47 (52.8) vs 18 (45), $P = .48$	15 (34.1) vs 101 (54) vs 1 (14.3) vs 5 (27.8), $P = .007$	67 (42.9) vs 55 (55), $P = .06$	17 (56.7) vs 35 (45.5) vs 70 (47), $P = .5$	42 (48.8) vs 80 (47.1), $P = .78$

Abbreviations: COVID, coronavirus disease; NACT, neoadjuvant chemotherapy; PAPR, powered air-purifying respirator; RT, radiotherapy.