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# A STUDY ON THE DETERMINANTS OF INDIRECT EXPENDITURE ON CANCER TREATMENT AMONG THE POOR IN COIMBATORE: A LOGISTIC REGRESSION APPROACH

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***Abstract***

*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. Cancer is one such disease, where it is the second most common cause of morbidity and mortality in the world today after cardiovascular problems. In India cancer is a leading cause of death with about 1.5 to 2 million cases at anytime to which 7 lack new cases are added every year with 3 lakhs deaths. It is clear that most cancer patients in India reel under the pressure of expensive treatment. The very diagnosis of this incurable disease spells worries for a cancer patient's family. Although the Indian government does provide free / subsidized treatment at the cancer centres, a patient has to go for expensive advanced-level treatment to increase his chances of survival. The nature of the problem and the required variables naturally call for a micro-level empirical investigation, especially with cancer subjects who are going to government hospital for treatment i.e., Coimbatore, as units of analysis. Therefore, it was decided to conduct this study in an urban setting of Tamil Nadu state, India. No published studies are available about the city ever before regarding the current topic. 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. Therefore, it is important to study the cost of cancer treatment for the patients so that advance measure may be taken to control this havoc in near future. In view of these facts, attempts have been made to study the cost of treatment, source of payment and the problems of insurance. In this background the study aims to analyze the total indirect expenditure spent by the cancer patients for their treatment in Coimbatore.*

***Keywords:*** *health policy, health care, Cancer, financial burden, insurance, economic cost analysis*

## Introduction

Health of the people is really the foundation upon which all their happiness and all their powers as a state depend. Low income, poverty and illiteracy prevent many people in developing countries to neglect giving due importance to the primitive and preventive aspects of health care. Where health plays important role in human's life and a person can

be more healthy if only he is far from the poverty, World Health Assembly, UN Secretary General Kofi Annan in his 2001 address pointed out that "The biggest enemy of health in the developing world is poverty". Globally, there is a stark relationship between poverty and poor health: Poverty creates hunger, which in turn leaves people vulnerable to disease. Poverty denies people access to reliable health services and affordable medicines, and causes children to miss out on routine vaccinations. Poverty creates illiteracy, leaving people poorly informed about health risks and forced into dangerous jobs that harm their health.

**Cancer in India**

The problem of cancer is universal; the only variation occurs in types, site or other clinic epidemiologic parameters. Cancer is the second most common cause of morbidity and mortality in the world today after cardiovascular problems. Six million people die due to cancer every year. It is estimated that by 2020 there will be 15 million new cases every year. Cancer is one of the most serious diseases that can affect a person. With over 200 different types of cancer that can occur within the human body, there are numerous treatment options available. There are numerous treatments available for cancer patients, depending largely on the location, scope and severity of the cancer, as well as on the overall health of the patient (w*ww*.cancer.gov). In India cancer is a leading cause of death with about 1.5 to 2 million cases at anytime to which 7 lack new cases are added every year with 3 lakhs deaths. Over 15 lakhs patients require facilities for diagnosis and treatment. Studies by WHO show that by 2026 with the expected increase in life expectancy, cancer burden in India will increase to about 14 lakhs cases (R.Srinivasan, 2010).

The treatment of the commonest form of cancer in India - head and neck cancer - usually costs between Rs. 15,000-20,000 a month in government hospitals. A study, conducted in 2006-07 by the All India Institute of Medical Sciences *(*AIIMS) which is super speciality government hospital in India, aimed at estimating the costs of treatment borne by cancer patients and family during the course of radiotherapy found that the average cost across all treatment plans is Rs. 1,062 per week. Patients end up paying around Rs 8184/ for a seven-week course in radiotherapy; as much as 59 per cent of this is spent on transportation and food and lodging. The average economic burden to a patient being treated at AIIMS amounted to Rs. 14,031 (before start of radiotherapy), add to that Rs. 8,184 totaling up to Rs. 22,215/-. If the average expenditure of Rs. 14,597 made before coming to AIIMs is added, an average cancer patient surveyed in the study would have to bear an economic burden of Rs. 36,812 for the entire cancer therapy course (which is equivalent to US $ 669 considering 1 US$=INR 55/-) (Mohanti et al., 2011).

**Statement of the Problem and Need For the Study**

Cancer is perhaps the most progressive and devastating disease posing a threat of mortality to the entire world despite significant advances in medical technology for is diagnosis and treatment. The impact of cancer is far greater than mere numbers. Its diagnosis causes immense emotional trauma and its treatment, a major economical burden, especially in a developing country like India. India is growing with a good progress rate and probably will become a developed country within few years resulting into its participation in the world development. 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). Recent times have seen an increase in the incidence of cancer. This is mainly attributed to urbanization, industrialization, lifestyle changes, population growth and increased life span (in turn leading to an increase in the elderly population).

It is clear that most cancer patients in India reel under the pressure of expensive treatment. The very diagnosis of this incurable disease spells worries for a cancer patient's family. The government's efforts are to provide health facilities at the various levels in public hospitals of the area though free of cost and managed by trained professionals has however, not lead to desired level of use of the services. Primary health care services are greatly underutilized, despite repeated efforts by the government to improve these services. Lack of voice and accountability, government ineffectiveness, low level of regulatory quality, weakness in establishing rule of law, lack of transparency, mismanagement, lack of adequate human and financial resources, and, corruption all are impediments to good services in health care sector focusing in the area under study.

The initial diagnosis of cancer is perceived by many patients as a grave event, with more than one-third of them suffering from anxiety and depression. Cancer is equally distressing for the family as well. It could greatly affect both the family's daily functioning and economic situation. The economic shock often includes both the loss of income and the increase of expenses because of the treatment and health care. This disease is associated with a lot of fear and despair in the country. It is hard to imagine the impact of cancer on patients of our country where insurance policies exist infrequently and often cost becomes the greatest barrier in availing cancer treatment. These costs include the direct cost of disease treatment and care, indirect costs accrued by the patient and family, and economic losses to the society as a whole (Sharma et al., 2009). The results of the present research will be valuable as they can be utilized by the individual patient, his or her family caregivers, health care providers and policy makers.

So far, there are neither published studies on the economic burden of Cancer treatment for the poor people in Coimbatore, nor on the socio-economic factors that influence it. In the absence of adequate public health programmes to effectively deal with this problem,

estimates of cost, however imprecise, will help conceptualize strategies to deal with the situation at local, regional and national level. This information is also useful to the individual. Hence, it is felt necessary to analyze the cost and source of finance for treatment of the Cancer patients in Coimbatore City. It has been felt as pertinent to study the expenditure incurred and health insurance among the poor cancer patients in an urban city, of Tamilnadu, i.e., Coimbatore. The nature of the problem and the required variables naturally call for a micro level empirical investigation, especially with cancer subjects who are going to government hospital for treatment i.e., Coimbatore, as units of analysis. Therefore, it was decided to conduct this study in an urban setting of Tamil Nadu state, India. No published studies are available about the city ever before regarding the current topic. 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. Therefore, it is important to study the cost of cancer treatment for the patients so that advance measure may be taken to control this havoc in near future. In vie*w* of these facts, attempts have been made to study the cost of treatment, source of payment and the problems of insurance. (http://*www*.cancercaremission.org). In this background the study aims to analyze the total indirect expenditure spent by the cancer patients for their treatment in Coimbatore.

**Data Sources and Methodology**

This study is designed to capture the costs borne by the cancer patients and family of government hospitals in Coimbatore city during the course of treatment, which can reflect a major portion of economic cost analysis for cancer care. The data has been collected on a temporal basis on expenditures done by these patients, in order to have a comprehensive understanding about the economic burden of cancer at its initial phase of cancer diagnosis and therapy. To the best of the Researchers knowledge and literature search, this study is the first of its kind reporting the expenditure incurred by the poor cancer patients in government hospitals of Coimbatore city. The outcomes of the study can be utilized for different purposes:

- To inform further improvements in delivery of cancer care through public hospitals and regional cancer centers,
- To evaluate the provision of financial support to cancer patients and
- To increase the compliance to curative cancer therapy by informing the likely costs to patients, their families, health institutions and the public health administrator.

The Researchers measured this in terms of burden on the economic resources of the household as they deal with the disease and its treatment. Also this study looked at various issues, which indirectly may have financial effects on cancer patients. The basic unit of

economic burden analysis of this study is the cancer patient who has taken treatment in a government hospital. This study includes patients on all such different treatment plans. However, this study concentrated only on patients whose treatment goal is curative.

The economic cost assessment have been done from the patient or a family career 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 after getting their consent. The Researchers has also explained the patients and family carers about the type of data required from them, and how the questionnaire will be filled up. Since cancer is one of the most important causes of morbidity and the magnitude of the problem is gigantic, it's burden on the economy for providing health care will be substantial. For the treatment of cancer patients, hospitals, beds, sophisticated equipment, machinery, drugs and other health care facilities such as trained nurses, oncologists, large number of hospital days are required. In addition to this, the indirect costs such as loss due to premature deaths, loss due to hindrance of productivity, economic dependence, etc, cannot be quantified. Hence, due to time and financial constrains, the Researchers tried to collect the major out-of-pocket expenditures incurred by the sample patients during the course of cancer therapy- i.e. transport to and from the government hospital, boarding, food, whether they incurred loss of household income and other expenditures.

**a) Area of the Study**

Coimbatore, the second largest city of the state, is one of the most industrialized cities in Tamil Nadu, known as the textile capital of south India or the Manchester of the South. Among all the districts of Tamil Nadu, Coimbatore district is one of the most affluent and industrially advanced districts of the State. Fast pace of industrial, spiraling population and the increase in the health awareness had led to the growth of the Health Care industry in Coimbatore. It has been reported that the city stands second to Chennai in Tamil Nadu for highly affordable and quality Health Care delivery of International Standards. At the same time, there has been a need for getting an insight into the Health Care Services in the urban Coimbatore. Generally, it is assumed that people in Urban A**reas** are well covered by health services saturated with large hospitals, innumerable dispensaries, nursing homes, specialists and general practitioners.

In the Regional Cancer Center (RCC) of Coimbatore Medical College Hospital, (CMCH) a large number of cervical cancer patients from rural areas, who developed the problem due to lack of hygiene, were treated. The main reason for cancer cases, reported was as ignorance about a healthy lifestyle and diet besides not realising the need for regular health check-ups. Only around 10 per cent of patients came at a stage early enough to be cured. A majority of the cancer cases being treated by Coimbatore Medical College Hospital's Regional Cancer Centre (RCC) are found to have been caused by tobacco

products such as cigarettes, pan masala and ghutka. Lung, head and neck cancers, all of which are caused by tobacco use, constitute nearly one-third of all cases treated at the Rs. 15 crore-centre, which became operational from September, 2013. (R.Sairam, The Hindu, 2013).

**b) Data Collection Process**

In order to select representative cancer population receiving treatment in Coimbatore city, it was felt an empirical enquiry would be apt. However, due to time and resource constraints the area of coverage had been restricted to Coimbatore city as it had all the necessary characteristics for conducting a study of this kind. The sample cancer patients were drawn from government hospitals in Coimbatore city in Tamil Nadu State. For this study the final sample is 250 respondents.

**c) Analysis of Data**

The surveyed data were manually edited, coded and then, entered into SPSS spreadsheets. *A*fter verification, the preliminary analysis of data had been carried out on the basis of frequency distributions and cross-tabulations., and the statistics such as the percentage, and Logistic Regression Techniques were used.

**Determinants of Total Indirect Expenditure on Cancer**

In order to find out the principal determinants of respondents' total indirect expenditure on cancer, in this section, an attempt is made to apply a multivariate technique. For this purpose, the total direct expenditure on cancer has been considered as dependent variable, which is dichotomous in nature, viz., total indirect expenditure on cancer is fairly high (assigned a score of 1) and total indirect expenditure on cancer is comparatively low (assigned a score of 0) and all the independent variables are treated as categories. In such a situation, adopting the logistic regression analysis is more appropriate. The results based on this analysis are presented in Table 1.

**Table 1 Logistic Regression Results on Respondents' Total Indirect Expenditure on Cancer**

| Explanatory Variables | Beta | Odds Ratio | Level of Sig. |
|---|---|---|---|
| **Gender** | | | |
| *M*ales | **--** | 1.000 | **--** |
| Females | 0.353 | 0.543 | 0.461 |
| **Current Age** | | | |
| 45 Years or Less | -- | 1.000 | -- |
| 46 – 60 | 0.918 | 1.561 | 0.211 |
| 61+ | 1.607 | 5.965 | 0.015 |

| Explanatory Variables | Beta | Odds Ratio | Level of Sig. |
|---|---|---|---|
| **Social Background** | | | |
| Ref: SC/ST | -- | 1.000 | -- |
| MBC | 0.012 | 0.001 | 0.979 |
| BC/FC | 0.238 | 0.245 | 0.620 |
| **Educational Status** | | | |
| Illiterates | -- | 1.000 | -- |
| Primary/Middle School | 2.086 | 8.326 | 0.004 |
| Secondary School and above | 2.519 | 10.577 | 0.001 |
| **Occupational Status** | | | |
| Not-working / Students | -- | 1.000 | -- |
| Agricultural Activity | -5.546 | 19.871 | 0.001 |
| Household Industry / Trade / Business | -1.724 | 8.583 | 0.003 |
| Job in Organized Sector / Professionals | -1.724 | 6.820 | 0.009 |
| **Total Family Income** | | | |
| Rs. 10,000 and Less | -- | 1.000 | -- |
| 10,001 – 14,000 | -0.311 | 0.173 | 0.677 |
| 14,001 – 18,000 | -0.546 | 1.806 | 0.271 |
| 18,001+ | 0.285 | 0.206 | 0.369 |
| **Assests** | | | |
| Rs. 300000 or less | -- | 1.000 | -- |
| 300001 – 500000 | -2.705 | 10.800 | 0.001 |
| 500001 – 700000 | -1.077 | 3.511 | 0.061 |
| 700001 + | -0.464 | 0.782 | 0.377 |
| **Nativity Status** | | | |
| Rural | -- | 1.000 | -- |
| Urban | -0.635 | 1.939 | 0.164 |
| **Family Size** | | | |
| Below 3 | -- | 1.000 | -- |
| 4 | 0.545 | 0.567 | 0.452 |
| 5+ | -0.406 | 0.839 | 0.360 |
| -2 Log likelihood | | 211.250 | |
| Chi-square(d.f.) | | 23.099(8) | |
| Significance Level | | 0.003 | |
| N | | 250 | |
| Cox & Snell R-Square (%) | | 0.416 | |
| Nagelkerke R-Square (%) | | 0.555 | |

Among the sample respondents, it is pertinent to note that, controlling for all the variables used in the model, the odds of spending high indirect expenditure for cancer are 10.8 times and 3.5 times higher among those who hold assets worth of Rs.3,00,000 - 5,00,000 and Rs. 5,00,000 - 7, 00, 000, respectively as compared to those who own the asset worth of less than or equal to 300000, and the significant 'p' value requests the same, on the contrary, even though the respondents who hold higher asset worth of Rs. 700000 and above spend lesser than the other two categories, due to the insignificant 'p' value we cannot arrive any conclusion based on this category. It is also striking to note that such higher odds are also found in the case of those respondents who are engaged in agricultural activities (19.8 times), household industry/ trade / business (8.5 times) and employment in organized sector / professionals (6.5 times) as against to those who are not-working / students. Here too, the t-test results have been turned out as highly significant ($p<0.001$, $p < 0.005$ and $p< 0.009$ respectively). These findings evidently support that, the economic factors are playing a crucial role in determining the high indirect expenditure for cancer. Thus, though the respondents are from Government Hospital wherein the direct expenditure is mostly free, depending upon their economic background, the capacity to spend is appears to be high among those respondents who are working in different income generating avenues and also among those possessing large sums of assets. The role of education on the amount of indirect expenditure for cancer appears to be varied. For instance, while the probability of spending high amount of indirect expenditure is higher among those who have completed secondary school and above as against their illiterate counterparts, this unexpected attribute another respondents is spending may be due to the reason of better treatment and to find an apt service provider to marginally reduce the direct expenditure on cancer treatment. Similarly, the likelihood of respondents who spend large indirect expenditures on cancer is higher and significant. among those who are above 61 years as compared to their counterparts who are in the ages of 45 years and less. Among the other variables used in the model, the independent effects of different categories pertaining to respondents' gender, social background, total family income, nativity and family size on the total sum of indirect expenditure for cancer exhibited neither consistent nor significant.

**Conclusion**

Cancer incidence is increasing, owing to a mix of risk factors such as changes in diet and life style, the legacy of high tobacco consumption along with population aging with cancer being more common in older populations (Popkin et.al 2001 and Murthy et.al 2008). The current findings provide much better understanding of economic burden of cancer on the poor patients in Coimbatore city. To our knowledge, this is the first study to estimate the burden of cancer in the government hospital of Coimbatore city). The current research analyses the prevalence, causes, cost and source of treating the cance disease. The Researchers synthesizes knowledge from various research studies and conducted his own

survey in the government hospitals in Coimbatore city. After the results were analysed based on collected facts and figures. In the current research, it was found that compared with the general population, the rates for certain diseases, including some types of cancer; appear to be higher among agricultural workers, most human societies have moved from agrarian diets to fast foods and active lives to sedentary habits. This fact is again confirmed that most of the sample patients of the current research are not inclined to do proper physical exercises not even to adapt regular walking and The unscrupulous addiction to the evil habits like tobacco, smoking, alcohol etc not only made the healthy weak, but also more prone to cancer disease, It is evident from the collected data and analysis that cancer is one of the expensive health problems in the city. In addition to the direct medical cost, the non medical expenditures such as food, transport and appliances were also added. These additional costs are even greater than all the other costs combined and have a direct consequence on the complications and disabilities resulting from mismanaged cancer disease. It is also recommended that an individual has to exercise daily with good diet foods to maintain good health and financially to be untroubled health insurance and there is an immediate need to reform the public sector healthcare system. Programmes initiated by governments must be regularly monitored for efficiency and quality. There is a need to plug financial leakages and wastages to improve the efficiency of public sector healthcare as well as there is also a need to improve the issues of doctor absenteeism, lack of storage facilities for drugs, attitudes of hospital staff, etc.

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