Cost-benefit analysis in patients with cancer (esophagus, gastric) in North Khorasan Province

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Abstract

The word cancer is derived from the Latin word carcinoma, means crab and refers to a malignant tumor that is caused by abnormal growth of a cell or group of cells. Since the operating time of manpower is a major investment for community, time lost due to premature death or non-fatal consequences of illnesses, and various events and accidents have become as the most important criterion to measure the health level. The present study is experimental and in terms of the nature and method is descriptive-survey. A sample of patients with gastric and esophageal cancer was studied in North Khorasan in 2012 and 2013. In this study, the methods of descriptive statistics such as frequency distribution tables, percentage and mean, standard deviation, minimum and maximum values and quartiles were used to evaluate and compare the data collected from the medical documents and also in inferential statistic sector (according to the confirmed data normality), the independent two-sample t-test was used. In this regard, factors affecting the cost-benefit such as the medical expenses, indirect costs of treatment, average financial interests after treatment, support of contracting organizations and assessment of treatment costs for early detection were examined in this study. As it was predicted, records of patients with cancer have been responsible for all the research hypotheses All hypotheses were confirmed by the difference in the amount of costs and among these factors, early prevention and timely diagnosis were very helpful in improvement of patients and had very low cost for the patient and the Department of Health. Furthermore, financial support of insurances is relatively low that the enhancement of heavy costs for patients in addition to the tolerance of disease leading to the stopping continued treatment.

Keywords: esophagus and gastric cancer, prevention, patients, North Khorasan, cost-benefit analysis

Introduction

In countries with higher health level, people live longer, and consequently will have more economic activity. Measurement of outcomes and efficiency of health sector should be done with specific management. Themes such as prevention of diseases and deaths through vaccinations, relieving pain, chemotherapy and relieving cancer patients, neurotropic and psychiatric patients' treatment which are the special issues of health and care, should be paid greater attention in terms of efficiency. On the other hand, many planning decisions depend on the choice of possible alternative plan to achieve the goals. Undoubteldy, the health is the rights of all human beings that have been accepted as indisputable fact. In this regard, the provision of health care services with reliance on the existed experiences and followed by extensive planning, prepare the system of health care networks as the organizational forms to provide the health care services. Proper planning, timely investment, strong management, fortitude and devotion of health personnel and adequate support will follow the significant improvement of health indicators; therefore, these question have always been on the minds of managers and designers "How much is the true cost of each health care unit?", "What are the cheap and expensive services?", "How expensive services can be offered cheap without reducing their quality?", "How

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can we increase the efficiency of services by keeping fix the cost?". Every year, twelve million people are beinh afflicted by cancer in the world. Statistics show that every year seven million and five hundred thousand people are losing their lives from the disease. Now, cancer is the first cause of death in the world. Reducing alcohol consumption, smoke free and lack of exposure to sunlight are known as the ways to fight cancer. Cancer is about three times higher in men than women. Cost - Benefit Analysis is a method for assessing the relative merits of investment projects in terms of efficient and optimal allocation of resources. Cost - Benefit Analysis aims to improve the efficiency of resources towards the economic welfare. In other words, the purpose of the assessment is to help the selection of the best decision toward the optimal and desired use of resources (Weick, 1993, p 3). Cost analysis in the health sector is done from two aspects of macro and micro-economy.

Macro-economy is used in planning of health and care and microeconomic is used for management of organizations and enterprises of health and care services. Calculating and estimating the total cost of the health sector has very importance from the perspective of health planning and policymaking. In advanced countries, the total health services' costs are separately estimated for the private sector and government departments. Therefore, proper planning requires that the health costs in terms of financial and physical resources and types of available services to be analyzed in each geographical region. Such analysis provides the development of existed health resources and seeking ways to improve resources. It should be determined that who is responsible for health facilities and advantages, how much should be spent for controlling these facilities, how is the coordination rate of health plans with overall national development plan and finally, to what extent the payment of Health care costs can solve the problem of "poverty".

One of gastrointestinal tract's members that has been less emphasized, but today its importance has been detected more is Esophagus. Muscular tube that conveys food to the stomach in a highly specialized form, occurrence of smallest irregularity in the movement of the esophagus, causing disorder in passage of food and finally leads to malnutrition (Doctor Hooman Khalili, Weekly Health). Golestan province is the poles of esophageal cancer in world, if esophageal cancer is not quickly de-

tected and controlled in the stages of the tube and expands to the lungs and liver,it becomes very dangerous. Based on the investigations that have been done in the Turkmen region of the Golestan province, which is one of the common areas suffers from esophageal cancer, it was found that drinking hot liquids like tea increases the risk of esophageal cancer catching. Therefore, trying to drink lukewarm liquid until the hot consumption does not cause cancer (Keshavarz, specialist in nutrition and diet therapy). Esophageal cancer is the main cancer that is caused by eating burnt food. Alcohol, drinking hot tea, cigarettes, pot bottom, brown or dark meat, genetic background, kinds of sweets, desserts, salt, pickles and soft drinks increase the risk of esophageal cancer. In progression stage of this disease about 75% of individuals swallow food hardly and 35% of patients with cancer in northern Khorasan suffered from esophageal and gastric cancer which is the most common and the first type of cancer in this province (Hariri, managing director of Support Association of Cancer patients in northern Khorasan, February, 2012). According to the identified medical researches, the prevention of this type of cancer is the most important factor and so, it has important impact on cost and benefit for individuals and country that the majority of patients due to low financial ability are not able to treat it in the early stages. Therefore, individual's illness is intensified and led to the rapid progress and the government has to import drugs to treat patients and finally, drugs with high prices impose the drug subsidy on government and consequently, very high costs. Discussion of cost benefit analysis of patients will help to the medical community and insurance contract until the tolerance of high costs cannnot be effective.

Although "the evaluation of economic projects" or "Engineering Economy" is closely related to conventional microeconomic , it should be said thatit has its own independent history and profile. Economic evaluation of the project was first proposed in 1884 by Julius Dopoye French, but the practical use of Cost - Benefit Analysis with evaluation of relevant projects to the water resources development have started in the U.S. in 1930 (Pakzad, Evaluation of Industrial Projects).

When cells in a part of the body begin to grow out of control, they can cause cancer. Cancer is the third factor of death in Iran that the gastric cancer is considered as the most deadly. Prevalence of this

disease in men is two times more than women and is the fourth most common cancer in the world. Gastric cancer is the most common cancer in men after lung cancer, while the breast cancer is the most common cancer in women.

Cost-Benefit Analysis is a method to evaluate the relative merits of investment projects in terms of optimal and efficient allocation of resources. Cost-Benefit Analysis aims to improve the efficiency of resources toward economic prosperity. In other words, the objective of assessments is to help the selection of the best decisions toward optimal use of resources (Weick, 1993,p.3) Doupi introduced the theoretical basis of cost - benefit in 1844. He used the concept of consumer surplus. Since that date onwards, Cost - Benefit Analysis has played a vital role in economic welfare (Verker et al, 2002, p 30). The first practical application of Cost - Benefit Analysis refers to 1930 and Water Resources Development of American States (Pakzad, 1993, p. 54). There are various definitions of cost - benefit analysis method. According to Bourdman, Cost - Benefit Analysis is a scale to measure. Therefore, the entire positive values (the cash flow and benefits) on one side and the scales and all negative values (expenses and losses) are placed on the other side of the scale. Cost - Benefit Analysis is a method for finding the entire costs and benefits of a plan to assist them,so that the difference between these two represents the cost-effectiveness of active decision making. In advanced countries, due to the lack of financial resources, allocating it in the best alternative investments is vital (Khalili, 1995, p. 63). Cost - Benefit Analysis of economic projects in countries such as Iran,which relies solely on the exchange revenues earned from sale of oil, according to the conditions, its domination on developments of energy in global has particular importance (Noori Naeini, 1986, p 27). This method is also used for decision-making in public policy and social benefits and costs. In the United States of America, Environmental Protection Agency regularly uses Cost - Benefit Analysis in the decision-making process. For example, the pollution level in cities of Los Angeles and California indicates the enhancement of total benefits of pollution abatement from the calculated costs. Also, the policies adopted in this area has successfully been influenced by these findings (Comics 7 et al, 1999, p. 4).

The main problem of Cost - Benefit Analysis refers to the government intervention in the economy. Subsidies, taxes, trade barriers, protectionist policies are some of disruptive factors of the normal market mechanism. However, accuracy of data and statistic in cost - benefit analysis is doubtful because the accurate assessment is impossible. Therefore, evaluating all direct and indirect impacts of infrastructure projects on long time horizon is hard. For example, long-term impacts of infrastructure projects on the ecological issues are not measurable completely (Verker et al, 2002, p. 30).

Another cost-benefit issue refers to the difficulty of re-calculating the costs and benefits in some cases (Watkins, 2008, p. 4). Another problem is the quantification of many intangibles variables with more weight (in some cases) towards the tangible variables. This subject has a large extent impact on the evaluation of results. On the other hand, some of critics to CBA method are related to the use of long-term market interest rate as the discount rate because founded rates based on the market transactions are not suitable for non-market options. Cost - Benefit Analysis has some other restrictions too that are as inseparable issues in assessment of projects. Gaps and uncertainties in access to statistics and information, errors of prediction and selection of the inappropriate discount rates, are the source of error creating in evaluation. However, problems such as inappropriate technology, supportive and structural systems, executive problems and ecological policies also are other restrictions of Cost - Benefit Analysis (Weick, 1993, pp. 4).

Research background in Iran

Many studies have not been done in this regard, but a lot of researches have been conducted abroad, which can be pointed as follows:

By investigating the direct treatment and non-treatment costs of cancer patients who were hospitalized in Cancer Center of Tehran's Imam Khomeini Hospital in 2010, it was concluded that the new policies in relation to covering heavy costs of cancer patients especially by insurance organizations, banks, charities, proper distribution of specialized cancer centers with providing accommodation for patients who come from city, in addition to achieving the indicators of Health Equity, can reduce financial barriers facing cancer patients and helps them to manage their disease better.

The Analysis of willingness to pay for screening of breast cancer through mammography using a Clauses Valuation Method (CVM) in 2010 concluded that if the mammography's cost for any person to be less than 300 thousand riyals, screening is

economically justified by mammography. A person who allocates more funding to a service with goods has more desire to pay for screening with mammography.

Naghvi and Jamshidi in a part of their research entitled "health services benefit in Islamic Republic" which was conducted in 2002 have investigated the occurrence rate of heavy costs of treatment care and outpatient in country and concluded that, about 1.9% of population bear the heavy costs because of hospitalization during 2002 and have fallen under poverty.

In another study which was conducted in 2002 by Semnani and Keshtkar entitled " estimating the fairness of health service costs by the population research center in Gorgan region" researchers sought to determine the pattern of income distribution in urban households of mentioned population, the distribution of health costs in separation of cost's main items and measuring the fairness amount of these costs in different deciles of population income. Results of their study showed that low-income households spent 40% of their meager income to health costs while this ratio is about 90 for affluent households. Also, despite of the increased coverage of insurance organizations, supplementary insurance, still more than half of the health services cost is paid directly from the pocket. Finally, these two researchers expressed that according to World Health Organization standards, it is essential to revise the status of health insurance and payment systems in the country.

Karami et al have conducted a study in 2009 entitled "catastrophic health service costs in Kermanshah province" with the aim of measuring the amount and also the distribution of these costs. This research results showed that 22.2% of surveyed households hadconfronted to the catastrophic costs that 11.9% of households were woman-headed, 40.5% of households had children under 12 age, 266.2% of households had members more than 60 age and 9.5% of households had members with chronic disease. In addition to the financial burden imposed by the disease, 21.4% of households have sold their jewelries; 16.7% of households have spent their savings and 47.6% were forced to borrow.

Research background in other countries

Cost-benefit analysis of screening for esophageal cancer, endoscopy in high-risk areas of China, the results of alternative therapies for early cancer management and a recommendation to Chinese government to establish the rural and urban family physician in 2005 for early detection and initial treatment program were regarded to reduce healthcare and non-healthcare costs of patients and assist government in the early detection in the area of buying expensive drugs.

Costs-Benefits Analysis of the prostate cancer in America due to the high cost of oncology physicians has guided physicians to understand the costs of prostate cancer. Assessment of economic health well designed and expression of view clearly studied and competing interventions are examined and promote the performance of long-IMRT is more affordable than alternative treatments such as radiation of radical surgery.

In another study entitled "Heavy payment of health service and health insurance: Unexpected evidence from a low-income country" was conducted by Ekmander 2007. The researcher through a questionnaire derived from the Demographic Health Studies relevant to the Statistical Bureau of Zambia has tried to measure the impact rate of insurance programs on incidence of health services' heavy costs by the use of a logistic model. He finally reached to this conclusion that the insurance programs in Zambia had no effect on prevention of the occurrence of health services' heavy costs and this is caused by several key factors including issues relevant to the quality assurance and supervision on services providing.

Su, Koviat and Flsa in another study entitled "The heavy costs of household for receiving health service in a population with low-income: study the Nona area in Burkina Faso" by using information and data obtained from population health studies as well as the data related to 800 households during the period of 2000-2001, that were selected by cluster sampling, estimated a multi-variable model of Hir-grsionil Jestek. They concluded that, 6-15% of all households living in the area of Nona have encountered to the heavy costs of health service that its determinant key factors were the disease occurrence in the household's adult members and existence of the members with chronic diseases.

Methodology

Research hypotheses

How much is the average medical expenses of esophageal and gastric cancer patients in Northern Khorasan province?

How much is the average non-medical expenses

of cancer patients (esophagus, gastric) in Northern Khorasan province?

How much is the average financial interests after treatment of cancer patients (esophagus and gastric) in Northern Khorasan province?

The medical expenses of cancer patients (esophagus and gastric) that have been detected early to what extent is less than the medical expenses of patients who have been detected late in Northern Khorasan province.

How much of direct medical expenses of patients with cancer (esophagus and gastric) is financially provided by supporting individuals and organizations in Northern Khorasan province.

The Statistical Population and Methods

The statistical population of this study were the esophagus and gastric cancer patients of the northern Khorasan province. In the present study, the existed medical records and documents are used to collect data in framework of field method, which are secondary,based on the data used in the research . All files of years 2012 and 2013 were investigated and costs were spent by patients and hospital were extracted from patients' file and were separately designed based on the name and last name, gender, referring year, the amount spent, the final result of the treatment and the disease type Finally, the statistical calculations were done for data analysis.

In this study, the descriptive statistical methods such as frequency distribution tables, percent and mean, standard deviation, minimum and maximum amount and quartiles were used to investigate and compare the collected data through the questionnaire and also in inferential statistic sector (according to the confirmed data normality), the independent two-sample t-test was used.

The present study in terms of purpose is applied and in terms of the nature and method is descriptive-survey. Considering that the aim of the present study is to analyze the cost-benefit of esophageal and gastric cancer patients of northern Khorasan through the medical documents and records. Therefore, it can be said that the present research's method is descriptive-survey. In this study, by examining all medical documents of cancer patients, in the first stage, the esophageal and gastric files were separately specified in 2012 and 2013 and given that, the Imam Reza (AS) Hospital of Bojnurd city is the center of cancer diseases and just takes care of cancer patients. Therefore, based on the conducted studies the number of files were identified during the 2012 and 2013. In the second stage, the

patient's age was identified in presentation and cancer detection time. Then, the existed costs based on the drugs type and performed services were collected and the total cost of a patient was obtained during the treatment and the cost of a treatment period was calculated in private sector for the same person based on the public total cost and the tariffs of private sector. In the third step, the amount of contracted insurance protection during the period was calculated and the contribution amount of base insurance was determined for each patient. Finally, the result of patient to continue treatment or death or improvement was determined and non- therapeutic costs was specified and calculated according to the service city and number of referring for travel rent and relevant costs. Investigating the cost benefit of cancer patients is proposed as the main axis of study. Accordingly, the topic of this study is formed in relation to these patients who are the most influential groups that can be considered as the cost-benefit analysis. In this regard, the factors affecting the cost-benefit, such as medical expenses, non-medical expenses, the average financial interests after treatment, advocacy of contracted organizations, review of the treatment costs for early detection, prevention and culture influences, etc were investigated and evaluated in this study.

Results

How much is the average medical expenses of esophageal and gastric cancer patients in northern Khorasan province?

As table 1 shows, the average medical expenses (public sector) in patients with esophagus and gastric cancer are 83940451 with standard deviation of 41030626 in northern Khorasan. The minimum medical expenses (public sector) in patients with esophagus and gastric cancer are 2,821,000. The maximum medical expenses (public sector) in patients with esophagus and gastric cancer are 139,142,500 in province.

How much is the average non- medical expenses of cancer patients (esophagus, gastric) in northern Khorasan province?

According to table 2, the average non-medical expenses for patients with esophagus and gastric cancer are 3650967 with standard deviation of 2116460 in northern Khorasan province. The minimum non-medical expenses of patients with esophagus and gastric cancer are 400000 in province. The maximum non-medical expenses of patients with esophagus and gastric cancer are 6380000 in province.

Table 1. The statistics related to the medical expenses (public sector) cancer patients

	Mean	SD	Minimum	Maximum
Amount	2821000	41030626	83940451	139142500
	number	First quartile	Second quartile	Third quartile
Amount	93	54481250	105241500	113331250

Table 2. The statistics related to the non-medical expenses of cancer patients.

	Mean	SD	Minimum	Maximum
Amount	3650967	21164606	400000	6380000
	number	First quartile	Second quartile	Third quartile
Amount	93	1290000	4120000	5560000

How much is the average financial interests after treatment of cancer patients (esophagus and gastric) in northern Khorasan province?

As discussed, the financial interests after treatment are the comparison of medical expenses of those improved with medical expenses of all cancer patients. So, the average financial interests after treatment was obtained by the comparison of average medical expenses of those improved with the average medical expenses of all patients.

The independent two-sample T-test was used for analysis:

Table 3. The comparison of medical expenses of improved cancer patients with total patients (public)

	Number	Scores' mean	SD
Total patients	93	83940451	41030626
Those improved	5	8697600	4742875

Table 4.Statistical indicators of independent two-sample t-test about the average financial interests after treatment

Utilized test	Difference in mean	Calculated T	Degrees of freedom	Significant level
Independent Samples Test	75242851	4.079	96	0.000

The average medical expenses (public sector) of all patients with esophagus and gastric cancer was in Northern Khorasan province is more than the average medical expenses of those cancer patients that

have been detected early because as it can be seen in the above table, the significant level for the relevant test (0.000) is smaller than 0.05. Therefore, the average financial interests after treatment of patients with esophagus and gastric cancer (public sector) were 75242851 in Northern Khorasan province.

The medical expenses of cancer patients (esophagus and gastric) that were detected early to what extent is less than the medical expenses of patients who were detected late in Northern Khorasan province.

The independent two-sample T-test was used for analysis:

Table 5. Comparison of medical expenses in early detection and late detection state

	Number	Scores' mean	SD
late detection (death)	23	55078195	43915182
early detection	5	8697600	4742875

Table 6. Statistical indicators of independent two-sample t-test about research's third hypothesis.

test	Mean difference	Calculated T	df	P
Independent Samples Test	46380595	2.324	26	0.028

The average medical expenses of those cancer patients (esophagus and gastric) that were detected early is less than the patients who were detected late in Northern Khorasan province. As it is clear

from the above table, the significance level for the relevant test (0.028) is smaller than 0.05. Therefore, based on the obtained statistics, it can be concluded that the medical expenses of those cancer patients (esophagus and gastric) that were detected early is about 46380595, which is less than the patients'

expense who were detected late in Northern Khorasan province.

How much of direct medical expenses of cancer patients (esophagus and gastric) is financially provided by supporting individuals and organizations in Northern Khorasan province.

Table 7. The statistics related to direct medical expenses of cancer patients.

	Mean	SD	Minimum	Maximum
Amount	38326238	17261870	1967000	77802720
	number	First quartile	Second quartile	Third quartile
Amount	93	33012220	43302720	48953060

As the above table indicates, the average medical expenses of patients with esophagus and gastric cancer in Northern Khorasan province is 38326238 with Standard deviation of 17261870. The minimum direct medical expenses of patients with esophagus and gastric cancer in Northern Khorasan province is 1967000. The maximum direct medical expenses of patients with esophagus and gastric cancer in Northern Khorasan province is 77802720.

Discussion and Conclusion

It is concluded that all research hypotheses were confirmed by the difference in the amount of costs and among these factors, the early prevention and timely detection are very helpful in improvement of patients and have very low expense for patient and health ministry.

According to the study that was conducted in Japan, the evaluation result caused to screening of individuals over 40 years in Japan in order to reduce the death rate and high cost of gastric and esophageal cancer.

The results obtained from the research hypotheses testing briefly indicates that the early detection has very high impact on the prevention of patients' mortality and reducing costs for patients and the state. According to Tables 1, 2 and 4, it was found that the lowest patients with this type of cancer were people under 35 to 44 years old.

Therefore, screening is recommended for people under 40 years old for prevention and early detection.

Recommendations of the study

By considering the results of the study, the following recommendations can be raised:

• Informing on the nutritional status of people and making culture are the most influencing factors and lack of public awareness raising as general objectives to prevent the occurrence of cancer in the future with health organizations' support.

• Considering that the most type of cancer refers to the esophagus and gastric cancer in Northern Khorasan and treatment outcome of all patients who were detected late is death, it is recommended that the pilot screening of all people over 45 years old to be done freely through endoscopy to release the government and people from costly treatment in the future.

• As cancer patients were ignored so much by insurance coverage and more drugs of these patient are imported and drug prices vary because of sanctions but insurance pay a fixed amount, it is recommended that more financial support to be confirmed by insurance to reduce the patients and families' pain and insurances franchise amount to be reduced from 30% to 5% or 10% until the cancer patients do not force to sell their living furniture.

• Establishing a national program for early detection of cancer

• Providing curable treatment with increase of cancer specialists and subspecialist in most cities

• Planning and support of custodians personnel to assist the cancer patients in order to relieve them from cancer pain (in the area of providing drug and free services)

• Cover general insurance of all community members and minimizing the franchise of cancer patients

• Establishing appropriate context for the cancer patients' rest and companions who are referring to hospitals from long distance

• Support of Non-Governmental Organizations (NGO) by the Health Ministry and provincial authorities who can provide great assistance to cancer patients

• Attracting donors to create support associations (financial and psychological support) from patients and their families.

• It is better to make some decisions about the continuation of treatment to be made by patient until spends the last days of his life away from the treatment environment.

Limitations of the study

One of the most important limitations of this research is the confidentiality of medical records of individual that due to confidentiality, access to these documents is not possible easilyThe lack of sufficient research background can be regarded as another limitation of this study.

Suggestions for further research

It is recommended that further researches should be done in the following areas:

• Reasons for the lack of full protection of insurance coverage

• Cost analysis of screening in people over 45 years old towards the cost of cancer patients in country

• Analysis of subsidies paid to the imports of foreign drugs and the expenses government incurred for treatment of a cancer patient.

• It is suggested that the cost-benefit analysis to be done in other provinces (Ardabil, Eastern Azarbaijan and etc.) as Northern Khorasan where the gastric cancer is more than other cancers

• Cost-benefit analysis of breast cancer in women and evaluating the effect of screening by mammography in all women over 40 years old

• Investigation and analysis of research costs and study and prevention of cancer in front of cancer expenses of a province done in the public sector

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