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Original Research Article

Optimizing state per capita health expenditure to alleviate cancer burden on hospitals in India: an exploratory study

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ABSTRACT

Background: One death among six is due to cancer globally. Low-and middle-income countries contribute 70% of total cancer cases. In India, cancer cases increased 44% in the last twelve years, but related infrastructure could not be developed. Indian states are lacking cancer-care services and patients need to travel long distance for treatment. This additional cost put pressure on the financial health of patients. The study aimed to analyse cancer burden and inequities in cancer-care services in different states of the country, and the importance of healthcare expenditure in reducing cancer burden.

Methods: Data has been collected from various secondary sources such as ministry of health and family welfare, National-Cancer-Grid and Finance commission of India. Primary data has been collected from randomly selected hospital in Delhi with the help of structured questionnaire. Regression-analysis has been performed with the help of SPSS-version-22. Total 238 patients have been purposively selected as samples.

Results: Cancer-cases are increasing across most of the Indian states. There is skewed availability of cancer-care hospitals in the country. In Bihar there is one cancer hospital for 12142 patients whereas in Maharashtra the figure is 1281. In the primary survey it was found that 75% patients were coming from outside the city for the treatment and travel expenses account for 43.8% of total indirect expenditures.

Conclusions: Disparities in cancer-care facilities accentuates economic burden of cancer in the country. Increase in government expenditure reduces cancer burden on hospitals. The study provides actionable recommendations for policymakers, healthcare providers, and other stakeholders.

Keywords: Cancer burden per capita health expenditure, Cancer care, Cancer care facilities, Cost of treatment, Inequities

INTRODUCTION

Cancer is one of the leading cause of deaths in many countries. As per World Health Organization (WHO) estimates, one death among six is due to cancer globally. Seventy percent of cancer cases come from low- and middle-income countries. In low-and-middle income countries (LMICs), early onset of cancer coupled with low screening and late diagnosis leads to high mortality and treatment complications.[1]

In India, the cancer burden in 2020 was 1.39 million, which is estimated to increase to 1.57 million by 2025 (NCPR 2020). Data reveals that between 2009-2022 the cancer cases have increased 44 percent in the country. One in ten Indians develops any type of cancer during their lifetime, and one in 15 Indians dies of cancer (WHO). Various factors, such as increasing population, ageing, and changing lifestyles, make the burden of cancer more concerning and alarming.[2]

The cost of the treatment is very high in India and disproportionate availability of cancer care and screening

services makes treatment unaffordable for most of the people. The skewed availability of services across different states has substantial financial impact on the patients.[3] There are huge disparities in India when it comes to access to cancer care and screening facilities. Inequalities, are major determinants of India's cancer burden.[4] Patients have to travel to big cities for the treatment and frequent visits compel patients and caretakers/family members to either leave their job or take long leave without salary. Rural areas and small cities of the country are suffering from low quality services, inadequate infrastructure, inaccessible and unaffordable healthcare services which is result of less per capita healthcare expenditure by the states. On the other hand, big and metro cities have observed substantial developments in this regard. The low health insurance coverage and high dependency on out-of-pocket payments create further financial noxiousness for the cancer treatment. The hardest hit will be the middle class just above the poverty line who are neither eligible for government benefits nor have the resources to manage the expenditure.[5] Out of pocket expenditures push the patient and their family into deeper debt, financial disaster, and deprivation. This means that patients need to travel a long distance to see a doctor who can help them. Additional time and cost make cancer care services very expensive and unaffordable for the patients. Due to the treatment of cancer, the probability of impoverishment and catastrophe has been recorded at 133% and 180%, respectively, compared to the odds of other communicable diseases in India.[6]

Rationale

The present study focused on the inequalities in the country in cancer-care services and state wise per capita health expenditure. The data revealed that many Indian states are lacking cancer-care services though the cancer burden is very high. Patients travel to other states and that increases indirect cost of treatment. The present paper highlights disparities in cancer care services in the country and explains how better spending on healthcare by state governments can reduce inequalities and burden on cancer care facilities.

Objectives

To analyse cancer burden in different states of the country. To analyse the inequities in cancer-care services. To calculate the indirect cost of treatment due to skewed availability of cancer-care services. To reveal the role of government healthcare expenditure in reducing disparities and cancer burden on hospitals.

METHODS

Study design

The study was a cross-sectional descriptive study.

Methods:

Data has been collected from both primary and secondary sources. To analyse the cancer burden, data has been collected from the website of The Ministry of Health and Family Welfare (MoHFW). The state-wise number of cancer hospitals has been taken from The National Cancer Grid. State-wise per capita health expenditure has been taken from The Finance Commission of India.

Primary data has been collected from purposively selected private tertiary care hospital in Delhi with the help of structured questionnaire to analyse how unavailability or skewed availability of cancer-care services contribute to the indirect cost of treatment.

Inclusion and exclusion criteria

Patients of out-patient department of selected hospital from following categories have been included in the study. Patients with a primary stage of treatment. Patients with an advanced stage of treatment. Patients who survived during the last-year and come for follow-up visits. Patients from in-patient department have been excluded from the study.

Sample size

With the help of random sampling technique, a total of 238 patients have been selected using sampling formula with 95% confidence interval and 5% margin of error.

Linear regression analysis has been performed considering number of patients per hospital as dependent variable and state-wise per capita health expenditure in India as independent variable, with the help of SPSS version 22.

Study duration

The study was conducted during March 2024 to April 2025.

Ethical consideration

Ethical approval for this study has been obtained from the institution review board (IRB) of IIHMR, Delhi.

RESULTS

India has witnessed a substantial surge in cancer cases over the last few decades. There is skewed availability of cancer-care hospitals in the country. Within states, the availability of cancer care hospitals is mainly in the state capitals or in major cities, that contributes drastically to the indirect cost of treatment for those who live in small cities and rural area. Large variations are reported in cancer incidence, patterns, and mortality among different regions of our country.[6] In the primary survey it was found that 75 percent patients were coming from outside

the city for the treatment and travel expenses account for 43.8 percent of total indirect expenditures.

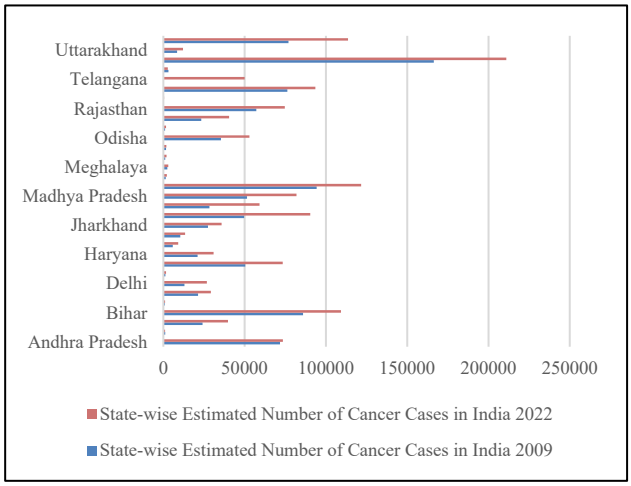

Figure 1: State-wise cancer cases trend in India.
Data Source: Indiastat data base.

The Figure 1 shows the trend of cancer cases in the different states of India. The figure compares the cancer cases between 2009 and 2022. The majority of the states show the rising trend in cancer cases other than Arunachal Pradesh and Tripura where the cases have declined by 4.98 percent and 11.88 percent respectively. The situation is alarming in the states like Delhi and Kerala where the cancer cases have increased 106.77 percent and 108.92 respectively during above mentioned period. Karnataka demonstrates an 81.83 percent growth rate while Mizoram, Punjab, Assam and Puducherry have 74.58, 73.78, 65.20 and 62.54 percent growth in cancer cases respectively.

Only Andhra Pradesh and Nagaland are the states that demonstrate single digit growth in cancer cases. Overall, in India 44 percent growth has been observed in the number of cancer patients from 2009 to 2022. The major problem is that the increasing burden of cancer is not coinciding with the cancer care services available in Indian states and government per capita health expenditure.

Table 1: Inequities in cancer care facilities and state per capita health expenditure in India.

States	Number of cancer hospitals*	Cancer** cases 2022	Number of patients per hospital#	State-wise per capita health expenditure in India***
Goa	2	1700	850	6207
Delhi	15	26735	1782	
Chandigarh	1	1088	1088	
Gujarat	25	73382	2935	1478
Haryana	11	30851	2805	1422
Karnataka	25	90349	3614	1429
Tamil Nadu	29	93536	3225	1653
Telangana	11	49983	4544	1405
Uttarakhand	3	12065	4022	1873
Kerala	24	59143	2464	2048
Himachal Pradesh	1	9164	9164	3074
Maharashtra	95	121717	1281	1069
Andhra Pradesh	9	73536	8171	1441
Punjab	9	40435	4493	1059
Arunachal Pradesh	1	1087	1087	6937
Mizoram	1	1985	1985	4907
Rajasthan	8	74725	9341	1552
Odisha	6	52960	8827	1308
Nagaland	2	1854	927	2968
Chhattisgarh	4	29253	7313	1303
West Bengal	10	113581	11358	983
Jammu and Kashmir	3	13395	4465	3145
Assam	4	39787	9947	1360
Madhya Pradesh	11	81901	7446	947
Meghalaya	2	3025	1513	3055
Jharkhand	6	35860	5977	913
Manipur	1	2097	2097	1813
Uttar Pradesh	19	210958	11103	807
Bihar	9	109274	12142	616

Data Source: * MoHFW ** National Cancer Grid *** Finance Commission of India # Calculated.

Table 2: Model summary.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics			Durbin-Watson
					R square change	F change	Sig. F change	
1	.533a	0.284	0.256	3114.56	0.284	9.928	0.004	1.956
a. Predictors: (constant), state-wise per capita health expenditure in India								
b. Dependent variable: number of patients per hospital								

Table 3: Coefficients[a].

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.	Collinearity statistics	
	B	Std. error	Beta			Tolerance	VIF
1 (Constant)	7829.936	1002.02		7.814	0		
State-wise per capita health expenditure	-1.203	0.382	-0.533	-3.151	0.004	1	1

Dependent Variable: Number of patients per hospital.

The Table 1 shows that there is an inequitable distribution of cancer care services across the country. In Bihar for 12142 cancer patients there is one cancer care hospital and in Uttar Pradesh, West Bengal and Assam, for 11103, 11358 and 9947 patients respectively there is one hospital. This reveals excessive burden on the cancer care services in these states. On the other hand, in Delhi and Maharashtra for 1782 and 1281 patients respectively there is one cancer care hospital. This reveals skewed availability of services across different states in the country. The states must create cancer care facilities that requires more expenditure on health. The paper analyses how an increase in per capita health expenditure in states can decrease cancer burden on hospitals. Both the variables are negatively correlated (-0.533) which indicates that an increase in expenditure reduces cancer patients per hospital. The value of R^2 was 0.284 that indicates that 28.4% variation in the dependent variable is explained by state-wise per capita health expenditure in India. The regression coefficient was -0.533 that shows that per capita health expenditure should be increased by the states and that will reduce cancer burden on hospitals by 0.533 times

Most of the Indian states are suffering with from low per capita healthcare expenditure. This is the reason that the patients travel long distance that accentuates the indirect cost of treatment and the economic burden of cancer.

The table below depicts the distribution of the patients as per their native state from a sample of 238 patients that has been collected from a randomly selected hospital in Delhi.

The Table 4 depicts that out of 238 samples of patients, more than 39 percent patients are coming to Delhi form UP and 12.6 percent patients are coming from Bihar despite long distance from Delhi to Bihar. This complements the information in Table 1 where it has been shown that UP and Bihar have fewer cancer care facilities and very little per capita health expenditure as compared to the burden of disease in these states. Evidently, 75 percent of patients were from outside Delhi, indicating a lack of cancer-oriented infrastructure in other states. This increases indirect costs, with travel expenses accounting for 43 percent of these additional indirect costs. The financial burden from both direct and indirect expenses can be catastrophic for treatment seekers and that will increase not only economic but also mental burden on the household. These costs can become not only an economic burden but also mentally draining.

Table 4: State-wise distribution of patients.

State	Frequency	Percentage
Andaman	1	0.4
Bihar	30	12.6
Delhi	60	25.2
Haryana	9	3.8
HP	4	1.7
J&K	2	0.8
Jharkhand	5	2.1
MP	10	4.2
Punjab	5	2.1
Rajasthan	10	4.2
Sikkim	1	0.4
Uttarakhand	7	2.9
Uttar Pradesh (UP)	93	39.1
West Bengal	1	0.4
Total	238	100

Data Source: Primary Survey.

DISCUSSION

The present study fills the research gap as it highlights the cancer burden across various Indian states, and trend of number of cancer patients from 2009 to 2022. This reveals cancer cases are increasing in almost all the Indian states other than few exceptions and cancer care

facilities are not increasing in proportion to the burden of disease. There are inadequate public health facilities with challenges of infrastructure, shortage of human resource and modern technology. Consequently, many patients turn to private health facilities, significantly increasing their healthcare expenditures beyond expectations particularly when the public health expenditure as percentage of gross domestic product (GDP) is 1.9 percent in financial year 2024. Given the low population coverage of health insurance in India and a weak public health sector, put a large burden of out-of-pocket spending on households.[7] Moreover, health financing for cancer treatment in India is regressive in nature that put more burden on poor population as compared to rich.[8] Expensive cancer treatment is associated with poor quality of life, accumulation of debts, premature entry into the labour market, and non-compliance with treatment.[9] The paper highlights the importance of per-capita health expenditure that is helpful in creating health infrastructure and decreases cancer burden on facilities particularly where cancer burden is high, and health expenditure is low. Travel for treatment has become imperative for the patients because of inequities in the cancer care facilities in the country. Expenses are accentuated by poor geographical dispersion of cancer treatment facilities.[10] Caretaker, who is mostly a family members also accompany patients when they travel to other states for treatment. That boosts their indirect cost of treatment. When patients and their families travel to urban areas, they incur various expenses such as transportation, accommodation, and additional costs related to meals and other daily needs.[11] This puts pressure on the out-of-pocket expenditure of the patients as the contribution of indirect cost of treatment becomes very high.

It is crucial for researchers and policymakers to develop methods to enhance the accessibility and affordability of cancer care globally. This involves seeking improvements in cancer treatment options and ensuring that individuals can receive the necessary care, regardless of their location.[12]

Policy implications

The geographical location of most of the respondents under study is the northern region of the nation, such as Uttar Pradesh, Rajasthan, and Bihar as these states are lacking in cancer care facilities and state per capita healthcare expenditure. This accentuates their cost of treatment. They struggle to provide their residents with enough access to medical treatment. Even private health providers target big and metro cities. India has a severe scarcity of cancer care service providers in rural areas and small cities. It clearly indicates that people who live in remote areas need more cancer care services as they frequently travel long distances for treatment. It becomes imperative to develop diagnostic and treatment facilities in tier-II and tier-III cities to ensure quality and affordable care to all cancer patients.[3]

CONCLUSION

This study explored the crucial policy implications necessary to mitigate the challenges related to cancer burden in the country and availability of cancer-care services.

The disparities in treatment facilities costs significantly affect low- and middle-income families who rely on public hospitals for affordable treatment. Due to less Government expenditure and inaccessible nearby cancer care infrastructure, many patients may delay or forgo necessary care, exacerbating their health conditions. Those opting for private hospitals often bear huge treatment cost that put them under excessive financial distress. Low insurance penetration is the other significant reason for the financial hardships during cancer treatment. Patients or household of patients are bound to enter in catastrophic medical expenses that leads them to poverty. The study provides actionable recommendations for policymakers, healthcare providers, and stakeholders to address this pressing issue effectively.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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