Background: The epidemiologic data on demographic features of early-onset multiple sclerosis (EOMS) are rare in the Middle East, and no previous study has explored it. We aim to perform a neuroepidemiologic analysis to emphasize on the demographic features of EOMS in Tehran, Iran, during 2005–2015. Materials and Methods: Our study was performed in Tehran, Iran; the research included patients with EOMS who had experienced their first symptoms before the age of 18 years and those who were referred to Iranian Multiple Sclerosis Society in Tehran during 2005–2015. A total of 300 patients were contacted and filled the checklists by themselves or the physician. The checklist contained data about gender, age at the onset, the first symptom, time interval between the first presentation and the diagnosis, clinical course, family history of MS, and history of smoking in parents. Results: Among the patients with EOMS, 78% were female and 22% were male. Average age of disease onset was 15.6 years (standard deviation, 2.6 years), mean time interval between the first symptoms and disease diagnosis was 16.8 months, the shortest time interval measured was 0.1 month, and the longest time interval was 144 months. The first symptom at the onset of the disease was ocular in 140 patients and sensory in 82 patients. Approximately 16.7% of the patients had a positive family history for MS. The most common clinical course of disease was relapsing-remitting MS (RRMS). Parental smoking history was negative in 63.3% of the patients. Conclusion: In our study, the EOMS was higher in females. Despite the earlier studies, it was found that the polysymptomatic onset was not very common. Optic neuritis was the most initial presentation and RRMS was the most frequent course.

Keywords: multiple sclerosis, early onset multiple sclerosis, MS demographic findings

Introduction

Multiple sclerosis (MS) is one of the most common inflammatory demyelinating diseases of central nervous system and is one of the main causes of nontraumatic disability in young adults.[1,3] Pathogenesis of MS is not yet completely known.[1] Disease incidence in women is 1.6:1 to 2.1:1, which is higher than that in men.[2] MS has both genetic and environmental risk factors including smoking, Epstein–Barr virus infection, and vitamin D deficiency.[3,4,5] Patients’ age at the onset of the disease is between 10 and 60 years, but the peak age is between 20 and 30 years.[2] Early-onset MS (EOMS) is characterized with the first symptoms before the age of 18 years and is seen almost in 5% of the patients.[3] The first case of EOMS was proven by the autopsy of an 8-year-old boy in 1896.[8] EOMS is sometimes diagnosed with an interval of 2–5 years after the occurrence of first symptoms because of unusual presentations. It may begin with acute presentations such as fever, seizure, and acute disseminated encephalomyelitis, which can mislead the physicians to a wrong diagnosis.[4,9]

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How to cite this article: Omrani F, Sahraian MA, Saeen AA, Omrani Z, Hayeri G. Early-onset multiple sclerosis: Reports of 300 patients from Iran. J Pediatr Neurosci 2018;13:137-40.
MS has four types of clinical course: relapsing-remitting MS (RRMS), primary progressive MS (PPMS), secondary progressive MS (SPMS), and progressive relapsing MS (PRMS).\textsuperscript{[1,2]} Generally, 40% to 60% of the EOMS cases experience their first relapse after 1 year.\textsuperscript{[3,5]}

Epidemiological data on demographic features of EOMS are rare in the Middle East. In this study, we aim to emphasize on demographic features of patients with EOMS in Iranian Multiple Sclerosis Society, Tehran, Iran.

**SUBJECTS AND METHODS**

Our study was performed in Tehran, the capital of Iran, which is the largest city in Western Asia with a population of around 8.3 million and an area of around 686.3 km\textsuperscript{2}. It is located between latitudes 35\textdegree{} and 42\textdegree{} north and longitudes 51\textdegree{} and 25\textdegree{} east. This research included patients with EOMS, who had experienced their first symptoms before the age of 18 years and were referred to Iranian Multiple Sclerosis Society in Tehran during the last 10 years (from April 2005 to March 2015). We designed a checklist to collect the information we needed. The checklists were filled in by patients, their parents, or from the patients’ documents in the archive of the Iranian MS Society. The checklist contained data about gender, age at onset, the first symptoms, time interval between the first presentation and the diagnosis, clinical course, family history of MS, and history of smoking in parents. Statistical analysis was carried out with Statistical Package for the Social Science (SPSS) software, version 16, and the descriptive analysis of the aforementioned variables was performed.

**RESULTS**

In this study, among 300 patients with EOMS referred to Iranian Multiple Sclerosis Society during the last 10 years, it was found that 234 patients were female (78\%) and 66 were male (22\%) [Figure 1].

First symptom at the onset of disease in 140 patients (46.7\%) was ocular, and in 82 patients (27.3\%), it was sensory. A total of 30 patients (10\%) were polysymptomatic at the onset [Figure 2, Table 1].

Of the 300 patients, 50 patients (16.7\%) had a positive familial history for MS whereas 250 patients (88.3\%) had no familial history [Figure 3].

The most common clinical course of disease was relapsing remitting in 240 patients (80\%). Thirty-eight patients of 300 patients (12.7\%) were secondary progressive [Figure 4, Table 2].

Parental smoking history was negative in 190 patients (63.3\%) and positive in 110 patients (36.7\%) [Figure 5]. The patients were divided into two groups: the group under the age of 15 years consisted of 24.6\% patients, and the one between the age of 15 and 18 years consisted of 75.3\% patients [Figure 6].

On the basis of age group analysis, the least MS frequency was found at the age of 11 years. The MS prevalence age increased with age, that is, between 13 and 18 years.
Average age of disease onset was 15.6 years (standard deviation, 2.6 years), among whom the youngest patient was 4 years old and the oldest patient was 18 years. Mean time interval between the first symptoms and disease diagnosis was 16.8 months (standard error of the mean, 1.8 month). The shortest time interval measured was 0.1 month and the longest time interval was 144 months [Figure 7].

**DISCUSSION**

In literature, EOMS is defined by first presentations before the age of 16 years. In our study, we decided to define EOMS before the age of 18 years because the university entrance exam, one of the most stressing exams in our country, is taken at this age. Among the patients with EOMS, prevalence of true childhood MS (which is defined before the age of 10 years) was 4.6% whereas it was 0.6% in a study of EOMS in Isfahan, Iran. In another study by Chitnis in 2009 in the United States, it is reported that 3.6% of the patients had their first symptoms before the age of 18 years. [26]

On the basis of earlier studies, it was found that female/male ratio in EOMS is higher than that in adult MS; this ratio in adulthood is 1.6 to 2.1, and in EOMS it is between 2.2 and 3. In our study, female/male ratio is 3.5. The female preponderance in our study is higher than that in the earlier studies. [4,9]

In literature, polysymptomatic presentation is more frequent in patients with EOMS than in adult patients (48.9% vs. 12%). [10,13-18] In addition, monosymptomatic
onset in EOMS is more frequent than polysymptomatic onset (49%–62% vs. 48.9%). In our study, unlike earlier studies, polysymptomatic onset was not very common (10%). In contrast to earlier studies in which brain stem or cerebellar syndromes were the most common initial presentations, optic neuritis was the most common initial presentation found in our study (46.7%).

In our study, RRMS was the most frequent course (80%) followed by SPMS (12.7%). This finding was consistent with that reported other studies in which RRMS was the most common form (32%–84%; mean, 67%), followed by SPMS (7%–61%; mean, 24.4%).

In our study, 16.7% of the patients had a positive family history for MS, compared to 8.7% reported in an earlier study in Iran.

**Financial support and sponsorship**
Nil.

**Conflicts of interest**
There are no conflicts of interest.

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