Prevalence of Stroke in People with Multiple Sclerosis

Dear Editor,

Multiple sclerosis (MS) is a chronic condition affecting the central nervous system (CNS). MS is associated with various comorbidities, including cardiovascular diseases, neurological disturbances, stroke, hypertension, and metabolic disorders.[1] stroke characterized by malperfusion of CNS tissue, is among the significant comorbidities observed in MS patients.[2,3] We undertook a study aimed at determining the prevalence of stroke among pwMS in Isfahan, Iran.

The study presented herein (approved by the Isfahan University of Medical Sciences [IR.MUI.MED. REC.1401.256]) was an observational, cross-sectional study on the pwMS seen regularly at the Isfahan MS clinic from 2018 to 2022. Inclusion was based on the following criteria:

1. Being diagnosed based on McDonald's criteria a year before interview; and
2. Residence within the Isfahan province.

Participants were interviewed by their MS neurologist either in person or via telephone calls, and the MS neurologist documented results in electronic forms. Data items included sociodemographics (current age, sex, and ethnicity), and MS-related characteristics (age at MS onset, MS subtype, expanded disability status scale score [EDSS], and disease modifying therapy (DMT)). WHO International Classification of Diseases (ICD)-10 codes I61 (intracerebral hemorrhage [ICH]), I62 (other nontraumatic intracranial hemorrhage), and I63 (cerebral infarction) were used as definitions of stroke. An incident stroke was identified through comprehensive history taking neurological examination and confirmed through neuroimaging.

Interviews with 2465 pwMS (1965 females, 500 males/RRMS = 2251, SPMS = 214) revealed 10 (0.4%) cases of incident stroke (six ICH and four cerebral infarctions). Table 1 summarizes their features. The crude stroke prevalence was 41 (95% CI 19, 74) per 10,000 pwMS. Stroke patients were 70% female (7 persons, 35.6 per 10000 female patients, 95% CI = 9.3, 61.9) and 30% male (3 individuals, 60 per 10,000 male patients, 95% CI = 12, 108) with a P value of 0.438. The mean (SD) age of MS patients with stroke and disease onset was 51.8 (9.28) and 38.8 (10.23) years. The mean (SD) time between MS diagnosis and stroke was 6.5 (2.91) years. The mean (SD) EDSS score was 2.05($\pm$0.3).

Table 1: Demographic information of MS patients that had stroke attack

Patient Number	Sex	Age (years)	Age at MS Start (years)	Duration between MS and Stroke (years)	First MS sign	MS type	MS medication	Last EDSS	Past medical history	Stroke type (ischemic–hemorrhagic)	Bleeding site
1	Male	57	29	8	Quadriplegia + Paresthesia	SPMS	Natalizuamb	3	-	Ischemic	Left Occiput
2	Female	63	47	10	Upper limbs paresthesia	RRMS	Interferon beta 1-a	1.5	Ulcerative colitis	Hemorrhagic	Right Parietal Lobe
3	Female	45	33	5	Right facial paresthesia + diplopia	RRMS	Interferon beta1-a	1.5	-	Hemorrhagic	Parietal Lobe
4	Female	58	48	8	Upper limbs paresthesia	RRMS	Dimethyl fumarate	1	Hypertension + Diabetes type 1	Ischemic	Lacunar in internal capsule
5	Female	50	40	3	Vertigo, ataxia	SPMS	Rituximab	4	Asthma	Hemorrhagic	Left temporal and parietal
6	Male	58	49	6	Left lower limb Weakness	RRMS	Interferon beta 1-a	1.5	Hypertension	Ischemic	Medulla
7	Female	49	21	10	Lower limbs paresthesia + diplopia	RRMS	Dimethyl fumarate	1	-	Ischemic	Left middle cerebral artery branch
8	Female	55	45	9	Upper limbs paresthesia	RRMS	Teriflunomide	1.5	-	Hemorrhagic	Pons
9	Male	30	28	2	Diplopia	RRMS	Dimethyl fumarate	1	Hypertension	Hemorrhagic	Left Parietal
10	Female	53	48	4	Lower limbs weakness	SPMS	Dimethyl fumarate	3	-	Hemorrhagic	Thalamus

Regarding the clinical subtypes of MS at the time of stroke, 70% of the ones with stroke had RRMS (31 per 10000 of RRMS patients, 95% CI = 8.2, 54), whereas the remaining 30% had SPMS (140 per 10,000 of SPMS patients, 95% CI = 0, 298) with a P value of 0.013.

Our study on pwMS from Isfahan revealed a stroke prevalence of 41 (95% CI 19, 74) per 10,000 persons, underscoring the relevance of this comorbidity in clinical practice.[2,4] Diet, smoking, and nonsteroidal anti-inflammatory drug (NSAID) use affect MS comorbidities and stroke risk, showing the complex relationship between environmental and biological factors.[3] Moreover, MS patients often have cardiovascular comorbidities such hypertension and hyperlipidemia, which increase their stroke risk.[5] One of the most common risk factors for stroke in our stroke affected MS patients was hypertension (n = 3, 30%). Thus, cardiovascular prevention for MS patients may prevent strokes.

In conclusion, the co-occurrence of MS and stroke poses a significant challenge in clinics, as they share clinical attributes, and contribute to substantial disability for affected individuals.

Ethical considerations and code of ethics

Ethical approval was obtained from the Isfahan University of Medical Sciences with the code of [IR.MUI.MED.REC.1401.256]; ensuring that the study met all necessary standards and regulations.

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Conflicts of interest

There are no conflicts of interest.

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