Economic and Social Standing of Individuals in Iran Diagnosed with Multiple Sclerosis

Fereshteh Ghadiri, MD; Mohammad Ali Sahraian, MD; Fereshteh Ashtari, MD; Seyed Mohammad Baghbanian, MD; Nastaran Majdi-Nasab, MD; Hamidreza Hatamian, MD; Fardin Faraji, MD; Asghar Bayati, MD; Ehsan Sharifipour, MD; Nazanin Jalali, MD; Hossein Mozdehianpanah, MD; Hoda Kamali, MD; Saeideh Ayoubi, MSc; Sharareh Eskandarieh, PhD; Abdorreza Naser Moghadasi, MD

1Multiple Sclerosis Research Center, Neuroscience Institute, Tehran University of Medical Sciences, Tehran, Iran
2Isfahan Neurosciences Research Center, Isfahan University of Medical Sciences, Isfahan, Iran
3Department of Neurology, Booolicina Hospital, Mazandaran University of Medical Sciences, Sari, Iran
4Musculoskeletal Rehabilitation Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran
5Department of Neurology, School of Medicine, Poursina Hospital, Gilan University of Medical Sciences, Rasht, Iran
6Department of Neurology, School of Medicine, Arak University of Medical Sciences, Arak, Iran
7Department of Neurology, Shahrkord University of Medical Sciences and Health Services, Shahrkord, Iran
8Department of Neurology, Shohada Tajrish Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran
9Department of Neurology, School of Medicine, Rafsanjani University of Medical Sciences, Rafsanjan, Iran
10Department of Neurology, Qazvin University of Medical Sciences, Qazvin, Iran
11Neurology Research Center, Kerman University of Medical Sciences, Kerman, Iran

Abstract

Background: Multiple sclerosis (MS) may be affected by socioeconomic status (SES). This study aims to explore the determinants of SES among Iranian patients with MS and examine how these factors relate to disability and disease progression.

Methods: All patients with MS listed in the nationwide MS registry of Iran (NMSRI) until January 8, 2022, were included in this population-based study.

Results: Among the 5153 patients, most were female (74.5%), married (70.8%), and did not hold an academic degree (53.8%). Unemployment (OR: 3.75) and being unmarried (OR: 2.60) were significantly associated with Expanded Disability Status Scale (EDSS) ≥ 6, and the time to progression was shorter in the unemployed group (P value: 0.03). There was also a significant negative correlation between the time to progression and the age at disease onset.

Conclusion: The study suggests that providing financial and social support to MS patients and their families through investment could reduce both individual and societal burdens.

Keywords: Iran, Multiple sclerosis, Socioeconomic status


Introduction

Multiple sclerosis (MS) is a potentially disabling disease affecting different aspects of patients’ life. Its prevalence has been rising in recent years. In terms of productivity changes, 60 hours could be lost over three months due to MS. Aside from the probable physical disabilities, the cognitive aspects could also pose a substantial burden to the patients, their close ones, and the society.

Current evidence suggests a multifactorial model predisposing an individual to MS. Some studies mention culprit genes like HLA-DR15, besides 110 single nucleotide polymorphisms outside HLA regions, and female predominance, while many others highlight the role of environmental factors like Epstein-Barr virus, other viruses like cytomegalovirus and HHV-6, vitamin D, smoking, obesity, or the gene-environment interaction.

Socioeconomic status (SES) is a widely discussed matter in the field of MS. Although the exact definition of “socioeconomic status” is not well established, educational level, employment, income, and insurance coverage are its main components. It is considered to affect the incidence and progression of the disease, and access to treatment; it is also an aspect of patients’ lives that could be altered due to the disease. However, these associations are not quite straightforward. There are doubts about the exact mechanism and final determinants. Uncertain evidence suggests high SES level as a risk factor for developing MS. On the other hand, lower SES could be associated with a poorer outcome of the disease. One study by Mohtasham et al showed that the effect of some SES determinants like income and the education level of the fathers could be related to primary progressive MS.
method was used. For first-step univariate regression, $P$ value < 0.2; and for the final model, $P$ value < 0.05 were considered significant. To assure fulfilling logistic regression assumptions, Box-Tidwell test was used.

After informing the patients about the goals and structure of the study, they were free to enroll. Different access levels were used to reassure privacy and data security.

Results

After excluding incomplete files, data on a total of 5153 MS patients were evaluated. Their characteristics are summarized in Table 1. The majority of cases were female (74.5%), unemployed (65.1%), married (70.8%), and without an academic degree (53.8%).

Most female patients (n: 2851/3837, 74.3%) were housewives. Among men, 427 (32.4%) were unemployed.

Table 1. Basic Characteristics of the Participants

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (female)</td>
<td>3837 (74.5)</td>
</tr>
<tr>
<td>Mean age (SD)</td>
<td>36.3 (9.8)</td>
</tr>
<tr>
<td>Employment status</td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>1621 (31.5)</td>
</tr>
<tr>
<td>Unemployed</td>
<td>3357 (65.1)</td>
</tr>
<tr>
<td>Missing</td>
<td>175 (3.4)</td>
</tr>
<tr>
<td>Married</td>
<td>3647 (70.8)</td>
</tr>
<tr>
<td>Median family size (IQR)</td>
<td>4 (3-4)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>Illiterate</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Without academic degree</td>
<td>2770 (53.8)</td>
</tr>
<tr>
<td>With academic degree</td>
<td>2300 (44.6)</td>
</tr>
<tr>
<td>Missing</td>
<td>83 (1.6)</td>
</tr>
<tr>
<td>Housing</td>
<td></td>
</tr>
<tr>
<td>Owning a home</td>
<td>3594 (69.7)</td>
</tr>
<tr>
<td>Rental accommodation</td>
<td>1444 (28.0)</td>
</tr>
<tr>
<td>Missing</td>
<td>115 (2.2)</td>
</tr>
<tr>
<td>No health insurance coverage</td>
<td>79 (1.5)</td>
</tr>
<tr>
<td>MS type</td>
<td></td>
</tr>
<tr>
<td>Relapsing</td>
<td>4247 (82.4)</td>
</tr>
<tr>
<td>Progressive</td>
<td>830 (16.1)</td>
</tr>
<tr>
<td>Missing</td>
<td>76 (1.5)</td>
</tr>
<tr>
<td>Mean onset age (SD)</td>
<td>29.3 (8.9)</td>
</tr>
<tr>
<td>Median diagnosis delay (IQR), year</td>
<td>≥0 (0-1)</td>
</tr>
<tr>
<td>Median time to progression (IQR), year</td>
<td>8 (4-12)</td>
</tr>
<tr>
<td>Family history of MS</td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>926 (18.0)</td>
</tr>
<tr>
<td>Negative</td>
<td>4079 (79.2)</td>
</tr>
<tr>
<td>Missing</td>
<td>148 (2.9)</td>
</tr>
<tr>
<td>EDSS ≥ 6</td>
<td>239 (4.6)</td>
</tr>
<tr>
<td>Using assistance equipment</td>
<td>371 (7.2)</td>
</tr>
<tr>
<td>Positive history of physical rehabilitation</td>
<td>677 (13.1)</td>
</tr>
</tbody>
</table>

SD, standard deviation; IQR, interquartile range.

*For quantitative variables, mean (SD) or median (IQR) are shown.
Also, 211 patients (4%) were divorced at the time of the study. The mean age of unemployed men (39 ± 12.6) was significantly higher than those with a job (35.8 ± 9.1) (P value < 0.001). Out of 88 patients who declared a reason for their divorce, 25 (28%) stated MS as the reason. Having an academic degree was significantly associated with being employed (OR: 3.51, P value < 0.001).

Family history of MS was not significantly associated with any of the demographic, socioeconomic, and disease characteristics.

Considering EDSS ≥ 6 as the outcome measure, gender and age were fixed in the multivariable model. Of all socioeconomic determinants, unemployment and not being married were significantly associated with EDSS ≥ 6 (Table 2).

Time from the onset of the disease to progression was not normally distributed (P value < 0.001). It was found that time to progression was significantly less in the unemployed group (P value: 0.03). Besides, a significant negative correlation was found between time to progression and age at disease onset (rho: - 0.22, P value < 0.001).

Discussion

This study depicts a clear view of the SES of Iranian MS patients.

The unemployment rate of 65% in general and 32.4% in men seems notable, compared to the reported unemployment rate of 9.4% in Iran in 2020. The higher mean age of unemployed men (39.3) (compared to 35.8 in men with a job) is another point to consider. Although the difference is not large, it may point to more job losses as time passes. Added to the facts that most Iranian MS cases are in this age range, many unemployed cases have families of around four, around 54% of the patients do not have an academic degree, and 28% do not own a house, this calls for the attention to the issues of employment and income in this group. This would aid patients in leading an independent life. Besides, solving these problems could reduce the considerable burden of the disease on the society.

Only a minority (n = 79, 1.5%), did not have any health insurance coverage. As MS treatment and follow-up could be quite expensive in Iran without insurance, the reasons for no coverage in even this small group should be investigated and solved.

Progression is an important subject in MS, imposing a considerable socioeconomic burden on the patient and the society. It is important to delay it, or once started, reduce its speed in order to limit the resulting disabilities. Around 16% of Iranian patients were in the progressive phase. Other studies estimate the frequency of progressive MS at 11% in Kermanshah (western Iran), and 14% in East Azerbaijan (northeastern Iran). The prevalence of progressive cases is around 14% in Denmark and Chile, around 27% in Germany, and 8% in Argentina. The difference in the statistics could be the result of the study population and variable definitions. For example, in the German study, only + 18-year-old cases were included, or in the survey from Argentina, secondary-progressive MS (SPMS), relapsing-remitting MS (RRMS), and clinically isolated syndrome (CIS) cases were considered relapsing-onset versus PPMS cases as progressive-onset MS.

The observed correlation of the mean onset-age with time to progression is in line with the results of a Swiss study by von Wyl et al, along with older studies. The higher inflammatory (and less degenerative) nature of the earlier-onset MS is the proposed underlying mechanism.

About 18% of participants had a family history of MS, which is in line with the results of another study from Iran (19%). However, as predicted for genetic predisposition, regional variances have been found. We could not find any association between the familial history of MS and the basic characteristics of the patients. However, in a study by Salehi et al, female gender and the RRMS/SPMS phenotypes were more frequent among familial cases but no such association was found regarding EDSS. A systematic review in 2021 estimated the prevalence of familial MS at around 11%. No association of gender with familial form was found.

EDSS ≥ 6, indicating significant disability, was significantly higher in males and older patients as predicted. Its relation to unemployment and not being married is complicated. Both could be considered as possible predisposing factors and also consequent effects of the disease. A French study used European Deprivation Index and showed higher risk of reaching EDSS > 6 in more socioeconomically deprived patients. In the study by Harding et al, neighborhood-level average income was used as a measure of SES. They showed the higher SES levels could delay disability progression. From another point of view, job loss could be due to MS-related disabilities which highlights the need for work adaptations. In our study, unemployed cases progressed sooner than the others. Ware et al, using both neighborhood-level and participant-level indicators (education level), presented evidence that socioeconomic disparity is associated with an enhanced neurodegeneration process.

With regard to marriage, cultural factors in Iran complicate final decisions based on current findings. Some partnered people may not declare their relationship status. In addition, the reasons for divorce or being single could not be exactly elucidated. Besides, the cultures differ in urban and rural areas and different cities. But generally, it is important to bear in mind that spousal support is

<table>
<thead>
<tr>
<th>Variable</th>
<th>Exp (B) (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male gender</td>
<td>2.80 (2.04 – 3.84)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Age (y)</td>
<td>1.11</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Not married</td>
<td>2.63 (1.90 – 3.64)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Unemployment</td>
<td>6.15 (3.82 – 9.90)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

B, beta coefficient; CI, confidence interval; Exp (B), exponential B that equals to odds ratio (OR) for qualitative variables.
crucial for rehabilitation.49

Regarding rehabilitation, around 140 patients with EDSS < 6 use assistance equipment. This could indicate that some cases have to use this equipment in some special occasions. If proven, this should be taken into consideration in policy making for supporting these patients.

There is much recent insistence on motor rehabilitation in MS as a therapeutic option that could even change MRI markers.50 However, only 13% of our patients used such programs. As there is no precise data on the details of patients’ symptoms in our database, one could comment that not many of the patients might have motor weakness and so benefited from physical therapy or occupational treatment. Another explanation is the relative young age of the patients. One could speculate that as the mean age of the patients rises,51 there will be greater need for rehabilitation. Another point regarding MS care and services in Iran is that more than half of the subjects (51.9%) mentioned experiencing high stress level for increased costs of rehabilitation services51 while people with MS need long-term rehabilitation care.52

Iran is a country with a heterogeneous socioeconomic structure. In-country (rural to urban areas, small to big cities) immigration, access to medical facilities,53 and significant regional inequality54 complicate socioeconomic investigations in the country. Besides, this study relies on patients’ reports on variables like employment, housing, marriage history, family history, and using rehabilitation that could be biased. Our study design also bears the common limitations of a database method which may not be the best way to investigate a correlation. It should be emphasized that no final judgement could be made on the causative relationship between presumed determinants and outcome measures in the absence of more robust evidence. In other words, MS could affect and also be affected by socioeconomic performance of the patients. However, in the absence of stronger evidence, this could be the first step. Only including patient-related indicators could be considered another limitation. It is encouraged that neighborhood indicators are investigated in future reports.

In conclusion, the evidence shows that SES is an important factor in MS disease course. Investments in supporting MS patients and their families, financially and socially, could enhance this group’s physical and mental health, reducing the rate of progression, and decreasing the final burden of the disease on the individuals and the society.

Authors’ Contribution
Data curation: SAeiedeh Ayoubi, Sharareh Eskandarieh.
Formal analysis: Fereshteh Ghadiri, Sharareh Eskandarieh.
Funding acquisition: Fereshteh Ghadiri.
Methodology: Sharareh Eskandarieh.
Project administration: Sharareh Eskandarieh, Abdorreza Naser Moghadasi.
Writing–original draft : Fereshteh Ghadiri.

Competing Interests
The authors declare that they have no conflict of interest.

Ethical Approval
As mentioned in the methods section, enrollment was optional. The project protocol has been approved by the ethical committee of Tehran University of Medical Sciences (IR.TUMS.NI.REC.1400.016).

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References


42. Scalfari A, Neuhaus A, Daumer M, Deluca GC, Muraro PA, Ebers GC. Early relapses, onset of progression, and late outcome in multiple sclerosis. JAMA Neuro. 2013;70(2):214-