Clinical and demographic features in Iranian multiple sclerosis patients: a systematic review and meta-analysis

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Aim: This study was conducted to determine the clinical and demographic features in Iranian multiple sclerosis (MS) patients including clinical courses, positive MS family history, disability and age of disease onset. **Materials & methods:** All stages of the study were reported according to the PRISMA guidelines. A systematic review of published literature in Persian and English journals with a comprehensive search was conducted on English international databases including Scopus, PubMed/Medline, Cochrane Library, Science Direct, Web of Science, Embase, PsycINFO, as well as the Google Scholar search engine and national databases. **Results:** The prevalence of clinical courses of relapsing remitting, primary progressive, secondary progressive and relapsing progressive in Iranian patients with MS was 77.1% (95% CI: 72.2–81.3), 6.2% (95% CI: 4.1–9.2), 9.5% (95% CI: 6.8–13.1) and 0.4% (95% CI: 0.2–0.8), respectively. Positive family history of MS in Iranian MS patients was 8.9% (95% CI: 6.9–11.4). The mean age of disease onset was 28.9 years (95% CI: 27.8–30.1). **Conclusion:** The results of this meta-analysis in an Iranian population can provide useful information for neurologists and healthcare.

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Keywords: age of onset • disability • Iran • meta-analysis • multiple sclerosis • prevalence

Multiple sclerosis (MS) is an inflammatory demyelinating disease of the CNS, in which the protective sheath of the myelin that covers the nerve cells is destroyed and can cause permanent disability in the patient [1,2]. The exact pathophysiology of MS is not known, but it seems to be a multifactorial disorder associated with genetic talents and environmental triggers [2].

It is a common neurological disorder in adults and affects about 2.3 million people around the world. The disease is often seen as an active population in people aged 20–40 [3]. Clinical manifestations of MS include opiate neuritis, central paralysis, sensory imbalance, disturbances, cognitive impairment, fatigue and sleep disorders. For this disease, four clinical forms have been defined: relapsing remitting (RR), primary progressive (PP), secondary progressive (SP) and relapsing progressive (RP) [4,5]. Iran is a Muslim country in the Middle East and latitude of 32°00 and longitude of 53°00 and has 31 provinces. There are various ethnic groups, including Fars, Kurds, Mazani, Gilak, Lor, Turks, Arabs and Baluchis, and are now united under Iranian culture. Based on the 2013 Atlas of the MS, the Middle Eastern and North African countries are in the low to moderate danger zone [6]. However, recent studies report a moderate to high MS incidence in these areas, especially among women [7–11].

According to Kurtzke based on geographical areas, Iran is in a low prevalence region of MS (0–4 per 100,000 people) [12,13]. But according to a recent meta-analysis (2019), its incidence and prevalence in Iran was estimated 3.4 per 100,000 and 29.3 per 100,000 people, respectively. Over time, the incidence and prevalence has increased significantly [14].

In Iran, several epidemiological studies have been conducted among MS patients, and so far no meta-analytical studies have been conducted among them [15–18]. In systematic review and meta-analysis, a comprehensive picture of the dimensions of a problem in society can be found in the process by examining all the documents and combining them [19–21]. Therefore, the present study was conducted to evaluate the clinical and demographic features in Iranian MS patients including clinical courses, positive MS family history, disability and age of disease onset.

Materials & methods

Study protocol

The stages of the study include the search, selection of studies, quality assessment, data extraction and statistical analysis were reported according to the PRISMA guidelines for systematic review and meta-analysis [21].

Search strategy

A systematic review of published literature in Persian and English journals with a comprehensive search was conducted on six national databases including Barakat Knowledge Network System (<http://health.barakatkns.com/>), Magiran (<http://www.magiran.com/>), Iranian Research Institute for Information Science and Technology (IranDoc) (<https://irandoc.ac.ir/>), Scientific Information Database (SID) (<http://www.sid.ir/>), Iranian National Library (<http://www.nlai.ir/>) and Regional Information Center for Science and Technology (RICST) (<http://en.ricest.ac.ir/>) and seven English international databases including Scopus, PubMed/Medline, Cochrane Library, Science Direct, Web of Science, Embase, PsycINFO, as well as the Google Scholar search engine. For this purpose, the medical subject headings (MeSH) keywords for English databases and their Persian equivalents were used for Persian databases. These keywords include: 'Incidence', 'Prevalence', 'Age of Onset', 'Epidemiology', 'MS', 'Multiple Sclerosis', and 'Iran'. A combination of words was searched with the AND & OR Boolean operators. The combined search was as follows: ("Multiple Sclerosis"[Title/Abstract] OR "Disseminated Sclerosis"[Title/Abstract] OR "MS"[Title/Abstract]) AND ("Age of Onset"[Title/Abstract] OR "Incidence"[All fields] OR "Prevalence"[Title/Abstract] OR "Epidemiology"[Title/Abstract]) AND ("Iran"[Title/Abstract/Affiliation]). The search period was determined to be until April 2017. We investigated the search strategy with a list of references for referenced articles and relevant overviews to identify potentially deleted articles. Finally, we contacted to corresponding author for more information through email.

Inclusion & exclusion criteria

Inclusion criteria according to PICO (according to Evidence Based Medicine) [21]: population: epidemiological studies on MS patients; intervention: Poser or McDonald criteria to confirm MS; comparison: that can show the prevalence of MS clinical courses, positive MS family history and age of disease onset based on region; outcome: estimating the prevalence of MS clinical courses, positive MS family history, mean of age of disease onset, and disability in patients with MS.

The exclusion criteria were: nonrandom sample size; sample size other than MS patients; non-Iranian sample size; qualitative studies; non-relevance to the subject; review articles, case reports and letter to editor and duplicates.

Quality assessment

The researchers assessed the quality of selected articles using a scoring system (10 points) based on the modified Newcastle Ottawa Scale for cross-sectional studies [22]. The minimum score for entering the quantitative meta-analysis process was five and the articles that received the qualitative assessment score entered the process of data extraction and meta-analysis.

Data extraction

Data extraction was performed independently by two researchers, and in case of disagreement, with a third researcher. Data extraction sheet included first author, year of publication, year of study, study design, sample size, location of study, geographical area, province, prevalence and number of each MS clinical courses (RR, PP, SP and RP), mean and standard deviation (SD) of the onset of the disease, mean and SD of the expanded disability status scale (EDSS), and the MS diagnostic method.

Statistical analysis

In order to estimate the standard error and the prevalence in each study, normal distribution and binomial distribution were used, respectively. To evaluate the effect of gender (male to female ratio) on each of the clinical courses (RR, PP, SP and RP) of MS and positive family history of MS, odds ratio (OR) and for age at onset of disease and EDSS, standard mean difference (SMD) was used. Cochran's Q test and I^2 index were used to study the heterogeneity of the studies. In moderate heterogeneity ($I^2 = 25\text{--}49\%$), substantial heterogeneity ($I^2 = 50\text{--}74\%$) and high heterogeneity ($I^2 = 75\text{--}100\%$), a random effects model was used and in low heterogeneity ($I^2 < 25\%$), a fixed effects model was adopted [23]. In this study, the sensitivity of the analysis were also examined. The subgroup analysis was performed in terms of geographic area. The publication bias was studied based on funnel plot as well as Egger and Begg's tests. Meta-regression model was used for each of the clinical courses of MS, and age of onset of the disease based on the year of study. Finally, the data were analyzed using comprehensive meta-analysis version 2. The significance level of the tests was considered less than 0.05.

Results

Study characteristics & methodological quality

Of the 460 primary searches using the search strategy, 230 duplicate studies and 140 irrelevant studies were deleted and 90 potentially relevant studies were retrieved. By reviewing the full text of the articles, 50 articles were excluded from the study (non-MS or non-Iranian patients ($n = 23$), nonrandom sample size ($n = 17$), review articles, case reports and letter to editor ($n = 5$) and inadequate data according to the data extraction checklists ($n = 5$)). Finally, 40 studies with a sample of 42,472 MS patients were reviewed. All studies had to score more than five in quality assessment. The flow diagram of the study and selection identifier is illustrated in Figure 1 and the characteristics of the studies are shown in Table 1.

Clinical courses in Iranian MS patients

Pooled prevalence

The prevalence of clinical courses of RR, PP, SP and RP in patients with MS was 77.1% (95% CI: 72.2–81.3), 6.2% (95% CI: 4.1–9.2), 9.5% (95% CI: 6.8–13.1) and 0.4% (95% CI: 0.2–0.8), respectively (Figure 2).

Meta-regression

Meta-regression model for clinical courses of RR, PP, SP and RP based on the year of study is shown in Figure 3 and p-value for RR, PP, SP and RP is 0.53, 0.91, 0.23 and 0.67, respectively and were not statistically significant.

Subgroup analysis

The prevalence of MS clinical courses in the five geographical regions of Iran was shown in Table 2 and there was no significant difference in clinical courses of RR, PP, SP ($p > 0.05$) but in RP this difference was significant ($p = 0.015$) (Table 2).

Pooled prevalence based on gender

The prevalence of clinical courses of MS (male vs. female) was estimated for RR (68.4 vs. 77.9%), PP (10.2 vs. 5.8%), SP (14.8 vs. 12.8%) and RP (0.6 vs. 0.4%) (Table 2).

Age at the onset of disease

Pooled estimate

The mean age of disease onset in 17 studies with a sample size of 30,088 MS patients was 28.9 years (95% CI: 27.8–30.1). The lowest and highest age of disease onset was studied in Mazandaran (25.3 years) and Qom (34.2 years), respectively (Figure 4A).

Meta-regression

Meta-regression for the mean age of disease onset based on the year of study is shown in Figure 5 and was not statistically significant ($p = 0.46$).

Figure 1. PRISMA flowchart.

EDSS: Expanded Disability Status Scale; MS: Multiple sclerosis.

Subgroup analysis

Subgroup analysis of the mean age of disease onset in MS patients in terms of region in Table 2 shows that the lowest and highest mean age of disease onset was in the Eastern region (27.67 years) and Northern region (28.62 years), respectively. There was no significant difference ($p = 0.129$) (Table 2).

Pooled estimate based on gender

The mean age of disease onset in males and females patients with MS was 28.67 years (95% CI: 27.7–29.6) and 27.96 (95% CI: 26.7–29.2), respectively. The difference was statistically significant ($p < 0.001$) (Table 3).

Disability based on EDSS

Pooled estimate

In 15 studies with 5374 MS patients, the mean EDSS was 3.13 (95% CI: 2.61–3.65) (Figure 4B).

Subgroup analysis

The mean EDSS in patients with MS in the Center, East, North and South regions of Iran was 3.45, 2.90, 2.77 and 2.93, respectively. There was no significant difference ($p = 0.516$).

Meta analysis

Meta analysis

Figure 2. Prevalence of clinical courses of relapsing-remitting (A) primary progressive (B) secondary progressive (C) relapsing progressive (D) in Iranian multiple sclerosis patients. Random effects model.

C

Statistics for each study

Meta analysis

D

Statistics for each study

Meta analysis

Figure 2. Prevalence of clinical courses of relapsing-remitting (A) primary progressive (B) secondary progressive (C) relapsing progressive (D) in Iranian multiple sclerosis patients. Random effects model (cont.).

Table 1. Summary of demographic characteristics in studies into a meta-analysis.

Study	Year of study	Study type	Place	Diagnostic criteria	Sample size			Ref.
					All	Male	Female	
Izadi S (2015)	2013	Population based	Fars	McDonald	3354	665	2689	[15]
Ashjzadeh N (2015)	2010	Cross-sectional	Fars	McDonald	100			[16]
Izadi S (2015)	2011	Population based	Fars	McDonald	2535			[17]
Jajvandian R (2011)	2005–2011	Population based	North Khorasan	McDonald	105			[18]
Majdinasab N (2012)	2005–2011	Population based	Khuzestan	McDonald	1057			[24]
Etemadifar M (2010)	2003–2010	Cross-sectional	Isfahan	McDonald	3522	806	2716	[25]
Dehghan-Nayeria N (2017)	2016	Cross-sectional	Tehran	McDonald	128			[26]
Choobforouszade A (2016)	2014	Cross-sectional	Yazd	McDonald	108			[27]
Etemadifar M (2013)	2003–2013	Population based	Isfahan	McDonald	4536	1028	3508	[8]
Saman-Nezhad B (2012)	2012	Population based	Kermanshah	McDonald	448	115	333	[28]
Moghtaderi A (2012)	1996–2006	Cross-sectional	Sistan and Balouchestan	McDonald	206	65	141	[29]
Taraghi Z (2007)	2006	Cross-sectional	Mazandaran	McDonald	101			[30]
Pourmemari MH (2011)	2001–2005	Cross-sectional	Zanjan	McDonald	96			[31]
Lasemi E (2011)	2010	Cross-sectional	Tehran	McDonald	400			[32]
Khoshravesh S (2016)	2014	Cross-sectional	Kordestan	McDonald	800			[33]
Danesh-Sani SA (2013)	2010–2011	Cross-sectional	Razavi Khorasan	McDonald	510			[34]
Ashtari F (2011)	2007	Cross-sectional	Isfahan	McDonald	593	100	493	[35]
Hojjati SM (2015)	2002–2012	Cross-sectional	Mazandaran	McDonald	266	78	188	[36]
Saadat SMS (2014)	2010	Cross-sectional	Guilan	McDonald	160			[37]
Rezapoor A (2017)	2013	Cross-sectional	Fars	McDonald	171			[38]
Torabipour A (2014)	2012	Cross-sectional	Khuzestan	McDonald	332			[39]
Alehashemi A (2015)	2013–2014	Cross-sectional	Razavi Khorasan	McDonald	100	25	75	[40]
Taraghi Z (2010)	2005–2006	Cross-sectional	Mazandaran	McDonald	100			[41]
Karampoor S (2016)	2010	Cross-sectional	Tehran	McDonald	700			[42]
Ayatollahi P (2007)	2007	Cross-sectional	Tehran	McDonald	106			[43]
Ghajarzadeh M (2012)	2008–2009	Cross-sectional	Tehran	McDonald	100			[44]
Nabavi SM (2006)	2002	Cross-sectional	Tehran	McDonald	203			[45]
Mohammadi K (2013)	2009–2010	Cross-sectional	Tehran	McDonald			226	[46]
Saberi A (2012)	2008–2010	Cross-sectional	Guilan	McDonald	209	54	155	[47]
Sahraian MA (2010)	1999–2010	Cross-sectional	Tehran	McDonald	8146	2258	5888	[48]
Saadatnia M (2007)	2003–2006	Cross-sectional	Isfahan	McDonald	1718	388	1083	[49]
Khanjani Z (2012)	2011	Cross-sectional	Tehran	McDonald	80	24	54	[50]
Kargarfard M (2012)	2010	Cross-sectional	Isfahan	McDonald	328	208	120	[51]
Abedini M (2008)	2007	Cross-sectional	Mazandaran	McDonald	582	161	421	[52]
Kalanie H (2003)	1996–2001	Cross-sectional	Tehran	McDonald	200	56	144	[53]
Elhami SR (2011)	1989–2009	Population based	Tehran	McDonald	7896	2008	5588	[54]
Hashemilar M (2011)	2005–2009	Population based	East Azerbaijan	McDonald	1000	269	731	[55]
Ebrahimi HA (2013)	2013	Population based	Kerman	McDonald	762	188	744	[56]
Asgari A (2015)	2009–2014	Cross-sectional	Tehran	McDonald	122	45	77	[57]
Rezaali S (2013)	2011	Population based	Qom	McDonald	592	132	449	[58]

EDSS based on gender

The mean EDSS in males and females patients with MS was 3.48 (95% CI: 2.76–4.20) and 3.14 (95% CI: 2.46–3.83), respectively. There was no significant difference ($p = 0.907$) (Table 3).

Figure 3. Association of clinical courses of relapsing-remitting (A) primary progressive (B) secondary progressive (C) relapsing progressive (D) and year of study in Iranian multiple sclerosis patients.

Family history of MS

Pooled prevalence

The prevalence of positive family history in patients with MS was 8.9% (95% CI: 6.9–11.4). The lowest prevalence was in a study in Kermanshah (1.2%) and the highest prevalence was in a study in Isfahan (20.1%) (Figure 6).

Subgroup analysis

The family history of MS was estimated in the Central 11%, Eastern 10.1%, Northern 7.1% and Western 3.8% regions of Iran. The difference in family history of MS between regions was not significant ($p = 0.101$) (Table 2).

Figure 3. Association of clinical courses of relapsing-remitting (A) primary progressive (B) secondary progressive (C) relapsing progressive (D) and year of study in Iranian multiple sclerosis patients (cont.).

Pooled prevalence based on gender

In Table 3, the prevalence of MS family history was shown in males (13%; 95% CI: 10.6–15.8) and females (8.6%; 95% CI: 4.5–15.9). The positive family history of MS in men were significantly higher than women (OR = 1.37; $p = 0.018$).

Sensitivity analysis

Sensitivity analysis showed a robust point estimate by removing a single study at the same time for the clinical courses (RR, PP, SP and RP), the mean age of disease onset, EDSS and MS family history (Supplementary Figure 1).

Figure 4. The mean age of disease onset (A) and the mean EDSS (B) in Iranian multiple sclerosis patients. EDSS: Expanded disability status scale.

Table 2. Subgroup analysis of of relapsing remitting, primary progressive, secondary progressive and relapsing progressive, age of disease onset, family history and EDSS in multiple sclerosis patients based on region.

Variables		Studies (N [†])	Sample (N)	Heterogeneity		95% CI [‡]	Overall (%)
				I [‡]	p-value		
Relapsing remitting	Center	10	12,730	95.71	<0.001	73.4–83	78.5
	East	2	306	90.47	0.001	53.7–89.2	75.6
	North	5	2190	0	0.42	0.42–1.12	0.69
	South	6	7204	96.89	<0.001	67.7–80.7	74.7
	Test for subgroup differences: Q = 0.895, df (Q) = 3, p = 0.827						
Primary progressive	Center	8	11,934	96.80	<0.001	3.7–11.2	6.6
	East	2	306	91.34	0.001	1.2–42.2	8.7
	North	4	2057	87.65	<0.001	3.3–9.8	5.8
	South	5	3900	98.78	<0.001	0.5–24.6	5
	Test for subgroup differences: Q = 0.291, df (Q) = 3, p = 0.962						
Secondary progressive	Center	8	11,934	96.60	<0.001	6.9–19.7	11.9
	East	2	306	67.89	0.078	4.9–17.3	9.4
	North	4	2057	77.62	0.004	8.3–16.1	11.6
	South	5	3900	95.65	<0.001	2.7–13.9	6.3
	Test for subgroup differences: Q = 2.213, df (Q) = 3, p = 0.529						
Relapsing progressive	Center	6	10,094	34.55	0.177	0–0.5	0.1
	East	2	306	0	0.348	0.7–4.2	1.7
	North	3	1475	74.48	0.020	0.1–7	0.8
	South	4	3568	0	0.618	0.5–1	0.7
	Test for subgroup differences: Q = 10.475, df (Q) = 3, p = 0.015						
Positive family history	Center	6	3599	88.63	<0.001	8.1–14.9	11
	East	2	716	89.90	0.002	4.1–22.8	10.1
	North	3	1201	0.87	0.99	5.8–8.7	7.1
	West	2	1248	96.08	<0.001	0.4–26.6	3.8
	Test for subgroup differences: Q = 6.23, df (Q) = 3, p = 0.101						
		Studies (N)	Sample (N)	Heterogeneity		95% CI	Overall (mean)
				I [‡]	p-value		
Age at onset of disease	Center	11	26,968	99.47	<0.001	27.75–30.74	29.25
	North	4	1892	98.49	<0.001	25.24–31.99	28.62
	South	2	1228	0	0.430	27.22–28.13	27.67
	Test for subgroup differences: Q = 4.08, df (Q) = 2, p = 0.129						
EDSS	Center	7	3274	98.96	<0.001	2.83–4.07	3.45
	East	1	100	0	–	2.44–3.35	2.90
	North	4	735	99.48	<0.001	1.56–3.98	2.77
	South	3	1265	99.59	<0.001	1.18–4.68	2.93
	Test for subgroup differences: Q = 2.283, df (Q) = 3, p = 0.516						

[†] Number
[‡] Confidence interval.
df (Q): Degrees of freedom (Q); EDSS: Expanded disability status scale; I²: I-square; Q: Q test.

Publication bias

Publication bias was not significant for clinical courses of RR (p-value for Egger and Begg's tests was 0.824 and 0.127, respectively), SP (p-value for Egger and Begg's tests was 0.686 and 0.207, respectively), the mean age of disease onset (p-value for Egger and Begg's tests was 0.456 and 0.108, respectively), EDSS (p-value for Egger and

Figure 5. Association of the mean age of disease onset and year of study in Iranian multiple sclerosis.

Table 3. Clinical courses of MS, disability, age at onset of disease and multiple sclerosis family history by gender.									
Variables		Studies (N [†])	Sample (N)	Heterogeneity		95% CI [‡]	Pooled (%)	Ratio of males to females	
				I [‡]	p-value			OR [§] (95% CI)	p-value
Relapsing remitting	Male	8	3515	93.09	<0.001	60.1–75.6	68.4	0.88 (95% CI: 0.84–0.92)	<0.001
	Female	9	9150	97.32	<0.001	69.9–84.3	77.9		
Primary progressive	Male	8	3515	92.75	<0.001	6.2–16.3	10.2	1.71 (95% CI: 1.55–1.90)	<0.001
	Female	9	9150	94.19	<0.001	3.6–9	5.8		
Secondary progressive	Male	8	3515	93.27	<0.001	8.4–24.9	14.8	1.55 (95% CI: 1.14–2.09)	0.004
	Female	9	9150	93.9	<0.001	8.3–19.1	12.8		
Primary progressive	Male	4	2713	86.30	<0.001	0–0.87	0.6	2.49 (95% CI: 1.33–4.66)	0.004
	Female	5	7343	82.91	<0.001	0.01–2.1	0.4		
Positive family history of MS	Male	2	657	64.81	0.092	10.6–15.8	13	1.37 (95% CI: 1.05–1.77)	0.018
	Female	2	1814	93.54	<0.001	4.5–15.9	8.6		
Variables		Studies (N)	Sample (N)	Heterogeneity		95% CI	Pooled (mean)	Ratio of males to females	
				I ²	p-value			SMD [¶] (95% CI)	p-value
Age at onset of disease (year)	Male	10	3156	88.78	<0.001	27.70–29.65	28.67	1.05 (0.72, 1.37)	<0.001
	Female	9	8328	96.89	<0.001	26.70–29.23	27.96		
EDSS	Male	6	1219	97.71	<0.001	2.76–4.20	3.48	0.30 (-0.05, 0.67)	0.097
	Female	6	2899	97.71	<0.001	2.46–3.83	3.14		
[†] Number.									
[‡] Confidence interval.									
[§] Odds ratio.									
[¶] Standardized mean difference.									
EDSS: Expanded disability status scale; OR: Odds ratio; SMD: Standard mean difference.

Figure 6. A positive family history of multiple sclerosis in Iranian multiple sclerosis patients.

Begg's tests was 0.447 and 0.488, respectively), but was significant for MS family history (p-value for Egger and Begg's tests was 0.027 and 0.046, respectively) and clinical course of PR (p-value for Egger and Begg's tests was 0.003 and 0.363, respectively) (Supplementary Figure 2).

Discussion

The present study is the first systematic review and meta-analysis on published literature on MS clinical courses of RR, PP, SP and RP, age of disease onset, and positive family history in Iranian MS patients.

One of the main findings of this study, the RR course (77.1%) was the most common form of MS disease in Iran, followed by PP (6.2%), SP (9.5%), and RP (0.4%). The Meta regression model showed a reduction in the prevalence of RR clinical course and a increase in the prevalence of PP course in recent years but were not significant.

The findings are similar to those of other studies, indicating that the most common clinical form of clinical course are RR (between 33% and 96.8%), then PP (between 0.8% and 34.3%) and SP (2.4% and 57%) [59–68] and suggests that they are consistent with the results of this study.

The mean age of disease onset has been reported to be diverse in different studies: of 31.7 years in the study of TürkBörü [60], 30 years in the study of Ares [69], 34.6 years in the study of Bellantonio [62], 28.3 years in the study of Houzen [70] and 31.8 years in the study of Grytten [67]. In this study, the mean age of disease onset was 28.9 years.

In this study, the positive family history of MS were 8.9%. In other studies, positive family history have been reported among relatives to be between 5% and 26% [71]. In a meta-analysis study in Iran, the prevalence of familial MS was reported 11.4% (95% CI: 8.7–14.1) [72]. In addition, in an Italian study, for different types of MS, there is an increase in the prevalence of first-degree relatives, especially among siblings, compared with children and parents [73]. In Europe, the incidence of familial MS ranges from the lowest (2%) in Hungary to the highest (19%) in England. It varies from 3%–5% in North America to 10.5% in Mexico to 75%–78% in Argentina [74–77]. In a case-control study in Iran, an estimate of the increased risk associated with MS among patients with a positive family history was more than eight times [78].

In 5374 MS patients, the mean score of EDSS was 2.83. In other studies, EDSS has been reported in patients with MS to be 1.6–6 [59,61,65]. The EDSS is the most popular Kurtzke tool [79]. EDSS is clinician administered to assess the CNS. EDSS is used to describe the progress of disease in MS patients and to assess the effectiveness of therapeutic interventions in clinical trials. This order system is rated from 0 (normal nervous state) to 10 (death

due to MS) at an interval of 0.5 (when reaching EDSS 1). The lower scale values of the EDSS measure impairments based on the neurological examination, while the upper range of the scale (>EDSS 6) measures handicaps of patients with MS [80].

One limitation of this study is we not able to subgroup analysis based on Iranian subpopulation.

Conclusion

The results of this meta-analysis in Iranian population can provide useful information for neurologists and healthcare providers in the field of MS clinical courses, age of disease onset and disability in Iranian MS patients. This study showed that the most common clinical course in Iranian MS patients is RR. The prevalence of RR course during the studied years decreased and the prevalence of PP increased but were not significant.

Summary points

- The prevalence of clinical courses of relapsing remitting, primary progressive, secondary progressive and relapsing progressive in Iranian patients with MS was 77.1% (95% CI: 72.2–81.3), 6.2% (95% CI: 4.1–9.2), 9.5% (95% CI: 6.8–13.1) and 0.4% (95% CI: 0.2–0.8), respectively. This study showed that the most common clinical course in Iranian MS patients is RR.
- The prevalence of RR course during the studied years decreased and the prevalence of primary progressive increased but were not significant.
- Positive family history of MS in Iranian patients with MS was 8.9% (95% CI: 6.9–11.4).
- The mean age of disease onset of MS was 28.9 years (95% CI: 27.8–30.1).
- The results of this meta-analysis can provide useful information for neurologists and healthcare providers in the field of MS clinical course, age of disease onset and disability in Iranian MS patients.

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