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Original Article

Medical Oncology in India: Workload, Infrastructure, and Delivery of Care

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Abstract

Background: The growing burden of cancer within India has implications across the health system including operational delivery of cancer care and planning for human health resources. Here, we report the Indian results of a global survey of medical oncology (MO) workload in comparison to medical oncologists (MOs) in other low-middle- income countries (LMICs). **Methods:** An online survey was distributed through a snowball method through national oncology societies to chemotherapy-prescribing physicians in 22 LMICs. The survey was distributed to Indian MOs by the Indian Society of Medical and Pediatric Oncology and the National Cancer Grid of India. The workload was measured as the annual number of new cancer patient consults seen per oncologist. **Results:** One hundred and forty-seven oncologists from LMICs completed the survey; 82 from India and 65 from other LMICs. About 59% (48/82) of Indian MOs reported working exclusively in the private health system compared to 23% (15/65) of MOs in other LMICs ($P < 0.001$). The median number of annual consults per MO was 475 in India compared with 350 in other LMICs. The proportion of MOs seeing >1000 new consults/year was 24% (20/82) in India and 20% (13/65) in other LMICs ($P = 0.530$). The median number of patients seen in a full-day clinic was 35 in India and 25 in other LMCs ($P = 0.003$); 26% of Indian MO reported seeing >50 patients per day. Compared to other LMICs, Indian MOs worked more days/week (median 6 vs. 5, $P < 0.001$) and hours/week (median 51–60 vs. 41–50, $P = 0.004$) and had less annual leave for vacation (3 weeks vs. 4, $P = 0.017$). **Conclusion:** Indian MOs have higher clinical volumes and workload than MOs in other LMICs and substantially higher workload than MOs in high-income countries. Indian health policymakers should consider alternative models of care and increasing MO workforce supply to address the growing burden of cancer.

Keywords: *Cancer care, medical oncology, oncology workload*

Introduction

The burden of cancer in India is growing, with recent estimates reporting 1.45 million new cancer cases per year.[1] Projections suggest that this figure will increase to 1.70 million by 2035.[2] Approximately 87% of these patients seek medical attention in advanced stages of disease. This contributes to India's very high mortality-incidence ratio of 0.68 which is substantially higher than that of high-income countries (HICs) (0.38).[1,2] In addition to late-stage presentation, other factors that likely contribute to poor cancer outcomes in India include limited health system infrastructure, a scarcity of oncologists, and patients' inability to afford cancer treatment.[2]

Given the late stage of disease at diagnosis, the vast majority of the patients in India are treated with palliative therapy, and therefore, need to see a medical oncology (MO). The number of medical oncologists (MOs) in India is not known, but estimates from the membership of the Indian Society of Medical and Pediatric Oncology (ISMPO) suggest that they are <350. This translates into a very high caseload per MO (approximately 3000 new patients per year), which may have significant downstream implications for the delivery of quality care. Moreover, with the scarcity of MOs in India, a large proportion of patients may not even have the opportunity to see a medical oncologist in consultation.

We are not aware of any data regarding MO workload and delivery of care in the Indian context. Three studies have explored these issues in HICs.[3-5] In these three studies

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from New Zealand, the United States, and Australia, the MO caseload was 220–280 new patients/year. We have recently reported the results of a global analysis of MO workload in which we observed a striking difference in case volumes between HICs and low-middle income countries (LMICs).[6] A systemic therapy task force report commissioned in 2000 by the Cancer Care Ontario provided recommendations to ensure high-quality, sustainable cancer care. One of their key recommendations was a maximum caseload per medical oncologist of 160–175 new patient consults per year.[7] In India, there are no recommendations regarding the optimal caseload per medical oncologist.

To address this gap in knowledge, we report a subset analysis of a global study in which we describe: (1) the clinical workload of Indian medical oncologists compared to those of other LMICs; (2) available infrastructure and supports; and (3) delivery of clinical care in the Indian context. Data from this study will inform cancer policy and human resource planning in India.

Methods

Study population

We have recently reported the results of our global study of medical oncology (MO) workload.[6] The study population for the global study included any practicing physician who delivers chemotherapy; trainees were not eligible. The web-based survey was distributed using a modified snowball methodology to oncologists in 54 countries and 2 regional networks (Caribbean and Africa). The contact was preferentially directed to established national associations of medical oncologists; if this was not possible, we approached one personal contact per country to invite participation and distribute the survey through an informal national network. The survey was distributed to Indian MOs by the ISMPO and the National Cancer Grid (NCG) of India. The global study included 1115 participants from 65 countries. Eighty-two physicians from India participated in the study; they form the primary cohort described in the current analysis and were compared to 65 participants from other LMICs. This study was approved by the Research Ethics Board of Queen's University, Kingston, Canada.

Survey design and distribution

An online electronic survey questionnaire was developed through Fluid Surveys to capture the following information: participant demographics, clinical practice setting, clinical workload, and barriers to patient care. The survey was designed with the multidisciplinary input of the study investigators. A complete survey was then piloted and subsequently revised based on the feedback from 10 additional oncologists. The final survey included 51 questions and took 10–-15 min to complete.

Distribution of the global survey utilized two primary methods. The senior investigator Christopher M Booth (CMB) contacted individuals and regional oncology associations to create a broad distribution network. Whether the national contact was an association or an individual, they were provided with an electronic link to the survey to distribute to their national membership/network. These links were unique to each nation, but not individualized. The distributing partners were asked to provide the team with the number of survey recipients to ascertain national response rate for the survey. The survey was distributed in November 2016. A second reminder E-mail was sent through all national contacts in January 2017.

Statistical analysis

Countries participating in the global study were classified into LMIC, upper-middle countries (UMIC), and HICs based on the World Bank Criteria.[8] The results of respondents who identified India as their country of practice were extracted and analyzed as a single group. These results were then compared against the results from the other 21 LMICs that participated in the global study. The primary objective was to describe the workload of Indian oncologists compared to oncologists practicing in other LMICs. MO workload was defined as the annual number of new cancer patient consults seen per oncologist. All data were initially collected in Fluid Surveys and subsequently exported to SPSS. Data consisted of categorical, ordinal, and continuous formats, occasionally collected as ranges (e.g., <50, 51–100, and 101–150). In the latter case, medians were generated using the mid-point of the categorical range (e.g., a median value of 101–150 would be reported as 125). Data were analyzed using IBM SPSS (version 24.0 for Windows), Armonk, New York, USA, 2016. Pearson Chi-square tests were used to test for differences in proportions for categorical variables, and the Mann–Whitney U-test was used to compare ordinal and continuous data between Canada and the other HICs. $P < 0.05$ was deemed statistically significant. No adjustments were made for multiple comparisons.

Results

Characteristics of the study participants

There were 147 complete responses from LMICs; 82 from India and 65 from other LMICs. The median age of respondents from India was 41 years; 83% (68/82) were male [Table 1]. Indian MOs were younger and more likely to be male than other LMICs. About 83% (68/82) of the Indian respondents were MOs and 6% (5/82) were clinical oncologists; the corresponding figures for other LMICs were 52% (34/65) and 37% (24/65) ($P < 0.001$). Practitioners from other LMICs were more likely to deliver chemotherapy and radiation compared to Indian MOs (41% [27/65] vs. 5% [4/82], $P < 0.001$). MOs in India were more likely to have completed training in their home country (96%, 79/82) compared to other LMICs (63%,

Table 1: Demographics and clinical practice setting of respondents from India and other to a medical oncology workload survey

Demographics	India (*n*=82), *n* (%)	Other LMICs (*n*=65), *n* (%)	*P*
Sex			
Male	68 (83)	44 (68)	0.031
Female	14 (17)	21 (32)	
Age (median)	41	46	0.027
Years in practice (median)	8	11	0.226
Specialty			
Medical oncologist	68 (83)	34 (52)	<0.001
Clinical oncologist	5 (6)	24 (37)	
Pediatric oncologist	2 (2)	1 (2)	
Hematologist	4 (5)	3 (4)	
Other	3 (4)	3 (5)	
Treatment offered			
Chemotherapy only	78 (95)	38 (59)	<0.001
Chemotherapy and radiation	4 (5)	27 (41)	
Years of postgraduate training (median)	6	6	0.425
Completed training in home country			
Yes	79 (96)	41 (63)	<0.001
No	3 (4)	24 (37)	
Clinical practice setting system			
Public	23 (28)	19 (30)	<0.001
Private	48 (59)	15 (23)	
Both	11 (13)	30 (47)	
Setting*			
Hospital inpatient	79 (96)	57 (88)	0.061
Hospital outpatient	61 (74)	49 (75)	0.890
Other outpatient	12 (15)	10 (15)	0.899
Hospital type			
General hospital	39 (48)	38 (59)	0.189
Cancer hospital	43 (52)	27 (42)	
Radiotherapy on site			
Yes	69 (84)	48 (74)	0.124
No	13 (16)	17 (26)	
Palliative care on site			
Yes	59 (72)	45 (69)	0.719
No	23 (28)	20 (31)	
Chemotherapy pharmacist on site			
Yes	44 (54)	49 (75)	0.007
No	38 (46)	16 (25)	
Training program in center			
Yes	49 (60)	43 (66)	0.426
No	33 (40)	22 (34)	
Supervise trainees			
Yes	64 (78)	55 (85)	0.314
No	18 (22)	10 (15)	
EMR			
Yes	54 (67)	19 (30)	<0.001
No	27 (33)	45 (70)	
Clinic notes*			
Dictated	10 (12)	3 (5)	0.146
Hand-written	60 (73)	60 (92)	0.003
Typed	40 (49)	10 (15)	<0.001

Contd...

Table 1: Contd...

Demographics	India (*n*=82), *n* (%)	Other LMICs (*n*=65), *n* (%)	*P*
Service extenders*			
Nurse	54 (66)	49 (75)	0.210
Nurse practitioner	30 (37)	27 (42)	0.540
Medical students	10 (12)	21 (32)	0.003
Residents	55 (67)	46 (71)	0.631
Other physicians	27 (33)	22 (34)	0.907

*Applicants could choose multiple responses to same question. Numbers do not always add to 100% due to small amounts of missing data. Responses are missing for years in practice (4), clinical practice setting system (1) and access to EMR (*n*=2). LMIC – Low- and middle-income countries; EMR – Electronic medical record

41/65, $P < 0.001$). The median years of postgraduate training in both India and other LMICs was 6 years.

Clinical practice setting

About 59% (48/82) of Indian MOs reported working exclusively in the private health system; 23% (15/65) of MOs in other LMICs worked exclusively in the private system ($P < 0.001$). There were more reported oncology inpatient beds at Indian MO centers compared to other LMICs (median 51–100 beds vs. 21–50 beds, $P < 0.001$); 57% (47/82) of Indian MOs worked at centers with >50 beds compared to 28% (27/65) of MOs at other LMICs ($P = 0.001$). Despite having substantially more inpatient beds, the number of chemotherapy-prescribing physicians at Indian centers was not greater than that of other LMICs: 21% (17/82) of Indian MO worked at centers that had >10 chemotherapy physicians versus 32% (21/65) in other LMICs ($P = 0.233$). Indian MOs reported access to onsite radiation (84%, [69/82] vs. 74% [48/65] $P = 0.124$) and palliative care (72% [59/82] vs. 69% [45/65], $P = 0.719$) that was comparable to other LMICs. However, Indian MOs were less likely to have chemotherapy pharmacists (54% [44/82] vs. 75% [49/65] $P = 0.007$) than MOs at other LMICs.

Seventy-eight percent (64/82) and 85% (55/65, $P = 0.314$) of MOs in India and other LMICs supervise trainees. Two-thirds of respondents in both groups reported having MO training programs at their own centers. Clinics notes were hand-written by a majority of MOs in India and other LMICs (73% [60/82] vs. 92% [60/65], $P = 0.003$). The availability of service extenders in India was comparable with that of other LMICs.

Delivery of clinical care

Compared to other LMICs, Indian MOs worked more days (median 6 vs. 5, $P < 0.001$) and more hours (median 51–60 vs. 41–50, $P = 0.004$) per week [Table 2]. Indian MOs have a median of 3 weeks' annual vacation compared to 4 weeks at other LMICs ($P = 0.017$). MOs in India and other LMICs had a median of 2 weeks' annual conference leave. MOs in India reported being on-call a median of 5 nights per month. Seventy-one percent of Indian MOs (41/58) and 43% (18/42) of other MOs reported being on-call every night. The proportion of time that Indian MOs spend on clinical duties (mean 67%), research (mean 11%), teaching (mean 10%), and administration (9%) is consistent with MOs in other LMICs. Sixty percent (49/82) of Indian MOs and 68% (44/65) of other LMICs reported treating all tumor sites.

Clinical volumes

The median number of new consults per year among Indian MOs was 475 compared to 350 for other LMICs ($P = 0.032$) [Table 2]. Twenty-four percent (20/82) of Indian MOs reported seeing >1000 new consults per year. The proportion of MO seeing very low volumes was much greater among other LMICs; 24% (15/62) of MOs in other LMICs and 2% (2/82) of Indian MOs reported <100 consults/year ($P < 0.001$). The median workload for those in the public system ($n = 22$) was 451–500 new consults; for the private system ($n = 48$) the median was 401–450; for those who indicate both ($n = 11$), the median was 501–600 new consults per year.

The median number of patients seen in a full-day clinic was 35 in India and 25 in other LMICs ($P = 0.003$). Twenty-six percent (22/82) of Indian MOs reported seeing >50 patients per day. Indian MOs reported spending 25 min with a new patient and 7.5 min with a chemotherapy treatment patient; this was less than that reported by MOs in other LMICs ($P = 0.018$ and $P < 0.001$). Sixty-eight percent (54/82) of Indian MOs attend at least one tumor board per week.

Satisfaction, barriers, and challenges

The median job satisfaction score on a 10-point Likert scale (higher scores represent higher satisfaction) was 8 in India and 7 in other LMCs ($P = 0.057$). The most common barriers to clinical care reported by MOs from India included: patients being unable to pay for care (60%, 35/82), limited access to new treatments (42%, 34/82), high clinical volumes (39%, 32/82), insufficient time for reading (32%, 26/82), and a shortage of oncologists (22%, 18/82).

Discussion

In this study, we describe workload, infrastructure, and delivery of care among Indian medical oncologists. For

Table 2: Delivery of clinical care and clinical volumes* reported by respondents from India and other low-middle income countries to a medical oncology workload survey

	India (*n*=82)	Other LMICs (*n*=65)	*P*
Delivery of clinical care			
Work week			
Number of days worked/week (median)	6	5	<0.001
Number of hours worked/week (median)	51-60	41-50	0.004
Leave			
Number of annual weeks of vacation (median)	3	4	0.017
Number of annual weeks conference leave (median)	2	2	0.654
On-call duties^			
Number days on-call/month (median)	5	5	0.826
Respondents on-call every night^, *n* (%)	41 (71)	18 (43)	0.005
Allocation of duties			
Percentage time on clinical duties (mean)	67	59	0.025
Percentage time on research (mean)	11	13	0.097
Percentage time on teaching (mean)	10	13	0.008
Percentage time on administration (mean)	9	13	0.017
Disease sites, *n* (%)			
All cancers	49 (60)	44 (68)	0.322
Breast	15 (18)	15 (23)	0.981
Lung	15 (18)	11 (17)	0.829
Gastrointestinal	15 (18)	14 (22)	0.623
Gynecologic	15 (18)	10 (15)	0.641
Head and neck	14 (17)	11 (17)	0.322
Genitourinary	8 (10)	10 (15)	0.641
Clinical volumes			
Number of annual new consults (median), *n* (%)	475	350	0.032
<100	2 (2)	15 (23)	
101-250	19 (23)	12 (18)	
251-500	25 (30)	14 (22)	
501-1000	15 (18)	10 (15)	
1001-1500	8 (10)	6 (9)	
>1500	12 (15)	7 (11)	
Number of patients seen per clinic day* (median), *n* (%)	35	25	0.003
<10	6 (7)	9 (14)	
10-20	15 (18)	22 (34)	
21-30	14 (17)	11 (17)	
31-40	14 (17)	8 (12)	
41-50	11 (13)	7 (11)	
>50	22 (26)	8 (12)	
Time spent per patient (median minutes)			
New consult	25	35	0.018#
Chemotherapy treatment patient	7.5	15	<0.001

#*P* value significant. *Per full day of outpatient clinic; ^Among 58 and 42 respondents for Indian and other LMICs, respectively. 47 respondents were missing the number of days on-call as they did not respond to this if they indicated that they were always on call. 16, 12, and 23 were missing the percentage of time spent on research, teaching, and administrative duties, respectively. Two were missing data for new patient consults. LMIC – Low- and middle-income countries

comparative purposes, we also present data from 21 other LMICs. Several important findings have emerged. First, more than half of the Indian MO respondents work exclusively in the private health system; this is far greater than that of other LMICs or HICs. Second, the median number of new patients reported per year was 475 compared to 350 in other LMICs and 175 in HICs. One-quarter of Indian MO respondents see >1000 new cases annually. Moreover, Indian MOs work at centers with large inpatient services. This volume of inpatient work (which may not be captured by annual consultations) suggests potentially even greater workload for Indian MOs compared to other countries. Third, compared to other LMICs, Indian MOs work more hours and days per week and have less annual leave for vacation. Finally, the greatest challenges to clinical care reported by Indian MOs

are limited financial means of patients, limited access to new therapies, and high clinical volumes.

We have recently reported the first global analysis of MO workload and available infrastructure.[6] In our global analysis, we found striking differences in workload and delivery of clinical care between LMICs, UMICs, and HICs. Annual case volume in LMICs (median consults 425, 40% of respondents seeing >500 consults) was substantially higher than that of UMICs (175, 14%>500) and HICs (175, 7%>500) ($P < 0.001$). The highest volume countries in this global analysis were Pakistan (975 annual consultations, 73% respondents reporting >500 annual consultations), India (475, 43% >500), Turkey (475, 27%>500), LMIC Africa (375, 37% >500), Italy (325, 32% >500), and China (275, 22% >500).

To the best of our knowledge, this is the first country-specific report of MO workload in a low-resource setting. We are aware of three contemporary studies that describe oncologist workload in HICs. Balch *et al*. have described practice data for 589 hematologists/oncologists in the United States.[4] The median annual consult load was ~260 for outpatients but rose to 350 per oncologist if hospital inpatients were included. Blinman *et al*.[5] described an annual new consult workload of 280 among 94 Australian MOs, and a survey by the New Zealand Working Group of 32 MOs reported an annual consult load of 220.[3]

The finding that more than half of the Indian MO respondents work exclusively in the private sector has significant implications. The vast majority of Indian patients come from low-middle socioeconomic strata, and due to their limited ability to pay, they seek treatment at government institutions. This suggests that there may be even greater workload among MOs within India's public system. The median workload for those in the public system ($n = 22$) was 451–500 new consults; for the private system ($n = 48$) the median was 401–450; and for those who indicate both ($n = 11$), the median was 501–600 new consults per year. It is also notable that physician salaries are known to be considerably lower in public hospitals compared to the private sector. Moreover, a substantial volume of MO care in India is delivered in the inpatient setting. This relates to the vast distances patients travel for cancer care and the sparse cancer services available in district hospitals. Our data demonstrate that relatively fewer MOs work at these much larger inpatient centers compared to other LMICs and HICs; accordingly, our results likely underestimate the total relative clinical workload of Indian MOs.

The study results suggest that there are urgent needs within Indian MO centers to expand palliative care services and develop capacity in systemic therapy pharmacy. The responsibility of safely delivering chemotherapy in India often falls on the MO rather than a trained pharmacy team. This further adds to MO workload and can potentially lead to errors in chemotherapy planning and administration. Delivery of safe and high-quality care in this workload environment may be further compromised by nightly on-call duties and having fewer minutes per patient in the outpatient department. Task shifting and task sharing could be options wherein some of the work of oncologists are managed by physician assistants, nurses, and pharmacists.

The barriers to care reported by Indian MOs offer important insights for future planning. Concern regarding patient inability to pay for care highlights the need for central and state governments to invest in publically accessible and affordable cancer care. This may also partially address the second most reported barrier to care regarding access to new systemic therapies. Finally, it is worth noting that treatment recommendations are generally based on the research conducted in high-income settings which may not be applicable in India due to important differences in disease presentation, biology, and health system capacity. The implementation of research is further limited due to the high costs of all the novel agents. This has two implications – first, there needs to be a robust health technology assessment mechanism to identify systemic therapies which have "value" and second, this confers the responsibility of context- and resource-specific research to MOs within India. Given the staggering clinical workload of Indian MOs, it is therefore not surprising that only 11% of their time is dedicated to research. For the Indian cancer system to identify and implement unique solutions to its unique challenges, there needs further investment in resources and time to facilitate research by Indian MOs. The concept of "protected time" for research, which might be associated with short-term pain, might result in long-term rewards by identifying cost-effective treatment alternatives.

Our study results should be considered in light of important methodologic limitations. Because we do not know the number of potential respondents that received the survey, we are not able to determine a response rate. Moreover, due to potential selection (volunteer) bias, it is possible that our results are not generalizable to all Indian MOs. While our survey was distributed to all members of the ISMPO, this includes only an estimated 60% of all practicing MOs in India. Current estimates suggest that there are approximately <350 MOs in India. Accordingly, the ISMPO membership represents only a proportion of all MOs in the country. There are likely to be a number of "clinical oncologists" who administer both radiotherapy and chemotherapy who may not be members of the ISMPO. To increase the response rate in India, we also distributed the survey to members of the NCG. However, the survey may not have been equally distributed to all MOs within the NCG, and there will also be MOs at centers that are not part of the NCG. Therefore, the 82 Indian physicians

who responded to our survey may not be representative of all Indian MOs. The direction of the bias is uncertain since the highest volume MO may be less likely to respond to a survey given other time pressures; alternatively, they may be more likely to respond if they believe this issue to be important and relevant. Because our data are self-reported, they may or may not represent true clinical volumes as respondents may overestimate (or even underestimate) workload. Finally, for comparative purposes, we included 65 respondents from 21 other LMICs. There is clearly substantial variation within these other LMICs. Together with the relatively small sample size, this variability renders comparisons with India difficult to interpret.

Conclusions

This study offers insight into MO workload and delivery of clinical care in India. The clinical volumes and workload of Indian MOs are substantially greater than peers in HICs and other LMICs. With more than half of the Indian MO respondents working exclusively in the private sector (where care is not accessible for the majority of Indian patients), future health human resource planning needs to carefully consider how to equitably expand access to MO care. More granular state-level analyses of workload and alternative models of care are urgently needed.

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Conflicts of interest

There are no conflicts of interest.

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