Neuroepidemiology 2013;40:68–69

DOI: [10.1159/000341848](https://doi.org/10.1159/000341848)**Is the Iranian Revolution to Blame for the Increasing Incidence of Multiple Sclerosis in Iran?***Amir-Hadi Maghzi^{a, c, f}, Mohammad-Ali Sahraian^e,
Vahid Shaygannejad^{c, d}, Alireza Minagar^b*^aDepartment of Neurology, Multiple Sclerosis Center, University of California San Francisco, San Francisco, Calif., and^bDepartment of Neurology, Louisiana State University Health Sciences Center, Shreveport, La., USA; ^cIsfahan Neurosciences Research Center and ^dDepartment of Neurology, Isfahan University of Medical Sciences, Isfahan, and ^eSina MS Research Center, Brain and Spinal Injury Research Center, Tehran University of Medical Sciences, Tehran, Iran; ^fNeuroimmunology Unit, Center for Neuroscience and Trauma, Blizard Institute of Cell and Molecular Science, and London School of Medicine and Dentistry, London, UK

We read with interest the letter by Pakpoor and Ramagopalan [1], in which they suggest that the reported increase in the prevalence, incidence and sex ratio of multiple sclerosis (MS) is attributed to the occurrence of the Islamic Revolution in Iran, where women were required to wear a veil in public according to the state regulations, and this has resulted in vitamin D deficiency, which is a risk factor for MS.

As the authors also state, MS is a complex disease and a combination of factors are concomitantly needed in order to cause MS. We think that there are many possible explanations for this increase, and vitamin D deficiency – although important – might not fully explain it. During the recent decades, the level of hygiene and health care has increased in Iran. This translates into better diagnostic tools, increased numbers of physicians and increased disease awareness, which might have improved the case ascertainment. However, we believe that this could not be the whole story as the onset of first demyelinating events in both Iranian cohorts from Tehran and Isfahan occurred in the young and during recent years. Therefore, in case of an increase in the number of patients diagnosed, the number of older patient who were missed in the past would also be considerable [2–4]. On the other hand, increased hygiene on a population level could delay the exposure of individuals to common viral agents like Epstein-Barr virus translating into infectious mononucleosis, which in turn increases the risk of MS (hygiene hypothesis) [5]. We demonstrat-

ed that although smoking was a risk factor for MS in the Iranian population, it was not increasing and might not be responsible for the increased incidence and sex ratio of MS in Iran [6, 7]. On the other hand, we have previously proposed the young age structure (age structural shift) of Iran as another possible explanation for the increased crude incidence of MS [2].

Vitamin D deficiency is currently a health problem in Iran as well as in the rest of the world. However, in Iran there are gender differences in vitamin D levels [8–10]. Studies carried out in Isfahan and Tehran suggest that the rate of vitamin D deficiency is high in the general population and significantly more prominent in females and youngsters [8–10]. Although it has been shown that wearing a veil and covering is associated with hypovitaminosis D [11], it should be borne in mind that prior to the occurrence of the Islamic revolution in 1979, most Iranians were still Muslim, and since wearing a hijab by women is required by Islamic rules, most Iranian women used to wear a veil and covering in public even before the revolution. Nevertheless, there have been radical lifestyle changes during the past decades, such as urbanization, living in apartments, air pollution, insufficient consumption of vitamin-D-rich food, widespread use of sun screens, avoiding sun exposure for fear of skin cancer and esthetical issues, all of which are thought to cause vitamin D deficiency, and the latter two are more prevalent among females [8]. Moreover, Iranian women spend less time in the sun compared to men, which could also lead to vitamin D deficiency, but is independent of wearing a hijab or veil and is mostly due to culture and lifestyle [7, 9]. These factors combined with the hijab might have caused the gender difference in vitamin D deficiency in Iran. On the other hand, Iranian immigrants to Canada and Sweden have been shown to have similar high rates of MS, and a hijab is not a requirement in those countries [12, 13]. Furthermore, the incidence, prevalence and sex ratio of MS are also on the rise in other countries, which seem to be due to the lifestyle changes especially among women, which could have also occurred amongst Iranian women.

As Muslim women can expose their face and hands in public, sun exposure to these parts for a certain daily period could help supplying vitamin D levels. Taken together, dietary and lifestyle changes could help improve vitamin D deficiency in Iran. Moreover, as we have previously suggested [14], and as rightfully suggested by Pakpoor and Ramagopalan [1], vitamin D supplementation for Iranian women could be a good strategy to control the rising incidence and sex ratio of MS in Iran.

Disclosure Statement

No funding was received and the authors have no conflicts of interest to disclose in relation to this work.

References

- 1 Pakpoor J, Ramagopalan SV: Multiple sclerosis and the Iranian revolution. *Neuroepidemiology* 2012;38:122.
- 2 Etemadifar M, Maghzi AH: Sharp increase in the incidence and prevalence of multiple sclerosis in Isfahan, Iran. *Mult Scler* 2011;17:1022–1027.
- 3 Saadatnia M, Etemadifar M, Maghzi AH: Multiple sclerosis in Isfahan, Iran. *Int Rev Neurobiol* 2007;79:357–375.
- 4 Sahraian MA, Khorramnia S, Ebrahim MM, Moinfar Z, Lotfi J, Pakdaman H: Multiple sclerosis in Iran: a demographic study of 8,000 patients and changes over time. *Eur Neurol* 2010;64:331–336.
- 5 Maghzi AH, Marta M, Bosca I, Etemadifar M, Dobson R, Maggiore C, Giovannoni G, Meier UC: Viral pathophysiology of multiple sclerosis: a role for Epstein-Barr virus infection? *Pathophysiology* 2011;18:13–20.
- 6 Maghzi AH, Etemadifar M, Heshmat-Gahdarijani K, Moradi V, Nounahal S, Ghorbani A, Minagar A: Cigarette smoking and the risk of multiple sclerosis: a sibling case-control study in Isfahan, Iran. *Neuroepidemiology* 2011;37:238–242.
- 7 Alonso A, Cook SD, Maghzi AH, Divani AA: A case-control study of risk factors for multiple sclerosis in Iran. *Mult Scler* 2011;17:550–555.
- 8 Hovsepian S, Amini M, Aminorroaya A, Amini P, Iraj B: Prevalence of vitamin D deficiency among adult population of Isfahan City, Iran. *J Health Popul Nutr* 2011;29:149–155.
- 9 Moussavi M, Heidarpour R, Aminorroaya A, Pournaghshband Z, Amini M: Prevalence of vitamin D deficiency in Isfahani high school students in 2004. *Horm Res* 2005;64:144–148.
- 10 Rabbani A, Alavian SM, Motlagh ME, Ashtiani MT, Ardalan G, Salavati A, Rabbani B, Shams S, Parvaneh N: Vitamin D insufficiency among children and adolescents living in Tehran, Iran. *J Trop Pediatr* 2009;55:189–191.
- 11 Guzel R, Kozanoglu E, Guler-Uysal F, Soyupak S, Sarpel T: Vitamin D status and bone mineral density of veiled and unveiled Turkish women. *J Womens Health Gend Based Med* 2001;10:765–770.
- 12 Guimond C, Dyment DA, Ramagopalan SV, Giovannoni G, Criscuoli M, Yee IM, Ebers GC, Sadovnick AD: Prevalence of MS in Iranian immigrants to British Columbia, Canada. *J Neurol* 2010;257:667–668.
- 13 Ahlgren C, Oden A, Lycke J: A nationwide survey of the prevalence of multiple sclerosis in immigrant populations of Sweden. *Mult Scler* 2011.
- 14 Maghzi AH, Ghazavi H, Ahsan M, Etemadifar M, Mousavi S, Khorvash F, Minagar A: Increasing female preponderance of multiple sclerosis in Isfahan, Iran: a population-based study. *Mult Scler* 2010;16:359–361.