Estimating the Economic Burden of Cancer at a Tertiary Public Hospital: A Study at the All India Institute of Medical Sciences

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Abstract:

This report is based on a prospective study which attempted to estimate the cost of treatment borne by the cancer patients at an academic tertiary public hospital. There is a lack of information about the financial burden of major illness like cancer on patient and their families. An understanding of the out-of pocket expenditures required for cancer care can improve the health care delivery process in India, both for the patients and families on one side, and the health professionals and administrators on the other side. This study estimated the expenditures done by the surveyed patients for diagnosis and initial cancer-directed treatments, as direct and indirect costs.

The sampled cancer patients have monthly per capita income (MPCI) of IRS 1749(0-25,000). The economic burden of cancer therapy calculated as mean (average) costs to a patient amounted to IRS. 36,812 and it consisted of: IRS 14,597 spent before coming to the hospital, IRS 14,031 at the hospital, and IRS 8,184 during the prolonged period of radiotherapy course. Out of the one million newly diagnosed cancer patients per year in India, nearly 50 percent are suitable for curative aim cancer-directed therapy. It will be a highly justifiable approach to make financial provision for those cancer patients who can not meet the treatment costs and may be denied the benefits of cancer care.

Introduction

A nation's health policy should, fundamentally, address the questions of cost, access and quality in health care. A 'free market' of medical care relies on the notions of "perfect information" and "perfect competition". Yet, the patient usually does not have correct information on financial impact of a disease (Steinberg ML, 2008). Cancer is one such disease, where the financial burden of treatment is a major source of stress for patients and families. The out-of –pocket costs incurred because of the illness can consume substantial part of income and family budget (Lansky, 1983). However, patients and their family do not have a good estimate of the expenses involved. This issue has emerged as a cause for health policy concern, even in developed countries like USA and UK (Meropol NJ, 2009; Sikora K, 2009; Steinberg ML, 2008).

The health care delivery in India is going through a process of transition, more so the tertiary specialty care of chronic diseases like diabetes, hypertension, heart attack, kidney or liver failure, mental disorder, ageing and cancer. More than 80% of these patients are now seeking medical interventions from a private doctor or private/corporate hospital sector and more than 90% of these individuals end up paying the costs from their own pocket (Sakthivel S and Karan AK, 2009). New medical technologies and newer drugs cause increasing expenditures borne by patients and their family carers. According to one reported survey, the fee-charging private sector healthcare facilities in India accounted for 82% of the total $ 30.5 billion health sector expenditures in 2003 (www.pwc.com/en_GX/gx/healthcare/pdf/emerging-market-report-hc-in-india.pdf accessed on 30 June 2010). Public hospitals and academic medical institutions still provide the tertiary care at low costs. However, even in such "free" hospitals, patients have to bear several direct and indirect costs, which need to be evaluated. In this paper, we provide the costs for treatment in one such public hospital (AIIMS) for a major disease, e.g. cancer, that has a large financial impact on patients.

We provide an estimate of the costs incurred by a cancer patient for the initial anti-cancer therapy course at AIIMS. Our research results are valuable as they can be utilized by the individual patient, his or her family caregivers, health care providers and policy makers. A search of the published medical literature, and the commonly used websites like Google, Wikipedia, and AltaVista did not yield correct information about costs borne by Indian cancer patients, other than charges for cancer treatment levied by a hospital or individual stories of economic stress.

Approximately 1 million newly diagnosed cancer patients are seen in India each year and out of these nearly 50-60% present themselves at a disease stage suitable for curative cancer-directed therapy (CDT), which consist of surgery, chemotherapy and radiotherapy. Depending upon the cancer type and stage of disease, the initial therapy course is the most expensive period. Hence, a cancer patient and family members can face the double dilemma of confronting the cancer diagnosis and meeting the financial burden of CDT. Radiation therapy (RT) is a key treatment modality, two-thirds of all major cancers require RT with or without other the two types of treatment, and approximately 40% of all cancer cures are directly attributable to the benefits of radiation therapy (World Health Organization consultation, Porter A, 1999). Radiation therapy is delivered over a continuous period covering several weeks, mostly a curative aim of RT course lasts between 5 to 7 weeks. It is often observed that patients may not receive this RT course, because it is of long duration needing to stay near a cancer centre/away from own home and the economic cost of therapy duration is unaffordable (Mathews M et al, 2009).This non-compliance can have serious implications in term of a curative disease progressing to an incurable stage and subsequent loss of life.

This study was designed to capture the costs borne by Indian cancer patients and family during the course of radiotherapy, which can reflect a major portion of economic cost analysis for cancer care. The data were collected on a temporal basis. We also collected the data on expenditures done by these patients before the start of radiotherapy, in order to gather a comprehensive understanding about the economic burden of cancer at its initial phase of cancer diagnosis and therapy. Two public institutions of Delhi, All India Institute of Medical Sciences and Indian Statistical Institute, with their respective areas of expertise have joined together to carry out this project. To the best of our knowledge and literature search, this study is the first of its kind reporting the direct estimation of initial cancer therapy costs incurred by cancer patients in India. The outcomes of the study can be utilized for different purposes in India: 1. to inform further improvements in delivery of cancer care through public hospitals and regional cancer centres, 2. to evaluate the provision of financial support to cancer patients and 3. to increase the compliance to curative cancer therapy by informing the likely costs to patients, their families, health institutions and the public health administrator.

Aim:

This study mainly concentrates on those patients with cancers most prevalent in India-head and neck, cervix and breast cancer who received anti-cancer treatment at the All India Institute of Medical Sciences (AIIMS), New Delhi. The study measures the economic effects of cancer in two phases: the *first phase* is the period after detection of cancer and before coming to Dr. B. R. A. Institute Rotary Cancer Hospital (IRCH), AIIMS, i.e. specifically for those patients not diagnosed at AIIMS. In this process, we

provide socio-economic characteristics of patients who seek tertiary care at AIIMS (which is our point of first contact with the patients). The *second phase* of this study is during a major cancer treatment period at IRCH, AIIMS: the phase of radiotherapy that last between 5-7 weeks, as part of curative aim cancer therapy. We measure this in terms of burden on the economic resources of the household as they deal with the disease and its treatment. We also look at various issues, which indirectly may have financial effects on cancer patients.

Survey Methodology:

The basic unit of economic burden analysis of our study is the cancer patient and his/her household (i.e. those who share a common kitchen with patient at the home address). The distinct advantage of sampling patients at AIIMS is while it is a premier institute for cancer treatment; it is also a place deemed "affordable" to poor people as it offers treatment at a minimal cost. Moreover the available expertise also brings the non-poor to it (Newsweek, 2006). The sample obtained is thus heterogeneous, allowing us to look at the effects across different economic strata.

This economic cost analysis is based on two waves of primary data collection. The first wave of data were collected at the Out Patient Department (OPD) of Dr.B.R.Ambedkar Institute Rotary Cancer Hospital (IRCH), AIIMS which is the first point of contact for patients with doctors who specialize in cancer treatment at AIIMS. IRCH is the cancer centre of AIIMS and is also the regional cancer centre under the National Cancer Control Programme of Government of India. At this stage, data were collected on demographic and socio-economic characteristics using a questionnaire designed by the researchers. Patient's personal and disease characteristics were documented from the medical record of IRCH, AIIMS.

After clinical evaluation at the out-patient, the doctors decided the cancer therapy plan, i.e., whether the patient needed only radiotherapy or if it had to be combined with surgery and/or chemotherapy. Our study includes patients on all such different treatment plans. However, we concentrate only on patients whose treatment goal is curative[6].

The second wave of data is collected on a random subset of patients surveyed in the first phase, during radiotherapy course. Radiotherapy is the common treatment modality for all those being treated for the aforementioned kinds of cancer. For this subset of patients in the second phase, we collect information on expenses during radiotherapy (RT) course, as it usually lasts for 5 to 7 weeks. During this period, the patient and accompanying family carer come to the hospital daily on all weekdays. Hence it gives a sufficient time span to capture the major part of anti-cancer therapy duration for its economic impact on a patient and family. This second phase is not necessarily the following 7 weeks after our first survey in OPD. The survey can be at any time 1-6 months after our first survey, the interval depending on when the doctors consider the delivery of RT as part of anti-cancer treatment trajectory with surgery and chemotherapy and/or, are able to schedule the patients for radiotherapy course on RT machines. Our survey was done when patient started the radiotherapy course and

[6] This excludes patients on palliative care, those for whom the doctors cannot chart a curative treatment plan. Initially, the surveyors from the ISI team tried to survey such patients but it was not possible to get coherent replies from such patients. Also survey of such patients requires survey skills which were beyond the capability of the research team.

continued till the last week, spread over RT period of 5 to 7 weeks. We surveyed the patients on RT course at least once every week and subsequently every 2 weeks[7].

This survey was carried out on a pre-designed proforma, duly tested by the investigators and approved by the Ethics Committee, AIIMS. The Ethics Committee of AIIMS approved this study, and all patients participating in this survey provided the informed consent **(EC, AIIMS No. A-02/ 04.12.2006).** The study received funding from the Planning and Policy Research Unit at ISI set up by the Planning Commission, Government of India for a duration of 3 years.

The economic cost assessment was done from the patient or a family carer on a direct face to face to interaction, within the hospital premises, with due attention to privacy. Each patient was explained about the purpose of this economic survey and consent was obtained. For this economic data collection from patient/caregiver, a research staff from ISI and a doctor from the Radiation Oncology department of IRCH,AIIMS worked jointly at each interaction for the survey. At the first survey setting, the investigators explained to the patients and family carers about the type of data required from them, and how the questionnaire was to be filled up.

During both waves, our survey captured the major out-of-pocket expenditures done by the patient/household during this course of cancer therapy– i.e. medicines, tests, transport to and from hospital, accommodation, and food. The data was populated on the proforma for individual patient separately with name, hospital ID number, date of survey etc. Doctor from the treating team of IRCH,AIIMS and one research staff from ISI jointly decided the dates of survey, with periodic scrutiny of any missing information. During the RT course, the patients are evaluated by the doctors for disease response and treatment-related morbidities on a weekly basis as a standard of treatment practice. This clinical assessment date was simultaneously utilized for collecting the economic survey data on the same visit, by the research staff of ISI and the doctor.

Data Description:

Between the periods mentioned below, we surveyed all those who satisfied our criteria. In this section we briefly summarize the characteristics of our sample.Moreover, initially it was decided to concentrate on patients from around Delhi[8]. However, at the end of 2 months, this policy was revised to take into account all patients.

The baseline survey was done on 432 patients between October 2006 and December 2007 when they first came to RT-OPD registration at the cancer centre IRCH of AIIMS. This baseline survey was done on all patients that satisfied the criteria mentioned ealier.Native place wise, 37 percent of the sampled patients were from Uttar Pradesh, 26% were from Delhi, 14% from Haryana, 10% from Bihar, 5% from Uttarakhand, 3% from Rajasthan and the rest 5% from other parts of India. The study did not include patients from other countries, as this will not give a true picture about the cost burden of cancer vis-à-vis earning. States relatively far away from Delhi i.e. more than 100 km. constituted 74 percent of the sampled patients. The over

[7] The reasons for reducing the number of contact points will be explained later in the paper.
[8] This was done to facilitate a longitudinal survey,but the strategy was revised given the large number of patients from outside NCR.

whelming representation of states from north of India is not surprising given that the survey was conducted in Delhi[9].Gender and disease profile of the patients are shown in **Table 1**.

As stated earlier the economic burden assessment was carried out on patients who suffer from the common cancer types seen in India, with adequate representation from both sexes. The salient patient characteristics are shown in **Table 2**.

Patient's clinical history starts with the appearance of symptoms followed by diagnosis. Diagnosis could be in AIIMS or outside AIIMS. If it is outside AIIMS, the patient may get some initial treatment before coming to AIIMS. Once the patient comes to AIIMS, he/she registers first at a specialty in AIIMS and another conclusive diagnosis takes place at AIIMS after which cancer therapy starts based on a treatment plan. On the basis of cancer type and stage of diagnosis at AIIMS, the CDT can consist of radiotherapy in the treatment plan either alone or with other two modalities of surgery and chemotherapy. Then only registration of the patient is done at RT OPD of the cancer centre, i.e.IRCH.

Given that AIIMS is a tertiary medical care centre, there may be a long period between the number of months a patient is suffering and the attendance at IRCH, AIIMS for this survey. But as **Table 2** shows, more than half our patients are first surveyed within 6 months of the appearance of symptoms. About 80 percent of our sample has been surveyed within one year of the symptom, a time frame suitable enough to recall the expenditures undertaken for a disease course. The longer durations are mostly those of patients who got some treatment outside Delhi in other hospitals and subsequently have been referred to AIIMS.

Patient profile and their characteristics **(Tables 1 & 2)** of this survey showed the median age for cancer patients surveyed as 52 years. Most of the cancer patients are between ages 36 to 65. However 15 percent of women are below the age of 35. In general, more women suffer from cancer at younger age than men.

The average years of education is quite low, overall median of 8 years (below school pass out level), the mean is at 7.82 years for males and 5.29 years for females. Fifty five male patients (17.24 % of all male patients) and 54 female patients (47.79 % of all female patients) had no schooling.

Patients came from various economic strata. The total income of the household of each patient (including wages, income in kind) was divided by the number of persons in the same household to derive the monthly per capita household income (MPCI). The average MPCI of the households of the surveyed cancer patients is Rs.1749. Half the patients come from households with MPCI less than Rs 1000. But not all household are poor. The top 2 percent of household have MPCI greater than Rs 10,000. The incomes vary depending on whether the patients belong to an urban area (Rs 2205) or a rural/semi urban area (Rs 1173). Almost 20 percent of the patients live in katcha or semi-pucca houses.

ECONOMIC STRESS AND OUT OF POCKET EXPENSES:

[9] If we use only the sample when the distance criterion was not used, the proportions do not change much.

The economic stress on households begins with the advent of first symptoms. As **Table 3** shows, a considerable amount of money may already have been spent before the patient reaches AIIMS. We report all expenditures in Indian rupees for year 2007. Almost half of the surveyed patients have already spent more than Rs. 5000 before coming to AIIMS. For some, the expenditure may be very high, sometimes as much as Rs. 372, 500. Thus, the mean expenditure at Rs 14,597 is almost three times the median expenditure. These expenditures depend to a large extent on the length of time and the kind of facility patients go to. In this paper, we do not delve deeper into this except to highlight that cancer patients would have already made substantial out-of-pocket-spending before coming to AIIMS.

At the AIIMS, before the start of radiotherapy, patients may also need to spend money. In **Table 3**, we report these expenses, undertaken after reaching AIIMS and before the start of radiotherapy, these are reported separately for transport (coming to AIIMS, sometimes from out of town), for food and lodging, and for direct medical expenses. Though half of our patients have already spent Rs 640 on food and lodging, it must be noted that in many cases, these are stays at friends' and relatives' houses, costs that we have not explicitly included here. Medical expenses can also be high, especially in cases where radiotherapy starts after cancer surgery or chemotherapy and the patient may have already spent some time being treated for cancer in other specialties at AIIMS. These medical expenses also included a one time payment of Rs. 750 towards the RT course, before radiotherapy starts.

As stated above, the radiotherapy at IRCH is our starting point for the second phase of the economic survey. We concentrate on the cost to the patient during radiotherapy course. As before, these costs include both the direct cost related to treatment (tests, medicines, accessories) and other associated costs, for example, those for lodging and food and transport, indirectly linked to receive the radiotherapy.

The RT course usually ranges from 5 to 7 weeks, and might differ as this decision is made by doctors depending upon tumour type, stage and the combination with other anti-cancer treatment. The fixed nature of this window period for RT course also helps us relate the costs to a reference period and may give a better idea of the extent of financial burden on the cancer patient.

To calculate a detailed cost, we collect weekly data on a subset of 284 patients out of the 432 patients, first surveyed at the baseline. Our smaller sample is picked at random and should be representative of the patients surveyed as a part of baseline survey. We first establish that indeed is the case, as regards the treatment received and the patient's MPCI, both which influence the financial stress. Average costs may differ across different types of treatment plans. Hence we test if those who have been sampled are significantly different from those who were not surveyed **(Table.4a**). There are four types of treatment plans: Only radiotherapy (RT). Surgery and radiotherapy (S+RT), Chemotherapy and Radiotherapy (CT+RT) and Surgery, Chemotherapy and Radiotherapy (S+CT+RT). We conduct a Kolmogorov-Smirnov test of whether the distribution of patients across different treatment types is the same. Equality of distributions is not rejected at 5% level of significance.

Next we test if the average income of those who were surveyed differs from those who were not surveyed. This is important because some items of expenditure may differ across income groups. As **Table 4b** shows, we find that average income of

those who were surveyed is marginally higher than those who were not. However given that there is great variation across patients, we find that the difference between the two groups is not statistically significant.

While we chose a smaller sub-sample to conduct subsequent cost analysis, we traced the medical records of all 432 patients to figure out the attrition rate. Out of 432 patients, files of 21 patients could not be retrieved. Out of the remaining 411 patients, 390 patients completed the radio therapy treatment at AIIMS. Thus the attrition rate is 5.1 percent.

COSTS DURING RADIOTHERAPY COURSE at AIIMS:

As described earlier, radiotherapy constitutes both a major and a prolonged part of cancer therapy. We report the direct costs borne by the patient, for example, those on medication, food and lodging, and transport to get to AIIMS. The cost calculations are based on weekly data on 284 patients. RT course in these 284 patients was for 5 weeks in 6.7%, 6 weeks in 12.3%, and 7 weeks in 81% of the surveyed patients. A total of 987 episodes of individual patient interaction were carried out on these 284 patients. During this second phase of our study, for an initial subset of 141 patients, we collected data on all the prescribed weeks of radiotherapy. Using this sample, we carried out an interim analysis and found that there is very little temporal difference in costs, within each treatment plan and as a whole. A regression of total expenditure for each treatment plan showed that the expenditures in the week 2-7 were not significantly different from the expenditures in week 1 (results available on request). Hence for the rest of the sample, we decided to collect data only in the 1st, 4th and the 7th week, for the rest of 143 patients. Since we analyse the weekly cost during RT, we pool all the data to calculate the average weekly costs. We report these costs by treatment plan in **Table 5**.

We find that the average cost across all treatment plans is Rs.1062 per week. This would imply an average cost of Rs 5310 for a radiotherapy course treatment lasting 5 weeks. If we add Rs 750 that has to paid at the beginning as RT course fee, the patients end up paying around Rs.6060 for a 5 week RT course (in case of 7 weeks, this cost is higher at Rs. 8184). As much as 59 percent of this cost is spent on transportation and food and lodging. These direct, indirect and total weekly costs borne by patients during their RT course, depending upon treatment type are shown in **Figure.1**. As we have noted before, there are significant differences between the expenditures of various treatment plan. In particular the treatment plan with RT alone is cheapest while the plan with CT+RT is the most expensive (though there is also higher variability in the expenditures of patients under this plan). The plan including CT+RT has the highest component of medical cost, largely dictated by the requirements of chemotherapy drugs. It would seem to be the case that a plan with just RT requires less supplementary costs. For example, food costs are lower than when the patient undergoes surgery. Transport costs are predictably higher for patients when surgery is involved (though the transport cost is lower for patients under S+RT+CT, there are very few patients under this plan).

At AIIMS, for a five week to seven period cancer therapy covering radiotherapy, this represents approximately 330 percent to 450 percent of the monthly per capita income of the family over the same period (refer to **Table.4b**, which shows a mean MPCI of Rs. 1835 for the surveyed patients in 2nd phase of this study). Just to bring the overall

burden into perspective, the average economic burden to a cancer patient being treated at AIIMS amounted to Rs.14,031 (before start of radiotherapy) plus Rs. 8184 (for a 7 week period of RT course), giving rise to a total expenditure of Rs. 22,215. When we add to this, the average expenditure of Rs.14,597 made before coming to AIIMS, an average cancer patient surveyed in this study would have to bear an economic burden of Rs.36,812 for the entire cancer therapy.

DISCUSSION:

Health policy makers have long been concerned with protecting people from the possibility that ill health will lead to catastrophic financial payments and subsequent impoverishment. Yet catastrophic expenditure is not rare (Xu K, 2003). As a first step, we studied the extent of expenditures met by the cancer patients in India, at a public academic tertiary medical institution, which can aid in generating appropriate policy responses.

Economic evaluation using clinical data allows for an understanding of the patient's cost burden and healthcare access. Patients are largely unaware about financial requirements for cancer diagnosis and its treatment, which can consist of direct medical, non-medical, and other indirect costs. Even the medical fraternity has little knowledge about the costs of cancer treatment borne by patients and their families (Warren J, 2008). Cancer therapy consists of three major treatment modalities-surgery, radiotherapy and chemotherapy. It is seen in the global practice that 50%-70% of all cancer patients are in need of radiation therapy. The duration of RT and cost involved during this phase constitutes a major social and economic burden respectively. Although centralization of resources such as radiotherapy facilities is necessary to ensure cost-effective and high-quality care, many patients must travel and incur additional non-direct costs to receive the needed services. This is in addition to the psychological impact of leaving home to for cancer treatment. A Canadian economic survey found that nearly 20% of their rural patients spent $ 1000 in travel-related costs to access cancer care (Mathews M,2009).

The National Cancer Control Programme under the Government of India was launched in 1975-76[10] with the objectives of primary prevention, early detection, treatment and rehabilitation. In order to cater to the changing needs of the disease, the programme has undergone three revisions with the third revision in December 2004. Under the revised programme, the primary focus is on correcting the geographic imbalance in the availability of cancer care facilities across the country. India has a population of approximately 1100 million with a requirement of 1200 radiotherapy machines, whereas presently 400 RT machines are available for cancer treatment. The modern radiotherapy facilities are concentrated in private hospitals where the cost of RT course appear to be prohibitively high and beyond reach of common Indians. A web search on 'cancer treatment costs in India' showed only the price list of one particular corporate hospital group charging between USD 1350 to 2600 for RT course of 4 to 8 weeks (http://www.indiaprofile.com/medical-tourism). A similar equivalent charge converted to Indian rupees would amount to a radiotherapy course costing from Rs.60,000 to 117,000. It is to be highlighted that this cost range does not take into account the costs of other cancer treatments like surgery, chemotherapy, supportive medicines and indirect costs(transport,lodging,food etc.) borne by the

[10] (http://india.gov.in/sectors/health_family/national_cancer.php)

patient. A comparative evaluation for this Indian corporate hospital charge reveals that in USA the radiation therapy course costs between $3496 to $5629 for common cancers, through the fee-for-service Medicare (Warren J,2008). This is to be seen in the context of average monthly household income of approximately $ 4186 for an USA citizen, compared to the Indian household earning of Rs.11666 (http://en.wikipedia.org/wiki/Median_household_income). Our survey of cancer patients at AIIMS showed the mean MPCI of Rs.1835.

Health care delivery in India is getting into a public versus private medical care transition since the 1990s. Nearly three-fourth of all health care costs are borne by patients and their households as out-of-pocket spending(OOPS), more so for the chronic non-communicable diseases like cancer.(R Srinivasan, Healthcare in India, Planning Commission). A recent evaluation by the Planning commission's Deputy Chairman (Montek S Ahluwalia, 2011) places this in the context of GDP growth vis-à-vis individual's affordability, "The extent of reduction in the percentage of the population below the poverty line is clearly a very important indicator of progress. However, many families that are above the poverty line in terms of per capita consumption may lack access to basic services such as education, health, clean drinking water and sanitation. Inclusiveness must obviously include progress in delivery of these essential services."

Drawing on evidence from the past morbidity and health surveys (1986-87 to 2004) and consumer expenditure surveys (1993-94 to 2004-05) of the National Sample Survey Organisation, Selvaraj and Karan(2009) have argued that public provisions of healthcare in India has dwindled to new lows. Outpatient and hospitalization care in public hospitals in India in the past 20 years has declined drastically, leading to the emergence of private care players in a predominant way. While healthcare costs have shot up manifold in private provisioning, government health facilities are increasingly compelling patients to look for private outlets for procuring drugs and diagnostics. Due to these developments, millions of households are incurring catastrophic payments and are being pushed below poverty lines every year.

AIIMS has radiotherapy facilities comparable to the global modern standards. Hence this study carried out by AIIMS and ISI in a major city like Delhi is a reflection of the out-of-pocket spending incurred by a common citizen in a public tertiary cancer centre. The expenditures done by patients before coming to our cancer centre should as well be considered carefully. We have not normalized it for any standard reference period. Given, sometimes a long course of treatment, these are expenses accumulated over several months. We report these costs to highlight that patients may already be much stressed economically when they begin their radiotherapy and other cancer treatments at AIIMS.It is probably even more significant that in spite of the huge amounts of government subsidy at AIIMS, people need to spend Rs. 36,812 for the entire cancer therapy. When we ignore the MPCI of these patients, it is still much lower than the average cost of radiotherapy, just one part of cancer treatment, in a corporate hospital in India at present.

A recent article in India Today, a popular weekly magazine, has reported this as a concern that healthcare is emerging as a branded product in our private hospitals (Datta,D 2011).Even in the developed countries of the world, the high cost of cancer treatment often leads to financial hardships for patients and their families, including those with health insurance. In a 2006 survey in USA, almost a quarter of insured

patients reported using most or all of their savings during treatment, and a similar proportion said their insurance plan paid less than expected for a medical bill. It is a challenge for this century's healthcare system to balance the expanding financial burden of cancer on one side, and the increasing incidence and prevalence of many types of cancer on the other side (Elkin and Bach,2010)

Conclusions:

In this project, the researchers from AIIMS and ISI, Delhi have been handicapped by the non-availability of similar works done on Indian cancer patients. This empirical project, its design, and a prospective evaluation of treatment and related costs borne by the cancer patients can be considered a soundly constructed analysis of economic burden to the patients at a public tertiary cancer centre with comprehensive treatment facilities. The sample size, 432 patients as the base line and 284 patients during a protracted period of a major cancer therapy, should constitute a real world situation of financial implications of cancer care process.

How should we consider this economic survey for its broad policy value? Out of the one million newly diagnosed cancer patients in India every year, approximately 56% are likely to be suitable for curative aim of cancer care, involoving surgery, chemotherapy and radiotherapy. In order to calculate this provision of cancer treatments at the designated regional cancer centres, under the National Cancer Control Programme of the Government of India, an amount of Rs.40,000 for a patient whose MPCI is less than the national average should be a reasonable arrangement between the hospital and its nodal health ministry or funding agency. For treating approximately 1000 patients per year this will involve a sanction of 40 million (four cores) rupees to a cancer centre. It will be a highly justifiable amount for the public good and will initiate the process of proper compliance to cancer care for these patients in India.

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Table.1. Patient and Cancer Profile (n=432 patients)

Patients	Number	Proportion
Male	319	73.84
Female	113	26.16
Cancer type		
Head & Neck	345	79.86
Cervix	45	10.42
Breast	22	5.09
Others	20	4.63

Table.2. Salient Patient Characteristics

Patient Characteristic	Mean	Median	Range
Age (years)	51.78	52	17-81
Education (years)	7.16	8	0-18
Symptoms (months)	10.15	6	0-94

Table.3. Estimation of Cost to patients before the start of Radiotherapy

Expenditure Stage	Mean(IRS)	Median(IRS)	Range(IRS)
Before coming to AIIMS	14,597	4,575	0-372,500
At AIIMS-before start of RT course(total:a,b,c)	14,031	7,153	49-141,650
a. Expenses on Transportation	3,944	2,036	0-100,000
b.Expenses on Food and lodging	1,999	640	0-25,625
c.Medical Expenses	8,088	2,933	0-119,425

Table.4. Comparison of the Surveyed and Not surveyed Patients: for economic burden Estimation during the course of Radiotherapy (2^{nd} phase)

Table.4.a. Treatment modalities planned for these patients (total=432,surveyed=284)

Treatment Plan	Weekly Surveyed	Not Surveyed Weekly(NS)
RT	148	59
S+RT	27	21
CT+RT	93	16
S+RT+CT	16	8
Kolmogorov Smirnov Test for Equality of Distribution; p value = 0.09 : Equality Not Rejected at 5%		

Table.4.b. Average monthly per capita house hold income (MPCI), done at time of first interview at AIIMS

	Mean	**Median**	**Range**
Weekly Surveyed (WS)	1,835	1052	0-25,000
Not Surveyed Weekly (NS)	1,582	908	0-14,666
Studentized 't' Test for Equality of Means. p value= 0.16: Equality Not Rejected at 5%			

Table 5: Average Weekly Expenditure (Rs.)

Treatment Plan:	RT	S+RT	CT+RT	S+RT+CT	All Plans
Total Expenditure	836 (793-878)	1039 (910-1166)	1501 (1376-1627)	1264 (1018-1511)	1062 (1013-1110)
Of which:					
Transport Expenditure	285 (266-303)	347 (267-427)	300 (273-327)	251 (220-282)	292 (277-307)
Food & Lodging Expenditure	281 (254-308)	412 (319-504)	420 (357-483)	338 (248-428)	334 (308-359)
Medical Expenditure	270 (243-296)	280 (213-346)	781 (677-885)	675 (488-863)	436 (399-473)

(95% confidence interval in parentheses)

Figure 1. Graphical representation (bar-chart) of the weekly costs during the radiotherapy course at AIIMS: total and expenditure-head-wise for different treatment plans