

# Economic sanctions against Iran as an important factor in threatening the health of patients with multiple sclerosis

Received: 09 Sep. 2020  
Accepted: 06 Nov. 2020

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## Keywords

Multiple Sclerosis; Sanction; Medicine; Stress

## Abstract

**Background:** After intensified economic sanctions against Iran, decreased welfare of patients were more recognizable. The present study was aimed at identifying the challenges and stress level experienced by patients with multiple sclerosis (MS) regarding treatment and health care services in 2018-2019 after strengthening of economic sanctions against Iran.

**Methods:** A cross-sectional study was conducted on MS patients in Tehran, Iran. A structured questionnaire was designed to measure the main variables addressing the challenges and stress level of MS patients with respect to receiving care and treatment services.

**Results:** In total, 1039 MS patients were enrolled into the study. Among the patients who answered yes to the questions, 873 (85.8%) and 837 (86%) were concerned about medicine unavailability and supply and purchase of internationally branded medicine, respectively. Moreover, 671 (70.3%) subjects were

concerned about replacing their medicines with cheaper alternatives due to financial problems and 427 (41.4%) were unwilling to continue their treatment due to the economic burden of MS. In total, 795 (82%) were concerned about the effectiveness of Iranian drugs in comparison with internationally branded drugs. Generally, 970 (93.53%) subjects had experienced increased current living costs and 711 had experienced (68.82%) reduced nutrition quality, which (OR: 2.68; 95% CI: 1.99, 3.60) was significantly higher among subjects who had an income of less than or equal to 250 US\$ per month.

**Conclusion:** The sanctions can impose greater stress and hardship on patients due to the unavailability and costs of medicines. Iran should manage health care quality and provide services to prevent the adverse effects of sanctions on MS patients and guarantee patients' right to receive well-established medication and health services.

**How to cite this article:** Sahraian MA, Naser Moghadasi A, Eskandarieh S. Economic sanctions against Iran as an important factor in threatening the health of patients with multiple sclerosis. *Curr J Neurol* 2021; 20(1): 15-22.

## Introduction

According to the World Health Organization (WHO), prevention and control of non-communicable diseases (NCDs) are a major challenge and barrier to achieving Sustainable Development Goals (SDGs) and universal health coverage.<sup>1</sup>

WHO has presented the 4 factors of rational selection and use of medicines, sustainable financing, affordable prices, and reliable health and supply systems as affective on patients' access to medicine.<sup>1</sup> External factors affecting the health care systems can negatively influence patients' access to health care services including medicine availability; however, external factors such as imposed sanctions, which have direct and indirect impacts on public health, have not received adequate attention in research studies.<sup>2,3</sup> There is strong evidence suggesting that sanctions have resulted in serious health problems, disability, and mortality of many patients in countries affected by economic sanctions.<sup>4-6</sup> Economic sanctions can negatively affect the economic growth, impose restrictions on export and import activities, and cause difficulties in financial communications. Accordingly, sanctioned countries face a remarkable lack of resources in diverse areas including health care services.<sup>5,7-9</sup>

Iran has been the target of international economic sanctions, which have been increased by direct sanctions imposed on the Central Bank of Iran that is used as a political bargaining chip. The United States announced its withdrawal from the Iran trade on May, 2018. The mentioned withdrawal has resulted in increased economic burden and hardship in Iran.<sup>8</sup>

With the economic sanctions on Iran, prospective public health concerns were raised, especially regarding the availability of medicine. Although the majority of the Iranian population has been affected by economic sanctions, reduced socioeconomic status, increased poverty and stress level of the vulnerable population, and decreased welfare of patients have been more pronounced.<sup>10-12</sup>

Although several reports from Iran and other countries have acknowledged that the medicine market has been deleteriously affected by sanctions, no reports have been based on data directly obtained from patients with multiple sclerosis (MS).<sup>13,14</sup>

Medicine availability is of great significance among MS patients and represents the costs of treatment. Although the use of medicine is essential in the management of MS, the very goal

of treatment is to reduce the risk of its future worsening, control the disease, and improve MS patients' quality of life (QOL).<sup>15,16</sup>

Hence, considering the role of MS medication and care services in reducing the burden of this disease, and consequently, increasing the patients' QOL, the present study investigated the challenges and stress level experienced by MS patients with respect to receiving medication and health care services in 2018-2019 after increasing the political and economic sanctions against Iran, based on their gender.

## Materials and Methods

**Sampling:** The present cross-sectional study was conducted on 1039 MS patients referring to Sina Hospital (tertiary care referral center), 16 Azar (neurology clinic), and the Iranian MS Society (IMSS) from 10<sup>th</sup> January to 30<sup>th</sup> September 2019 in Tehran, Iran.

Sina Hospital has 1 MS specialist clinic and 3 neurology units that provide care and treatment services for MS patients. From these clinics, 719 subjects were selected and enrolled in the present study.

The IMSS established in 1999, is the single registry center in Tehran that registers MS patients and provides extensive medical, social, rehabilitation, and welfare facilities to them; 320 subjects were also enrolled in the study from the IMSS center.

Registered patients in the IMSS reside in all municipal and geographical areas of Tehran.

The MS diagnosis was confirmed for all patients by neurologists employing the McDonald criteria.<sup>17</sup>

**Data collection tool:** A structured questionnaire was designed in the MS research center of Tehran University of Medical Sciences. The questionnaire was designed to measure the main epidemiological variables including the concern for challenges and stress of MS patients with respect to receiving medications, care, and services as well as experiencing different problems imposed by the economic sanctions against Iran.<sup>18</sup>

The developed questionnaire covered questions following a standard methodology suggested by the WHO and Health Action International (HAI).<sup>19</sup>

A trained interviewer explained the aims of study to all patients and informed consent was obtained from all subjects.

All MS patients provided their baseline demographic characteristics such as sex, age, and

marital, occupational, income, and health insurance status in the questionnaire. Moreover, to obtain a better insight into the impact of economic sanctions on MS patients' challenges and stress level as well as the severity of experiences in receiving MS care, treatment, and services, the patients were asked to answer the structured questions.

The patients anonymously provided their responses to questions in a multiple-choice questionnaire considering the significance of each item. The items were scored on a 5-point Likert scale ranging from 1 to 5, where 1 referred to the concept of "very high" and 5 indicated the statement of "very low".<sup>20</sup>

The response rate (usable responses returned from subjects) was 83.12%.

**Ethical consideration and analysis:** First, the aims of the study were explained to the subjects by a trained interviewer. Then, written informed consent was obtained from all subjects. The study protocol, questionnaire, and consent form were approved by the Institutional Review Boards (IRB) at Tehran University of Medical Sciences, Tehran, Iran (code: IR.TUMS.NI.REC.1398.007).

The baseline characteristics of subjects, means, and significant P-value ( $P < 0.05$ ) were considered based on two-tailed tests.

Logistic regression was used to estimate the odds ratio (OR) at 95% confidence interval (CI) in SPSS software (version 23; IBM Corp., Armonk, NY, USA).

The sex-stratified analysis was implemented to determine whether men or women are at higher odds of outcomes.

## Results

Of the 1039 MS patients enrolled in the study, 827 (79.6%) and 212 (20.4%) were women and men, respectively.

The mean age of disease onset was 36.48 years, and the disease duration was 7.5 years. A majority of the patients, i.e., 649 (63.3%), were married. Moreover, the data regarding the patients' occupational status revealed a higher frequency of housewives (389; 38.0% patients) and currently employed individuals (366; 35.8% patients), respectively (Table 1).

The monthly income of 729 (73.0%) patients was less than 250 US\$, of which they had to spend an average of 55 US\$ on their MS treatment monthly (Table 1).

Among the subjects who answered to each questions, 873 (85.8%) patients were concerned about medicine shortage during the previous year following the sanctions and 941 (93.6%) patients

stated that they were worried about future unavailability of medicine as a result of sanction continuance in the subsequent years. The risk of concern for medicine shortage during the previous year was significantly higher among women (OR: 1.55; 95% CI: 1.04-2.33;  $P = 0.03$ ) (Table 2).

**Table 1.** Demographic characteristics of patients

Variables	Value
Gender [n (%)]	
Female	827 (79.6)
Male	212 (20.4)
Age	
Disease onset age (mean $\pm$ SD)	36.48 $\pm$ 9.59 (min = 13 and max = 76)
Disease duration (mean $\pm$ SD)	7.50 $\pm$ 5.71
Marital Status	
Married	649 (63.3)
Single (divorced and widowed)	377 (36.7) (60 divorced and 16 widowed)
Employment status [n (%)]	
Employed	366 (35.8)
Unemployed	133 (13.0)
Housewife	389 (38.0)
Student	75 (7.3)
Disable	36 (3.5)
Retired	24 (2.3)
Monthly income (US Dollars) [n (%)]	
Less than 70	93 (9.3)
70-120	247 (24.7)
121-250	389 (39.0)
251-350	153 (15.3)
More than 350	116 (11.3)
Main drug used [n (%)]	
Interferon beta	310 (33.1)
Rituximab	223 (23.5)
Glatiramer acetate	145 (15.2)
Fingolimod	106 (11.2)
Tysabri (Natalizumab)	102 (10.6)
Others	48 (5.1)
Do not know	12 (1.3)

SD: Standard deviation

Generally, 837 (85.8%) and 858 (89.2%) subjects were concerned about the supply and purchase of foreign medicine over the previous year and in the future as sanctions continue, respectively (Table 2).

In total, 684 (72.8%) patients were concerned about changing their medicine from internationally branded medicines to domestic brands because of the high currency values; while 795 (82.0%) patients were concerned about the effectiveness of the domestic medicines.

**Table 2.** Patients' experiences and stress levels regarding medication and odds of concern in women in comparison to men

Variables n (n = Yes response out of total response) (%)	Gender [n (%)]		Level of stress [n (%)]					P	OR (95% CI)
	Female	Male	Very high	High	Medium	Low	Very low		
Concern for medicine unavailability over the last year 873/1017 (85.8)	705 (87.0)	168 (81.2)	340 (40.2)	220 (26.0)	197 (23.3)	51 (6.0)	38 (4.5)	0.03*	1.55 (1.04-2.33)*
Concern for medicine unavailability in the future as sanctions continue 941/1005 (93.6)	755 (94.4)	186 (90.7)	527 (56.0)	243 (25.9)	112 (11.9)	37 (3.9)	22 (2.3)	0.05	1.71 (0.97-3.00)
Concern for supply and purchase of foreign medicine over the last year 837/973 (86.0)	671 (86.7)	166 (83.4)	463 (55.3)	205 (24.5)	119 (14.2)	24 (2.9)	26 (3.1)	0.23	1.29 (0.84-1.96)
Concern for supply and purchase of foreign medicine in the future as sanctions continue 858/962 (89.2)	685 (89.7)	173 (87.4)	521 (60.7)	188 (21.9)	105 (12.2)	23 (2.7)	21 (2.4)	0.35	1.25 (0.77-2.02)
Concern for replacing internationally branded medicines with Iranian branded medicines because of price increase in the future as sanctions continue 684/939 (72.8)	548 (73.7)	136 (69.7)	359 (52.5)	185 (27.0)	81 (11.8)	32 (4.7)	27 (3.9)	0.27	1.21 (0.85-1.71)
Concern for replacing expensive drugs with cheaper alternatives due to financial problems in the future as sanctions continue 671/954 (70.3)	527 (69.6)	144 (73.1)	322 (48.1)	196 (29.3)	90 (13.4)	35 (5.2)	27 (4.0)	0.34	0.84 (0.59-1.19)
Concerns about the effectiveness of Iranian drugs in comparison with foreign ones 795/970 (82.0)	637 (82.3)	158 (80.6)	401 (50.8)	209 (26.5)	127 (16.1)	30 (3.8)	23 (2.9)	0.58	1.11 (0.75-1.66)
Unwillingness to continue treatment due to increased economic burden of the disease 427/1031 (41.4)	315 (38.4)	112 (53.3)	215 (50.6)	89 (20.9)	53 (12.5)	31 (7.3)	37 (8.7)	< 0.01	0.54 (0.40-0.73)*
Unwillingness to continue treatment due to increased mental burden 440/1026 (42.9)	338 (32.9)	102 (49.0)	212 (48.4)	106 (24.2)	47 (10.7)	33 (7.5)	40 (9.1)	0.04	0.73 (0.53-0.93)*

OR: Odds ratio; CI: Confidence interval

\*Significant results compared to other odds ratios and 95% confidence intervals (CI)

Moreover, 671 (70.3%) patients declared that they were concerned about replacing their medicines with cheaper alternatives in the future due to financial problems if sanctions continued in the following years (Table 2).

Furthermore, 427 (41.4%) and 440 (42.9%) patients stated that they were unwilling to continue their treatment because of the increased economic burden and mental burden of MS, respectively (OR: 0.54; 95% CI: 0.40, 0.73;  $P < 0.01$  and OR: 0.73; 95% CI: 0.53, 0.93;  $P = 0.04$ ). This variable was significantly lower among female patients (Table 2).

With respect to patient care and services, more than half of the subjects referred to very high and high stress level experiences due to increased costs of laboratory services [781 (81.3%)], hospitalization [584 (64.4%)], rehabilitation and physiotherapy [533 (51.9%)], and psychological and psychiatric counseling [539 (52.2%)] (Table 3).

Furthermore, 970 (93.5%) patients reported increased current cost of living including housing, nutrition, and education costs. In addition, 618 (60.1%) and 687 (66.8%) patients had to reduce or withdraw from their social and physical activities, respectively (Table 3).

There was a significant difference between female and male subjects considering the risk of facing increased costs of mobility aid (OR: 0.70; 95% CI: 0.51, 0.96;  $P = 0.03$ ), loss of job and insurance services (OR: 0.54; 95% CI: 0.39, 0.79;  $P < 0.01$ ), and reduced quality of nutrition (OR: 0.69; 95% CI: 0.49, 0.98;  $P = 0.03$ ) (Table 3).

The risk of concern for replacing expensive drugs with cheaper alternatives due to financial problems in the future as sanctions continue (OR: 2.04; 95% CI: 1.50-2.77), unwillingness to continue treatment due to increased economic burden of the disease (OR: 2.02; 95% CI: 1.49-2.73), unwillingness to continue treatment due to increased mental burden (OR: 1.45; 95% CI: 1.08-1.94), and reduced nutrition quality (OR: 2.68; 95% CI: 1.99, 3.60) were significantly higher among subjects who had income  $\leq$  250 US\$ per month (Table 4).

## Discussion

The present study investigated the challenges and stress level experienced by MS patients according to their gender with respect to receiving medicine and health care services following the economic sanctions.

The findings of the study revealed that the addressed sample had a higher number of female

and young patients, and a higher number of patients with low monthly income. The group of patients with the lowest number of individuals was the employed group.

Female patients faced more socio-economic problems during the sanction period because job opportunities and job security for women were low during this period.<sup>8</sup>

According to the obtained results, while 73% of patients earned less than 250 US\$ per month, at least a quarter of their income was spent on MS treatment.

MS is a key cause of disability among adults and younger working-age population and requires lifelong treatment.<sup>21</sup> Although there is no cure for MS, disease modifying therapies (DMTs) can decrease the progression of the disease and reduce the number of attacks.<sup>22</sup> The illness-related lost productivity costs are more than one-third of the patients' entire costs for MS.<sup>16</sup> However, most of these patients reported the concurrent increase in care and treatment costs, and concerns for decreased access to medication.

During the sanction period, reduced income, increased inflation and poverty, and increased unemployment were associated with the deterioration of health care services and welfare of the population.<sup>4,7,9</sup>

The findings of this study revealed that many MS patients expressed significant levels of concern regarding drug unavailability and cost after lifting of the economic sanctions against Iran. Thus, a significant population of MS patients had concerns regarding the replacement of their internationally branded medicines with national alternatives and replacement of expensive drugs with their cheaper alternatives, while many of them had concerns about the effectiveness of domestic medicines.

The results of this study not only highlighted the importance of concern for medicine availability, but also that of the concern for affordability of the medicines used in care and treatment schedules for chronic diseases like MS.<sup>15</sup>

Lower availability and higher costs of medicines place a great deal of stress on all patients, especially those in countries with low-income and middle-income economies.<sup>23</sup>

Due to the patients' concern for the unavailability and increasing prices of medicines after the imposing of sanctions in the future, and consequently, the high economic and psychological burden on patients, a significant number of patients reported their unwillingness to continue treatment.



**Table 3.** Patients' experiences and stress levels regarding care services

Variables n (n = Yes response out of total response) (%)	Gender [n (%)]		Level of stress [n (%)]					P	OR (95% CI)
	Female	Male	Very high	High	medium	Low	Very low		
Increased cost of laboratory services 781/961 (81.3)	625 (75.6)	156 (73.6)	333 (42.9)	245 (31.6)	140 (18.0)	42 (5.4)	16 (2.1)	0.61	1.10 (0.74-1.64)
Increased hospitalization costs 584/907 (64.4)	455 (55.0)	129 (60.8)	216 (47.4)	117 (25.7)	69 (15.1)	33 (7.2)	21 (4.6)	0.30	0.83 (0.59-1.17)
Increased rehabilitation and physiotherapy costs in health centers 533/1027 (51.89)	414 (50.7)	119 (56.7)	285 (53.7)	132 (24.9)	61 (11.5)	30 (5.6)	23 (4.3)	0.12	0.78 (0.57-1.06)
Increased home rehabilitation costs 396/1028 (38.52)	306 (37.4)	90 (42.9)	221 (55.8)	87 (22.0)	32 (8.1)	28 (7.1)	28 (7.1)	0.14	0.79 (0.58-1.08)
Increased cost of mobility aid (canes, wheelchair, walkers) 345/1025 (33.65)	261 (32.0)	84 (40.0)	181 (52.6)	79 (23.0)	30 (8.7)	20 (5.8)	34 (9.9)	0.03*	0.70 (0.51-0.96)*
Increased transportation costs for referrals to health care centers 698/1032 (67.63)	550 (66.9)	148 (69.8)	302 (43.6)	178 (25.7)	157 (22.7)	29 (4.2)	26 (3.8)	0.32	0.84 (0.60-1.17)
Increased cost of psychological and psychiatric counseling services 539/1032 (52.22)	417 (50.7)	122 (58.1)	279 (52.1)	139 (26.0)	66 (12.3)	26 (4.9)	25 (4.7)	0.06	0.74 (0.54-1.00)
Increased current living costs 970/1037 (93.53)	769 (93.0)	201 (95.7)	704 (72.7)	185 (19.1)	51 (5.3)	17 (1.8)	11 (1.1)	0.15	0.59 (0.28-1.21)
Eliminating or diminishing social activities 618/1028 (60.11)	493 (60.2)	125 (59.8)	307 (49.8)	142 (23.0)	88 (14.3)	36 (5.8)	44 (7.1)	0.91	1.01 (0.74-1.38)
Eliminating or diminishing physical activities 687/1028 (66.82)	539 (65.8)	148 (70.8)	304 (44.3)	204 (29.7)	107 (15.6)	32 (4.7)	39 (5.7)	0.17	0.79 (0.57-1.10)
Job and insurance loss 492/1026 (47.95)	367 (44.9)	125 (60.1)	300 (61.2)	80 (16.3)	38 (7.8)	30 (6.1)	42 (8.6)	< 0.01*	0.54 (0.39-0.73)*
Reduced nutrition quality 711/1033 (68.82)	554 (67.3)	157 (74.8)	307 (48.2)	159 (25.0)	98 (15.4)	35 (5.5)	38 (6.0)	0.03*	0.69 (0.49-0.98)*

OR: Odds ratio; CI: Confidence interval

\*significant results compared to other odds ratios and 95% confidence interval

**Table 4.** Concern for receiving care based on monthly income among the patients

Variables	Income [n (%)]		OR (95% CI)	P
	≤ 250 US\$	> 250 US\$		
Concern for replacing internationally branded medicines with Iranian branded medicines because of price increase in the future as sanctions continue	482 (73.5)	174 (26.5)	1.20 (0.87-1.66)	0.250
Concern for replacing expensive drugs with cheaper alternatives due to financial problems in the future as sanctions continue	497 (76.9)	149 (23.1)	2.04 (1.50-2.77)*	< 0.001*
Unwillingness to continue treatment due to increased economic burden of the disease	333 (81.2)	77 (18.8)	2.02 (1.49-2.73)*	< 0.001*
Unwillingness to continue treatment due to increased mental burden	325 (77.6)	94 (22.4)	1.45 (1.08-1.94)*	0.010*
Eliminating or diminishing social activities	449 (75.6)	145 (24.4)	1.30 (0.98-1.74)	0.060
Eliminating or diminishing physical activities	493 (74.4)	167 (25.3)	1.20 (0.89-1.61)	0.220
Reduced nutrition quality	545 (79.8)	138 (20.2)	2.68 (1.99-3.60)*	< 0.001*

OR: Odds ratio; CI: Confidence interval

\*Significant results compared to other odds ratios and 95% confidence intervals

Based on the results of a study on 6 low-income and middle-income countries, patients with NCDs and chronic diseases had to terminate their medical treatment due to financial difficulties,<sup>19</sup> which would result in shorter remission period, increased number of MS relapses, more disability, and lower QOL.<sup>24</sup>

Direct costs include costs of inpatient care, outpatient care, drug purchase, diagnostic services, nursing care services, social services, and patients' travel costs in order to refer to health care centers. Indirect costs are costs of lost productivity due to short-term or long-term sickness absence, disability pension (in some countries called early retirement on medical grounds or incapacity benefit), early old-age pension due to health problems, permanent losses due to premature death, and sometimes the time spent by the next of kin to care for the patient.<sup>24</sup>

Intangible costs include humanitarian losses due to pain, anxiety, and suffering. It has been reported that the economic burden of MS includes direct medical and non-medical costs, intangible costs, and indirect costs of increased morbidity, early mortality, and negative impact on family and friends.<sup>21</sup>

In addition to the cost of medication, MS patients in the present study mentioned other direct costs including costs of inpatient and outpatient care associated with their disease. In this regard, the patients referred to increased cost of laboratory test and care services, hospitalization, physiotherapy, rehabilitation and counseling services, mobility aid, and patients' travel costs in order to refer to health care centers.

Moreover, male patients, as compared with

female patients, reported more significant sufferings regarding the increased cost of mobility aid, reduced quality of nutrition, and job and insurance losses.

Overall, income of less than 250 US\$ per month could be regarded as a serious challenge for receiving appropriate medication, treatment, and quality nutrition among MS subjects.

MS patients are vulnerable to economic crises. During the sanction period, people's ability to pay for health care services and maintain a healthy lifestyle may be reduced.<sup>25</sup>

Economic sanctions on countries such as Venezuela, Cuba, Nicaragua, Yugoslavia, Syria, and Iraq were associated with the worsening of health conditions among their citizens.<sup>26-28</sup>

Furthermore, deterioration of mental health status such as depression and suicide increased in the Iranian population during the severe economic sanction period.<sup>29</sup>

Economic sanctions can be one of the most important causes of MS drug deficiency among MS patients in Iran, which results in many challenges and increased stress level with respect to receiving health care services among the affected population.<sup>8</sup>

Iran should provide a strategy to prevent suffering among chronically ill patients due to the adverse effects of sanctions to ensure their right to receive medication and health care services.<sup>30</sup>

## Conclusion

The access to necessary medicines for MS care and treatment has been reduced in Iran after the international sanctions, which has resulted in patients' increased stress level. It can be concluded

that economic sanctions have adversely affected MS patients' health. Moreover, the negative consequences are more remarkable among the most vulnerable groups including patients with low income.

### Conflict of Interests

The authors declare no conflict of interest in this

study.

### Acknowledgments

The authors wish to thank Tehran University of Medical Sciences for grant number 98-01-188-41871. Moreover, we would like to express our gratitude to Mrs. Shima Nahardani for her sincere cooperation.

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