



## Non-adherence to Disease-Modifying Treatments in Patients with Multiple Sclerosis

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ARTICLE INFO	ABSTRACT
<p><b>Article type:</b> <i>Original Article</i></p> <p><b>Bullet points:</b></p> <ul style="list-style-type: none"> <li>• <i>Disease-modifying drugs are somehow intolerable for patients with MS.</i></li> <li>• <i>A high rate of non-adherence to DMDs in MS patients was demonstrated.</i></li> </ul> <p><b>Article history:</b>                      Received: 7 May 2017                      Accepted: 10 Jul 2017                      Available online: 8 Aug 2017                      CJNS 2017; 3 (10): 128-134</p>	<p><b>Background:</b> Multiple Sclerosis (MS) is a debilitating disease of the central nervous system. Usually, long-term MS medications are injected intramuscularly or subcutaneously, making them intolerable for many MS patients.</p> <p><b>Objectives:</b> In the present study, the rate and the causes of non-adherence to MS disease-modifying drugs (DMDs) were assessed in patients with MS.</p> <p><b>Materials and Methods:</b> Two hundred and three MS patients of Guilan MS Society were interviewed demographic and clinical data of the patients were collected.</p> <p><b>Results:</b> Among the 203 patients, 73.9% were female. The mean±SD age of the patients was 32.47±9.15. Non-adherence to DMDs was due to side effects (21.7%) and requests of the families (21.7%) or ineffectiveness (17.4%). Significant association was seen between the non-adherence to DMDs and gender (<math>p=0.015</math>) and relapses (<math>p=0.021</math>).</p> <p><b>Conclusion:</b> The evidence from the present study suggests that there is a high rate of non-adherence to DMDs in MS patients in Guilan.</p> <p><b>Keywords:</b> Multiple Sclerosis; Medication Adherence</p> <p>➤ <b>Please cite this paper as:</b>                      Roudbary SA, Yousefzadeh-Chabok Sh, Behzadnia H, Bakhshayesh-Eghbali B, Emamhadi M, Ghayeghran A, Hatamian H, Saberi A, Andalib S. Non-adherence to Disease-Modifying Treatments in Patients with Multiple Sclerosis. <i>Caspian J Neurol Sci</i> 2017; 3(10): 128-134.</p>
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## Introduction

**M**ultiple Sclerosis (MS), which is a debilitating chronic disease (1), affects the brain and spinal cord (2). MS is traditionally held to be the white matter disease (3) wherein lymphocytes invade the oligodendrocytes providing the myelin sheaths (4,5); however, neurodegenerative process has recently been recognized in the MS (6). Despite the fact that etiology of MS is not properly understood, infectious agents (7) and genetic changes (8,9) are said to play roles in the complex pathobiology of MS. The symptoms of MS are diverse. Common MS symptoms include fatigue (10), visual impairment (11), ataxia and tremor (12), bladder problems (13), bowel problems (14), cognitive impairment (15), anxiety (16), and depression (17). Hearing loss, which is also a symptom in MS (18), is less prevalent. Based on the course of the disease, MS is divided into several forms. MS diagnosis is made by clinical examination and magnetic resonance imaging (MRI) (19), and lumbar puncture (20). Evoked potential test (21) and optic coherence tomography (22) can add supportive evidence to the diagnosis. There is no cure for MS yet and treatments mostly modify the course of the disease, control its symptoms during attacks and prevent relapses and reduce the complications. Several medications are used in the treatment of MS. Interferon beta-1 is a commonly used medication in the treatment of MS. It is a cytokine that is secreted as an immune response and has immunomodulatory effects on MS. Interferon beta-1b (Betaseron), interferon beta-1a (Avonex), interferon beta-1a (Rebif), and interferon beta-1b (Extavia) have been FDA approved. Nonetheless, the most common side effects are reactions in the injection site and a flu-like syndrome.

Moreover, allergic reactions, hematologic disorder, and liver dysfunction might be seen after the treatment. Interferon beta is not recommended during pregnancy inasmuch as it increases the risk of abortion and decreases birth weight.

Disease-modifying treatments (DMTs) are usually expensive and should be consumed for a long time. Because DMTs require intramuscular or subcutaneous injections, they are difficult to be tolerated for a long time. In a Spanish study, 73% of patients discontinued immunomodulatory medication (23). More to the point, over a quarter of the patients stopped taking their medications, which was associated with lower education levels and previous relapses. MS treatment should be acceptable to the patient and enhance patient's adherence to long-term treatment. Little is known about the non-adherence to DMDs by MS patients in Guilan province in Iran. Hence, the present study investigated the non-adherence to these medications and its by MS patients in the Guilan province.

## Materials and Methods

A cross-sectional design was used for this study, in which 203 MS patients, members of the Multiple Sclerosis Society of Guilan province, were evaluated by questionnaires regarding demographic data (age, sex, duration of illness, education, adherence or non-adherence to treatment), causes of non-adherence to treatment (type of medication, medication price, disease progression, inefficiency of medications, unavailability of medications, side effects, family request for withdrawal from treatment, physician's decision, planned cessation such as pregnancy, and missing doses and *etc.*). The inclusion criteria were a diagnosis of

relapsing remitting (RR) MS according to the revised McDonald criteria (2005) and membership in Multiple Sclerosis Society of Guilan with a history of using DMDs. Informed consent was obtained from all the patients. Data was analyzed by SPSS software (version 17), using frequency, mean, and standard deviation. The Chi-square test was used to examine the associations.

## Results

Table 1 shows the demographic data of MS patients participated in the present study. Cinovex (% 42.4) and Actovex (21.9%) were the most consumed DMDs (table 2).

**Table 1.** Frequency distribution of some demographic factors of MS subjects

Variable		N (%)
Gender	Male	53 (26.1)
	Female	150 (73.9)
Age (years)	Less than 20	16 (7.9)
	21-30	77 (37.9)
	31-40	64 (31.5)
	More than 40	46 (22.7)
Age (years)	Mean $\pm$ SD	32.47 $\pm$ 9.15
Disease duration (years)	Less than a year	17 (8.4)
	1<Y* $\leq$ 2	29 (14.3)
	2<Y $\leq$ 3	29 (14.3)
	3<Y $\leq$ 5	33 (16.3)
	5<Y $\leq$ 10	59 (29.1)
	10 <Y	36 (17.7)
Disease duration (months)	Mean $\pm$ SD	76.6 $\pm$ 69.4
Educational level	Elementary school - illiterate	51 (25.1)
	High school - Diploma	89 (43.8)
	Academic education	63 (31)
Monthly income (Iranian Rials)	Less than ten million	99 (56.2)
	More than ten million	77 (43.8)
Increase in EDSS	Less than one unit	43 (21.2)
	More than one unit	160 (78.8)
Increase in EDSS	Mean $\pm$ SD	2.09 $\pm$ 1.1

\*: Disease duration

**Table 2.** Frequency distribution of DMDs consumed by MS patients

Type of DMD	N (%)
Cinovex	86 (42.4)
Actovex	39 (19.2)
Avonex	7 (3.4)
Resigen	26 (12.8)
Rebif	5 (2.5)
Actoferon	16 (7.9)
Betaferon	4 (2)
Ziferon	1 (0.5)
Extavia	1 (0.5)
Osvimer	10 (4.9)
Copamer	8 (3.9)
Total	203 (100)

58.1% of the patients (n=118) received DMDs regularly, while 22.7% (n=46) stopped taking the medications, and 19.2% (39) missed some of the doses. The most frequent causes of medication non-adherence were adverse effects (21.7%) and family request (21.7%) or inefficiency of the medication on the course of the disease (17.4%) (table 3).

**Table 3.** Frequency distribution of causes of DMDs non-adherence in the MS patients

Causes of for non-adherence to DMDs	N (%)
Side effects	10 (21.7)
At the request of the family	10 (21.7)
Ineffectiveness	8 (17.4)
High cost	5 (10.9)
Physician's decision	4 (8.7)
Patient choice	4 (8.7)
Unavailability of medications	3 (6.5)
Pregnancy	2 (4.3)
Total	46 (100)

The using state of DMDs was not significantly associated with age ( $p=0.43$ ), educational level ( $p=0.31$ ), monthly income ( $p=0.47$ ), disease duration ( $p=0.142$ ), EDSS ( $p=0.47$ ), and the type of medication ( $p=0.52$ ). There was a statistically significant association between the gender ( $p=0.015$ ), the number of relapses during the course of the disease and using state of DMDs ( $p=0.021$ ). There was not any association between the medication manufacturer and medication non-adherence and missing doses ( $p=0.52$ ) (table 4).

**Table 4.** Frequency distribution of using state of the of DMDs in the MS patients

Type of DMD	Regular consumption N (%)	Lack of regular consumption N (%)	Medication discontinuation N (%)	Total N (%)	Statistical significance
Cinovex	55 (64)	10 (11.6)	21 (24.4)	86 (100)	
Actovex	19 (48.7)	10 (25.6)	10 (25.6)	39 (100)	
Avonex	6 (85.7)	1 (14.3)	0 (0)	7 (100)	
Resigen	14 (53.8)	5 (19.2)	7 (26.9)	26 (100)	
Rebif	2 (40)	2 (40)	1 (20)	5 (100)	
Actoferon	7 (43.8)	5 (31.2)	4 (25)	16 (100)	0.52
Betaferon	3 (75)	1 (25)	0 (0)	4 (100)	
Ziferon	1 (100)	0 (0)	0 (0)	1 (100)	
Extavia	0 (0)	0 (0)	1 (100)	1 (100)	
Osvimer	7 (70)	2 (20)	1 (10)	10 (100)	
Copamer	4 (50)	3 (37.5)	1 (12.5)	8 (100)	
Total	118 (58.1)	39 (19.2)	46 (22.7)	203 (100)	

## Discussion

In the present study, 58.1% of the MS patients took DMDs on a regular basis, 22.7% stopped taking the medications and 19.2% missed some doses. In a similar study, Rio *et al.* (24) reported that non-adherence to interferon beta and glatiramer acetate for controlling MS was approximately 17%. Giovannoni *et al.* (25) reported that 16% to 27% of MS patients discontinued the treatment. Meyniel *et al.* (26) reported that the percentage non-adherence to IFN $\beta$ -1a (IM), IFN $\beta$ -1a (SC), IFN $\beta$ -1b, and glatiramer acetate was 44% after 3 years of follow-up, 43% after 2.9 years, 37% after 2.8 years, and

31% after 3.2 years. In the present study, we found that the medication manufacturer in each group was not associated with medication non-adherence or missing doses, which might indicate a close similarity between various types of MS medications approved by the Food and Drug Administration of Iran.

In this study, the medication non-adherence was due to side effects and family requests (21.7%), the inefficiency of medications on the course of the disease (17.4%), high cost (10.9%), patient choice (8.7%), and unavailability of medications (6.5). In a study by Tremlett *et al.* (23), 52.33% of the patients mentioned medication

inefficiency as a cause of non-adherence to the treatment. And, only 4.3% of the patients stopped taking medication due to side effects. By contrast, we found that the highest rates of medication non-adherence were due to side effects. Vicente *et al.* (27) suggested the lack of favorable effects of treatment (38.8%) and side effects (32.8%) as the most important causes of treatment non-adherence. Mesaroš *et al.* (28), in a 5-year follow-up in patients with MS, suggested that the absence of favorable effects (54%), pregnancy (21%) and side effects (17%) were involved in non-adherence to the medications. In addition, only 3% of the patients chose to discontinue medication. Similarly, 8.7% of the patients in our study chose to discontinue medications and 21.7% because of the family's request. Most studies reported medication discontinuation due to patient choice with low frequencies (23-27). However, Tremlett *et al.* (23) reported that non-adherence to medication due to patients' decision was seen in 17.2% of the German patients. Meyniel *et al.* (26) reported that MS medication discontinuation was higher in female than in male patients ( $p=0.003$ ). Berger *et al.* (29) examined discontinuation IFN $\beta$ -1a and reported higher discontinuation in the female patients. The present study did not find any statistically significant relationship between age groups and consumption status of DMDs, which is consistent with the findings of previous studies (23-25,27). There was no significant association between educational level and consumption status of DMDs. Berger *et al.* (29) did not find any association between educational level and medication discontinuation. The present study did not find any statistically significant association between increased EDSS score and consumption status of DMDs. Meyniel *et al.*

(26) found that EDSS score changes were involved in the medication discontinuation.

There was a statistically significant association between the number of attacks during the course of disease and consumption of DMDs in the present study. In fact, what is evident in all the previous studies (23,25-27) is that a major cause of non-adherence to medication discontinuation among patients was lack of an appropriate response or inadequate response, or the side effects of the medications. Rio *et al.* (24) reported ineffectiveness and medication side effects as the main causes of non-adherence to treatment in 56% of the patients. The education level and even unfavorable economic status were not common causes of non-adherence to treatment in this study. There was no significant relationship between monthly income and consumption status of DMDs.

## Conclusion

Altogether, the evidence from the present study suggests that there was a high rate of non-adherence to DMDs in the studied MS patients and the most prevalent cause of this event is the side effects of DMDs. On this account, it is necessary to heighten the knowledge of MS patients about the disease.

## Conflict of Interest

The authors have no conflict of interest.

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