Jundishapur Journal of Chronic Disease Care
Quarterly Journal of Ahvaz Nursing and Midwifery School

The impact of clinical and nonclinical factors on costs of Multiple Sclerosis in Khuzestan Province 2012

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Abstract

Introduction: Multiple sclerosis is a chronic and autoimmune disorder that imposes many direct and indirect costs on patients. Costs are affected by clinical and nonclinical factors. The aim of this study is to revise the impact of clinical and nonclinical factors on expenses of multiple sclerosis.

Materials & Methods: This study is cross sectional in nature. In this study after considering the exclusion criteria, 332 patients were studied in Khuzestan Province in 2012. Data were gathered through questionnaire during a 3-month period. Data were analyzed by SPSS.18 through statistics tests: x^2, Coefficient correlation and ANOVA.

Results: The results showed that 70.5 percent of patients were female. Mean of disease duration was 3.3±2.1 year. 30 percent of patients had inpatient record in hospital. Clinical forms of patients were: 92.1 percent RR, 3.6 percent SP and 3.3 percent PP. approximately 21.1percent of costs were due to transportation services (Rial 607712 per patient per month) and 22 percent of costs were due to medications (Rial 631605 per patient per month) that the largest share was assigned to them. In this study, gender of the patients and disability stages had a substantial correlation.

Conclusion: Findings of current study showed that clinical and nonclinical factors had impact on costs of Multiple Sclerosis.

Keywords: Multiple Sclerosis, Direct cost, Indirect cost.

Introduction

Multiple sclerosis is a chronic, autoimmune disease that can cause progressive disability. Although at the present time, the etiology of this disease is unknown, experts believe that genetic factors, autoimmune system disorders and environmental factors are involved in this regards (1-4). The incidence of the disease is greater for women than for men, and also it is known that it is the second leading cause of disability in young adults, too (5). The occurrence in Germany and Canada is estimated at 149 and 133 people per 100,000 people, respectively (6). Based on the global prevalence classification, our country, Iran, is classified as a low risk area. However, studies show that there is a considerable difference in prevalence in different provinces of the country, which is higher than as it is expected in some areas. The study of Saadatian et al. in Isfahan showed that the prevalence of the disease is about 43.5 in 100,000 people (7). Another study by Ashtari et al. showed that about 20.1 percent of people with the disease are affected by family type (8). Despite disease-

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Received: 17 Nov 2013 Accepted: 16 March 2014

modifying treatments and prevention of attacks and efforts to slow down the progression of the disease, no definitive treatment has been found for MS so far, and the treatment management and the costs of these patients still face a prodigious challenge (9). Since MS has come and continued throughout the most important years of the career (between 20 to 40 years), it has greatly affected the quality of life for individuals and families. The loss of jobs is a main problem for these patients, which has harmful results for the patients or their families, and it has an economic burden of illness for individuals, their families and especially community health system (10-13). A study by Qanati et al. in 89 showed that the total cost of interferon drugs in the next 30 years would be 20 billion 206 million 788 thousand and 808 Rials (if the government continues to allocate its drug subsidies, i.e., 90% of the cost of the drug). Like other studies, this study proves that MS is a cost-intensive disease with a very high economic burden for society (14). To achieve a standard of living equal to those without disabilities, people with disabilities and their families pay additional costs (such as the cost of care and assistive devices) that are socially and economically very important. However, they are difficult to measure the reasons such as multiple definitions of disability and different tools and methods of data collection. Generally speaking, the costs of disability are divided into two categories of direct and indirect costs. Direct costs include the costs of hospital, care, drugs; and indirect costs include losses due to absence from work or unemployment as a result of the illness, failure to pay taxes. (12-17). For example, in the UK and Ireland, 11-69% (10) and 20-37% of weekly earnings of individuals are spent on direct costs, respectively (12). Studies on the costs of the illness describe transient load of the diseases are based on the characteristics of supply, demand and help policy makers to portray the future of health care and the decision to allocate resources. In recent decades, the introduction of new therapies and the discovery of new drugs have improved direct costs due to increased drug costs. Requirements such as the progressive prevalence of MS in Iran, the economic burden of chronic diseases such as multiple sclerosis, limited studies on the costs of the illnesses (particularly MS disease), and the important role in managing patient costs in the economic decisions of the health system encouraged the researchers to do this research on the costs of MS disease in Khuzestan province. The purpose of this study was to examine the effect of different clinical and non-clinical factors on the costs of multiple sclerosis disease.

Materials and Methods

This research is a cross-sectional and retrospective study. The sample consisted of 450 patients referred to the Multiple Sclerosis Patients Association in Khuzestan province (sample size is equal to the total study population), which decreased to 430 people, because some under 18 patients died and some did not participate in the research. Finally, 332 patients (232 patients with no history of hospitalization and 100 patients with a history of hospitalization) answered questions and were included in the study. Instrument of data collection for this study was questionnaires containing a variety of services received (for outpatient costs) and the records available in the hospital's accounting department (for hospitalization costs). Trained interviewers were used to collect data on outpatient costs of patients. After the coordination and supervision of the Association, all patients were contacted; and after explaining the objectives of the study,

written consent was then obtained, from each patient in the association. Thereafter, mini mental state examination, which consists of 30 cognitive questions, was conducted to determine the cognitive level of patients, and the related score was calculated. The patients who earned the minimum threshold score (it was equal to 28 out of 30 points) received the forms related to personal information and the forms related to the list of quarterly costs (July, August and September of 2012). For the patients who did not gain the necessary cognitive score, the related forms and descriptions were given to the patient's relative (spouse or child) who had the greatest relationship with him/her. For the patients who did not have the ability to refer to the Association, the forms were sent to their homes. To reduce recall bias, patients were contacted two or three times per month, and the required recalls were done to complete the forms. The forms were delivered to the MS Association at the end of each month by a number of patients and after three months by some of them. Simultaneously with the delivery of forms, potential defects were examined and were resolved (it should be noted that in the forms that were filled out by patients, only the name and the number of disease-related services were requested, and no service fees were demanded from patients). Expenses include the cost of drugs, outpatient visits, injections, tests, and rehabilitation services (including physiotherapy, occupational therapy, speech therapy and audiology) as well as the costs of home care. To estimate and calculate the actual costs and approved prices, reference prices (such as manual of medical diagnostic tariff, drug rates, and the rates related to medical products and equipment) were used in accordance with the rates of the intended year. Information on the disability level of patients was measured by a neurologist using the Expanded Disability Status Scale (EDSS), and patients were classified into five stages of disability.

Patients with inability of 0, 1-3, 3.5-5.5, 6-7 and above 7 were placed in groups I, II, III, IV, V respectively. Grading by this instrument was done on a scale of 0 to 10, in which the disability rate increases as we get closer to the number 10 (the test has some items to assess the visual and motor status and so like, which is performed by a neurologist). After the estimation of outpatient costs during three months, the average costs were generalized to the entire year. The following formula was used to calculate the costs:

Total costs of the disease = direct costs + indirect costs

Direct costs= direct medical costs + direct non-medical costs (travel + services at home)

Indirect costs = costs per day of absence from work due to the illness

Finally, the data were analyzed by SPSS.18 software using descriptive statistics (such as means, standard deviations, Chi-square analysis tests, correlation coefficient and ANOVA).

Ethical considerations

To comply with the ethical principles, information about the study and the objectives were given through the Association to the study samples, and written consent was simultaneously obtained from them. Researchers also committed to keep confidential all patient information during and after the study. It should be noted that all the reports and the results of this study were presented and published by the Research Deputy Office of the University.

Results

In this study, data from 332 patients with Multiple Sclerosis in Khuzestan province in

2012 were carefully examined. The results showed that 70.5% of patients were women, and the rest were men. The average age of the patients was 33.6 ±9.1 years. In terms of age, 38% were in the age group of 18-29 years, 34.4% in the age group of 30-39 years, 19.3% in the age group of 40-49 years, and 8.4 percent in the age group of 50-59 years. In terms of education level, 4.8 percent were illiterate, 34 percent had less than a high school diploma, and 26.8% had a high school diploma; and 34.3 percent had an academic degree. Based on these results, it was found that the patients were housewives (9.47%), unemployed people (20.8%), students (9.6%), employees (8.7%), workers (5.1%) and other occupational groups. Most patients (94.3 percent) resided in cities and the rest were from rural areas. The types of basic health insurance included social security (62.3%), Iranian health insurance (32.8%), armed forces (3.6%) and rural health insurance (1.2%).

In terms of history of the disease, mean disease duration in patients was 3.3 ± 2.1 years. In addition, 30.1 percent of the patients had a previous history of hospitalization due to the illness above. Different clinical forms of the disease in patients were RR (92.1%), SP (6.3%) percent and PP (3.3%).

The results of the patients' cognitive level test to determine their ability to participate in this study showed that 6.89%, 87.3, 67.17% and 71.55% have the scores 27, 28, 29 and 30, respectively.

Cognitive level was 29.3 on average. A test to determine the level of disability (EDSS) showed that 7.8 percent of patients were in the group I, 73.8 percent in the group II, 12 percent in the group III, 3 percent in the group IV, and 2.4 percent in the group V. The average disability level was 2.2. The results of direct and indirect costs of the disease are presented in Diagram 1.

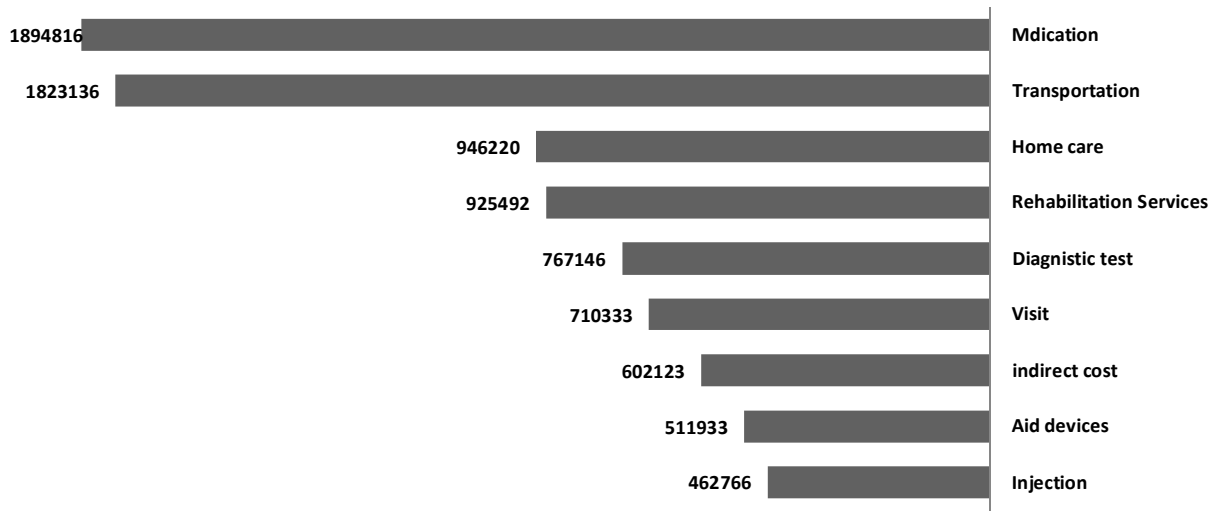

Diagram1: annual cost mean per patient, in Rial

As is clear from the diagram, 21.1% of the cost is related to the patients' transportation services (1823136 Rials per patient in three months and 607712 Rials per month) and 22% of the cost of providing professional drugs (1894816 Rials per patient and 631605 Rials per month).

These calculations were performed for the study period (3 months), and therefore if these costs are extended to one year, the costs will be considerable. In Table 1, the amounts of direct, indirect and total costs are calculated for day, month and year per patient.

Based on the results in Tables 1, the major cost of the disease belongs to the direct medical costs (31413904 Rials per year).

If the total number of the patients' studies is taken into account in 2012(332 people), a financial burden of 11638487088Rials caused by the disease will be imposed on patients of the province.

In this study, information on the patient's income was collected, whose results showed that the average income of patients per year was about 75945360 Rials. Therefore, considering the costs associated with the disease (it was 35055684Rials in year for each patient), approximately 46.1% of the annual total revenue of the patients are spent on the treatment and development of this disease.

After testing for the equality of means between the two groups of patients with and without a hospitalization, there were found no significant differences between the history of hospitalization, direct medical costs (outpatient) and indirect costs of the illness. However, an important difference was found between hospitalized and non-hospitalized patients and direct non-medical costs ($p = 0.17$), so that there was a higher average cost of home care for hospitalized patients group and higher travel costs in non-hospitalized patients, and the average of direct non-medical costs of patients without a history of hospitalization was totally higher than other groups.

The results also showed that there is a statistically significant correlation between patient age, history of the disease and the level of disability ($p = 0.001$), and that age had a statistically significant relationship only with the indirect costs of the disease ($p = 0.001$). Other personal variables were not significantly associated with any type of direct and indirect costs. On the other hand, the variable of disability had a statistically significant relationship with all types of costs ($p = 0.001$), so that it significantly increases the costs of disability level of disease (especially the direct medical costs). Cost changes in different disability levels of patients are shown in Table 2.

Table 1: Direct and indirect costs of illness separated by day, month and year for each patient

Time / Cost	Annually	In 3 month	Monthly	Daily
Direct	32647192	8161798	2720599	90686
Medical *	31413904	7853476	2617825	87260
Non-medical	12321288	3080322	1026774	34226
Indirect	2408492	602123	200707	6690
Total	35055684	8763921	2921307	97377

*To integrate the estimates and reduce the computational error, the hospitalization costs for patients with a history of hospitalization (100 patients) are not included in the group of direct medical costs. Costs were taken into account in Rials in 2012.

Table2: Average costs of the disease based on the different stages of disability

Type of cost	EDSS*	Frequency	Mean±SD	p-value
Non-medical cost	0	29	2706537.38±2471444.249	
	1-3	245	2854946.77±3792091.361	
	3.5-5.5	40	3546474.50±5003675.465	
	6-7	10	6603000±5342302.721	0.031
	7<	8	4603312.5±5293477.663	
	Total	332	3080322.36±3992823.389	
Medical cost	0	29	65558174.1±6532281.693	
	1-3	245	7308413.84±6650891.796	
	3.5-5.5	40	8657714.5±7561143.129	0.001
	6-7	10	13991700±4905720.903	
	7<	7	18932382.86±2300000.712	
	Total	331	7853476.44±7586291.045	
Indirect cost	0	29	43448.28±181172.291	
	1-3	245	404857.14±1612157.538	0.001
	3.5-5.5	40	1093857±1894252.605	
	6-7	10	4550000±6643501.420	
	7<	8	1275000±3149489.755	
	Total	332	602123.49±2078101.023	

In addition, according to the t-test with two independent samples to determine the equality of means, it was found that there is no significant difference between men and women in terms of average costs, so that average costs in women were higher than those in men (Table 3).

The results showed that there was a momentous relationship between type of insurance and average indirect costs of patients. The results of this test showed that among the types of costs, only direct non-medical costs had a statistically significant relationship with the educational level of patients ($p = 0.047$).Tukey test and PostHoc test revealed that this difference was related to the patients in the educational group of high school diploma and less.

Table3: The relationship between patient gender and costs on the basis of calculation during the study period (3 months)

Variables Type of cost		Frequency	Mean±SD	Bias Std. Deviation	t	p-value
Non-medical direct cost	female	234	3464960.08±4464806.562	291873.536	2.73	0.007
	male	98	2161901.68±2304172.299	232756.551		
Medical direct cost	female	234	8578293.8±8521788.327	558282.916	2.72	0.007
	male	98	6130186.17±4223903.744	426678.712		
Indirect cost	female	234	765619.66±2382891.202	155768.587	2.22	0.027
	male	98	211734.69±937865.558	94738.728		
Total cost	female	234	9037611.39±8932221.738	585169.302	3.37	0.018
	male	98	6772441.28±4715369.987	476324.299		

Discussion

The costs of multiple sclerosis disease are affected by clinical and non-clinical variables. The most important non-clinical factors are includes the region, the type of insurance and the individual characteristics of patients (18), which have been considered in the present study. In this study, the cost of the disease is divided into two categories of direct medical/non-medical costs and indirect costs (including the cost of days of absence from work due to illness) according to the classification used in the literature commonly (19, 20). According to the results of this study, most patients were female (70.5%) and young (72.4%) and were in the range of 18 to 39 years. Krampampa et al. obtained similar results in a study of this area (21, 22). The pattern of age and sex distribution is the same as most places in the world.

The results of our study also showed that among the individual variables of the patients, there is a significant relationship between age and sex of the patients and the costs of the disease. The variable of age had a significant relationship only with the indirect costs of the disease, which was stronger than the variable of sex; and the average costs in women were higher than those in men.

Other studies have also demonstrated that there was a significant relationship between the age and sex of patients and the costs of the disease, so that the costs of the disease increases with age, and the average costs in women were higher than those in men.

During the period of study, the total average costs for women and men are about 6700000 Rials and about 9000000 Rials, respectively. In terms of educational level, the majority of patients had a university education, which was the same as the result that was obtained in another study (21, 22). In this study, the various costs associated with the disease were examined, among which the highest and the lowest costs were associated with direct medical costs and indirect costs of the disease, respectively.

Among the medical direct costs, drug costs (22 percent) accounted for the highest share of the costs. These costs were approximately Rials 1890000 during the study period.

A study by the Australian Menzies Institute also showed that about 59 percent of the financial burden of Multiple Sclerosis is due to the cost of drugs (23).

The costs allocated to the drugs in the studies by Prescott and Jacqueline ware equal to 59.7 percent and 39.5 percent, respectively. Thus, the results of these studies showed a significant difference with the result of the present study.

In our study, among the non-medical direct costs, travel (transportation) expenses of patients accounted for the largest share (21.1%), which were equal to about 1823136 Rials during the study period and have been not included in Iranian and foreign studies (no results were obtained in this context).

According to the results of this study, there was a strong significant relationship between the direct and indirect costs due to the illness and the disease severity, which is consistent with the results of other studies (5,6,10,23,25,27). Our study also showed that the direct medical costs (Rials 32647192 per year) account for the highest share of the illness costs.

Other studies in this area showed that the pattern of direct and indirect costs is different in different parts of the world, so that indirect

costs in Canada, the Netherlands and Norway, direct medical costs in the United States, Australia, Belgium and France, and direct non-medical costs in Italy, Spain and the UK account for the main costs of multiple sclerosis disease; and in all European countries, indirect costs accounts for the highest share (6).

In the present study, indirect costs of the illness included 6.7 percent of total costs. This amount was 13.1 percent in the study of Taylor in Australia(13), 29.1% in the study of Bergh and Lingreen (26) in the Netherlands, and 49.2% in another study. As can be seen, the results of these studies differ significantly from the result of the present study. An important reason for this difference could be the differences in study design and the number of different samples; and different patterns of disease outbreaks are different in various geographic areas, so that the costs of the disease are increased by increasing the score of disability in patients. Much of this increased cost was in the direct costs, and indirect costs showed a smaller increase, with the purpose of direct medical costs during the study period are approximately 7000000 Rials in patients with the disability levels of 3-1 and about 18 million Rials in patients with the disability levels higher than 7. Other studies such as the study of Casado (5) had similar results.

Conclusion

The results of this study showed that different clinical and non-clinical factors have different levels of impact on the costs of multiple sclerosis disease. Gender of the patients and severity of disability due to the disease showed the greatest impact among the non-clinical and clinical factors, respectively.

On the other hand, travel expenses and costs of providing specialized medicines for patients accounted for the largest share. Therefore, more attention to the provision of prevention and treatment services, particularly timely provision of appropriate drugs for patients (especially women) through basic and complementary medical insurances as well as frequent assessment of the patient's disability level by specialists can moderate the future costs of patients and reduce the financial burden of the disease.
According to the results, one can predict that the increased level of disability is an effective factor in increasing the direct and indirect costs.

All costs such as the cost of drugs, home care, visits, and rehabilitation services can be substantially decreased by reducing the disability level and/or fixing the disability at lower levels. The cost of home care for these patients was equal to 9462220 Rials, which accounts for the largest share after the cost of drugs and transportation, and according to previous studies, imposes a heavy economic burden upon the family (28).

Reducing the level of disability has a significant effect on the quality of life for MS patients and their families. Regular use of rehabilitation services, particularly physiotherapy and occupational therapy services is one of the most important ways to reduce the disability level of patients, which increases the independence of people who move independently or with the use of assistive devices, hence increases participation in the social activities such as jobs (21).

Attack and recurrence of disease can increase the health care costs. As a consequence, the treatment methods that prevent the recurrence of the disease and attack can reduce the costs and also reduce the disability level of patients (27).

Suggestions for further research considering the results of this study and other studies on the economic burden of the disease, the following suggestions are offered: Provide the necessary public awareness of the recognition and diagnosis methods to reduce future costs. Cover costly medical items (including medications and assistive devices) by complementary health insurances. Make free evaluations to determine the disability in MS patients, through representing provincial MS patients associations. Develop centers for rehabilitation services to reduce the disability level. Examine the effect of geographic region on the prevalence and burden of the disease. Perform studies with a longer time period for the cost analysis in the final phases of the disease. Perform cost-effectiveness studies of suitable drug treatments in the country. Perform a feasibility study for providing a research database of MS patients in the province. Perform needs assessment study for supplying medicines, equipment and facilities needed for the management of MS disease in the province.

In this study, the following limitations can be cited: the lack of accountability and participation in this study by some patients, failure to record accurately all the necessary information by patients, time-consuming process of such studies and long course of the disease to estimate all costs.

Acknowledgements

This study is the result of the research project no. PHT9124 approved by the Research Deputy Office of Ahvaz Jundishapur University of Medical Sciences. The patient members of the MS patients Association in Khuzestan, esteemed colleagues of the Association, Research and Technological Development Deputy Office of Ahvaz Jundishapur University of Medical Sciences for financial support of this project as well as Musculoskeletal Rehabilitation Research Center of School of Rehabilitation Sciences are appreciated.

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