Original Article

Seasonal variation of Guillain-Barré syndrome in Iranian patients: a retrospective study

Hossein Hatami[1], Farzad Fatehi[2,3], Ramin Heshmat[4], Elham Dirandeh[2*]

[1] Department of Public Health, School of Public Health and Safety and Environmental and Occupational Hazards Control Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran.
[2] Department of Neurology, Shariati Hospital, Tehran University of Medical Sciences, Tehran, Iran.
[3] Department of Neurology, Iranian Center of Neurological Research, Tehran University of Medical Sciences, Tehran, Iran.
[4] Chronic Diseases Research Center, Endocrine Population Sciences Institute, Endocrinology and Metabolism Research Institute, Tehran University of Medical Sciences, Tehran, Iran.
Corresponding author and reprints: Elham Dirandeh, Department of Neurology, Shariati Hospital, Tehran University of Medical Sciences, Tehran, Iran. Postal Code: 1411713135
Email: dirandehe@razi.tums.ac.ir
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Abstract

Background: It seems that the incidence of Guillain-Barré syndrome (GBS) has seasonal trends depending on weather as well as environmental and demographic factors such as upper respiratory tract infection (URI). The aim of this study was to evaluate seasonality of GBS and its electrophysiological subtypes.

Methods: In this cross-sectional study, the records of all admitted patients to all wards of Dr. Shariati Hospital from March 2009 to March 2019 according to ICD-10 codes for GBS and other similar neuropathies were investigated and 87 patients were registered based on fulfillment of Brighton criteria and symptom onset during the recent 4 weeks. Statistical analysis was performed by IBM SPSS version 20. A p-value < 0.05 was considered statistically significant.

Results: Most of the patients (63.2%, n=55) were men. The mean age of them was 49.1±19.2 years, and 41.3% (n=36) and 10.3% (n=9) participants had recent URI and gastrointestinal infection, respectively. The frequency of GBS in different seasons was 35.6% (n=31) patients in the winter, 27.6% (n=24) in the autumn, 19.6% (n=17) in the spring, and 17.2% (n=15) in the summer. The most frequent electrophysiological subtype was acute inflammatory demyelinating polyneuropathy (AIDP) in all seasons. The most common GBS disability score was 1.

Conclusion: The highest and the lowest occurrence was seen in the winter and summer, respectively. AIDP was the most common electrophysiological subtype in all seasons. More studies are suggested to evaluate other aspects of GBS on more details.

Keywords: Epidemiology; Guillain-Barre Syndrome; Seasons; winter.

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Introduction

Guillain-Barré syndrome (GBS) is an immune-mediated inflammatory disorder of the peripheral nerves and their roots (1–5). The annual incidence of GBS is 1-2 cases in 100,000 in the world; however, its prevalence may vary in different geographical regions and seasons (2,5–8).

It seems that the incidence of GBS has seasonal trends depending on weather as well as environmental and demographic factors such as upper respiratory tract infection (URI) and gastrointestinal (GI) infection as recent triggers, which might be higher in special weather conditions (2). The incidence peaks in January and February in some countries like Italy, which may be related to possible viral infections or vaccination (9). Studies conducted in Germany and France showed a prominent occurrence of GBS in colder seasons such as the winter versus warmer seasons like the summer; however, a study in Saudi Arabia in 2019 found minimal seasonal variation between the summer and the winter with a prevalence of 44.9% in colder seasons versus 55.1% in warmer seasons (10–12). A Chinese study in children showed no significant difference in the occurrence of GBS between different months (13). The incidence of GBS in a study conducted in Taiwan varied in different seasons. The incidence was 0.47 in 100,000 person-years in the spring, which was approximately 10% higher than other seasons (14). In an Iranian research, the highest incidence rate was seen in October followed by May and the lowest rate was seen in November (15). However, the highest prevalence was seen in the spring in another Iranian study (16).

The prevalence of GBS has been reported from different countries separately; however, we only have data from a few Iranian medical centers. In addition, Dr. Shariati Hospital is one of the largest referral centers in Tehran in neuromuscular disorders, especially GBS. Therefore, this study was conducted to evaluate the epidemiology of GBS as well as its seasonal variation and electrophysiological subtypes.

Methods

In this cross-sectional study, the records of all patients admitted to all wards of Dr. Shariati hospital from March 2009 to March 2019 according to ICD-10 codes like G61.0 (the main code), G61.1, G61.8, and G61.9 for GBS and other similar neuropathies were investigated and 87 patients were registered based on fulfillment of Brighton criteria and symptom onset during the recent 4 weeks as inclusion criteria. Exclusion criteria were incomplete records, a diagnosis of chronic inflammatory demyelinating polyneuropathy (CIDP) in the follow-up period, acute onset CIDP, diabetic CIDP, and hereditary, toxic, or metabolic neuropathies.

Brighton criteria consists of different levels of diagnostic certainty:

- Level 1: Bilateral and flaccid weakness of limbs / decreased or absent deep tendon reflexes in weak limbs / monophasic course and time between onset-nadir 12 h to 28 days / CSF cell count < 50/µL / CSF protein concentration > normal value / nerve conduction study (NCS) findings consistent with one of the subtypes of GBS / absence of alternative diagnosis for weakness

- Level 2: First 3 above mentioned points / CSF cell count < 50/µL / with or without CSF protein concentration > normal value (*) / with or without NCS findings consistent with one of the subtypes of GBS (*) / absence of alternative diagnosis for weakness (*: If CSF is not collected or results not available, nerve electrophysiology results must be consistent with the GBS diagnosis.)

- Level 3: First 3 above mentioned points / without CSF cell count < 50/µL / without CSF protein concentration > normal value / without NCS findings consistent with one of the subtypes of GBS / absence of alternative diagnosis for weakness

- Level 4: With or without first 3 above mentioned points / with or without CSF findings / with or without NCS findings / absence of alternative diagnosis for weakness

The risk of inability to walk 6 months after admission was calculated based on the following site: https://gbstools.erasmusmc.nl, IGOS (International GBS Outcome Study), GBS prognosis tool. Also, according to this site, GDS (GBS Disability Score) was defined in this way: 0 or 1: no or minor disability, 2: able to walk 10 m unaided, 3: unable to walk 10m unaided, 4: wheelchair or bedbound, 5: ventilated, 6: dead.

We also followed the current patients' situation (current GDS) via telephone and neuromuscular department site, recording all visit documents. Iran national committee for ethics in biomedical research confirmed this study based on declaration of Helsinki. Data analysis was performed using the IBM SPSS software version 20. Independent-samples T Test was also used. A p-value < 0.05 was considered statistically significant.

Results

Eighty-seven patients fulfilled the criteria and were included in this study of whom 63.2% (n=55) were men. The mean age of the patients was 49.1±19.2 years (range: 9-86) (men: 47.3±20.1 years old, women: 52.2±17.5 years old). The majority of the patients (55.1%, n=48) were in the age range 40-70 years (Figure 1). Moreover, 41.3% (n=36) and 10.3% (n=9) of the patients had a recent URI or GI infection, respectively (Table 1). Sign and symptom frequencies were mentioned in Table 2. The mean muscle force was 4.2/5 on examination.

The frequency of GBS in different seasons was 35.6% (n=31) in the winter, 27.6% (n=24) in the autumn, 19.6% (n=17) in the spring, and 17.2% (n=15) in the summer (Figure 2).

The highest frequency was seen in January followed by September (16.1%, n=14 - 14.9%, n=13). The lowest frequency was

Table 1: Frequency of predisposing factors

Diseases or predisposing factors	No.	Percent
Hypertension	20	23%
Diabetes mellitus	15	17.2%
Hyperlipidemia	5	5.8%
Ischemic heart disease	5	5.8%
Recent URI	36	41.3%
Recent GI infection	9	10.3%
Recent surgery	4	4.6%
Recent malignancy	4	4.6%
Recent pregnancy	2	2.2%
Recent UTI	1	1.1%
Recent trauma	1	1.1%
Recent vaccination	0	0%

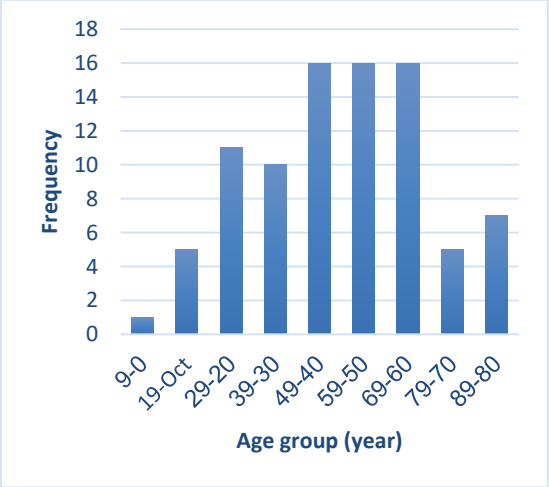

Figure 1: Frequency of different age groups

Table 2: Frequency of symptoms and signs

Symptoms & Signs	No.	Percent
Sensory symptoms	60	69%
Sphincter symptoms	15	17.2%
Bulbar symptoms	14	16.1%
Autonomic symptoms	7	8%
Motor symptoms	5	5.8%
Decreased or absent DTR	78	89.7%
Abnormal pinprick test	47	54%
Abnormal deep sensory test	34	39%
Bifacial weakness	31	35.6%
Cerebellar	8	9.2%
Extraocular weakness	6	6.9%
Sensory level	1	1.1%

Table 3: Frequency of electrophysiological subtypes

Electrophysiological subtype	AIDP	AMSAN	AMAN	MFS	Total
Men	36 (65.4%)	6 (10.9%)	9 (16.4%)	4 (7.3%)	55
Women	23 (71.9%)	6 (18.8%)	2 (6.2%)	1 (3.1%)	32
Spring	7 (41.2%)	3 (17.6%)	6 (35.3%)	1 (5.9%)	17
Summer	12 (80%)	2 (13.3%)	0 (0%)	1 (6.7%)	15
Autumn	19 (79.2%)	0 (0%)	4 (16.7%)	1 (4.1%)	24
Winter	21 (67.7%)	7 (22.6%)	1 (3.2%)	2 (6.5%)	31
January	7 (50%)	4 (28.6%)	1 (7.1%)	2 (14.3%)	14
September	9 (69.2%)	0 (0%)	3 (23.1%)	1 (7.7%)	13
July	3 (100%)	0 (0%)	0 (0%)	0 (0%)	3
Total	59 (67.8%)	12 (13.7%)	11 (12.6%)	5 (5.7%)	87

seen in July (3.4%, n=3). The most frequent electrophysiological subtype was acute inflammatory demyelinating polyneuropathy (AIDP) in all seasons (Table 3). Nine patients were admitted to the intensive care unit (ICU) in their disease course of whom 7 were intubated. Treatment included plasmapheresis (79.3%, n=69), plasmapheresis and then intravenous immunoglobulin (IVIG) (10.3%, n=9), and IVIG (9.2%, n=8). Also, 1 patient did not receive treatment. The mean risk of inability to walk 6 months after admission was 4.2%. It was 15.9% (the highest) in acute motor sensory axonal neuropathy (AMSAN) subtype and 2.1% in AIDP subtype. As for the GDS status at the time of discharge, 40.2% (n=35) of the patients had a score 2. This score was similar in all subtypes except AMSAN with a score of 3.

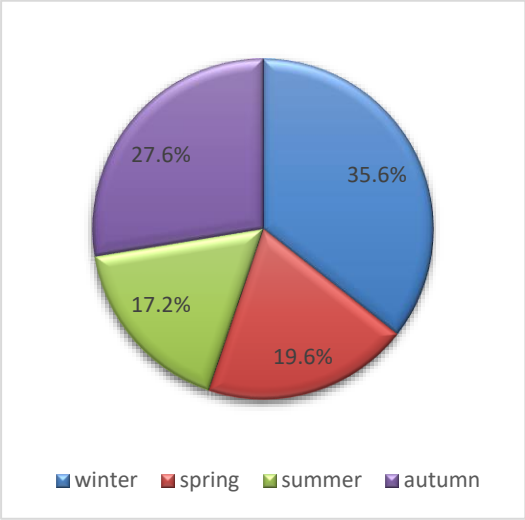

Figure 2: Frequency of different seasons

The most frequent current GDS was 1 in AIDP and acute motor axonal neuropathy (AMAN) and 6 in AMSAN subtype. The current GDS was 0 in all patients with the miller fisher syndrome (MFS) subtype.

Ten patients died in the period of this study (11.5%, 6 men and 4 women) with a mean age of 68.5±12.9 years. Four patients had AIDP subtype and the rest had AMSAN subtype.

Moreover, the mean duration of the following periods (between starting symptoms and admission / starting symptoms and starting treatment / admission and intubation) was significantly longer in the expired patients (CI=95%, P=0.049, 0.017, and 0.004, respectively). The mean MRC sum score was significantly lower in the mentioned group (CI=95%, P=0.004) and they were significantly older (CI=95%, P=0.001).

Discussion

According to the results of this study, 41.3% of the subjects reported recent URI and 10.3% reported recent GI infection. Most of the patients reported sensory symptoms like paresthesia and numbness at the onset of the disease and the majority of them patients had impaired sensory examination. Another important finding of this study was the frequency of GBS in different months and seasons, which was the highest in January and September and

the lowest in July. The highest occurrence was seen in the winter and autumn and the lowest was seen in the spring and summer.

Several studies have investigated seasonal variation in the occurrence of GBS. Basiri et al. studied more than 388 patients in Isfahan, Iran from 2010 to 2015. The highest occurrence was seen in the spring (29.1%) and winter (26%) and the lowest occurrence was seen in the autumn (21.4%). AIDP was more common in the spring and summer and AMSAN was more common in the autumn and winter, but in our study, AIDP was the most common subtype in all seasons (17). Moreover, no seasonal variation was detected in studies conducted in Iran (Tabriz), Denmark, and western Balkan (18–20). A Turkish study found 2 peaks in the winter and summer (21). In a study in Greece, the results showed that GBS was spread throughout the year with the highest occurrence in April and the lowest in October. Age, sex, and place of residence of the patients did not differ statistically between the four seasons. Like another study in northwest Greece and also in Chile, the highest number of cases (33.3%) was seen in the spring and the lowest (16.2%) in autumn unlike our findings (22–24). The highest occurrence of GBS was in November and the lowest was in January, April, May, July, and September in Quebec. However, in our study, the highest occurrence was seen in January and September and the lowest occurrence was seen in July (25). GBS was evaluated in children under the age of 15 years in Iraq. The highest number of cases was seen in January, which was similar to the present study (26). A Japanese study revealed that GBS occurred in every month of the year. MFS developed most frequently in May and June, with fewer cases in November and no cases in December and February. Moreover, 63% of the cases with AMAN, 51% of the cases with AIDP, and 70% of the cases with MFS occurred in the spring and summer. Furthermore, 60% of the patients in the AMAN group diagnosed in spring-summer had GI infection. URI was noted in 66% of the patients in MFS group diagnosed in spring-summer. In our research, AIDP was the most common subtype in all seasons, AMSAN and MFS subtypes had the highest occurrence in the winter and the AMAN subtype had the highest occurrence in the spring. Most of the patients with a recent URI or GI infection had AIDP (27). In a systematic review, there was a seasonal variation in the rate of admission due to GBS with significantly more patients admitted in the winter versus summer, with no difference in the admission rate between autumn and spring. The higher frequency of admissions in the winter was associated with a higher incidence of patients reporting a flu-like or respiratory prodromal illness in the winter versus summer. Similar to our research as well as a study in Denmark, there was a higher occurrence in the winter compared to summer (28,29). Finally, in an Iranian study in Children's Medical Center, there was a peak of GBS incidence at summer followed by autumn unlike our data (30).

In conclusion, the results of the present study were rather consistent with studies performed in other geographical regions across the world. In fact, the highest frequency of GBS was seen in the winter followed by autumn and the lowest occurrence was seen in the spring followed by summer. The most common electrophysiological subtype in all seasons was AIDP, which was similar to the results of several other countries. Moreover, the mortality was higher in older people. This study provides information about GBS and its clinical, epidemiologic, and electrophysiological features to physicians and other researchers to manage this syndrome more effectively. However, more studies are needed to shed light on details.

Authors' contributions

Study concept and design: HH, FF, ED; Data gathering: ED; Data analysis: RH, ED; Writing manuscript: HH, FF, ED; Revise manuscript: FF, ED; Approve manuscript: HH, FF, RH, ED.

Conflicts of interest

This article has been adapted from the research thesis of master of public health. The authors declare that they have no conflict of interest.

Source(s) of support

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Ethical statement

Iran national committee for ethics in biomedical research confirmed this study based on declaration of Helsinki and it was approved by School of Public Health and Neuroscience Research Center - Shahid Beheshti University of Medical Sciences (IR.SBMU.PHNS.REC.1398.068).

References

1. Shrivastava M, Nehal Sh, Seema N. Guillain–Barre´ syndrome: Demographics, clinical profile & seasonal variation in a tertiary care centre of central India. Indian J Med Res. 2017 Feb; 145(2): 203–208, https://doi.org/10.4103/ijmr.IJMR_995_14.

2. Giordano A, Vabanesi M, Costa GD, Cerri F, Comi G, Martinelli V, et al. Assessing seasonal dynamics of Guillain-Barré syndrome with search engine query data. Neurol Sci. 2019 May; 40(5): 1015-1018, https://doi.org/10.1007/s10072-019-03757-y.

3. Bölükbaşi F, Ersen G, Gündüz A, Karaalı-Savrun F, Yazici S, Uzun N, et al. Guillain-Barré syndrome and its variants: Clinical course and prognostic factors. Noro Psikiyatr Ars. 2019 Mar; 56(1): 71–74, https://doi.org/10.5152/npa.2017.18091.

4. Martic V, Bozovic I, Berisavac I, Peric S, Babic M, et al. Three-year follow-up study in patients with Guillain-Barré syndrome. Can J Neurol Sci. 2018 May; 45(3): 269–274, https://doi.org/10.1017/cjn.2018.12.

5. Yadegari S, Nafissi S, Kazemi N. Comparison of electrophysiological findings in axonal and demyelinating Guillain-Barre´ syndrome. Curr J Neurol. 2014; 13(3): 138–143.

6. Hafsteinsdóttir B, Ólafsson E, Jakobsson F. Incidence and outcome of Guillain-Barré syndrome in Iceland: A population-based study. Acta Neurol Scand. 2018 Nov; 138(5): 454–458, https://doi.org/10.1111/ane.13000.

7. A. C. Hughes R, Cornblath DR, Willison HJ. Guillain-Barre´ syndrome in the 100 years since its description by Guillain, Barre´ and Strohl. Brain. 2016 Nov; 139(11): 3041–3047, https://doi.org/10.1093/brain/aww247.

8. O. T. Sipilä J, Soilu-Hänninen M, Ruuskanen JO, Rautava P, Kytö V. Epidemiology of Guillain-Barré syndrome in Finland 2004–2014. J Peripher Nerv Syst. 2017 Dec; 22(4): 440–445, https://doi.org/10.1111/jns.12239.

9. Benedetti L, Briani C, Beronio A, Massa F, Giorli E, Sani C, et al. Increased incidence of axonal Guillain-Barré syndrome in La Spezia area of Italy: A thirteen-years follow-up study. J Peripher Nerv Syst. 2019 Mar; 24(1): 80–86, https://doi.org/10.1111/jns.12292.

10. Sudulagunta SR, Sodalagunta MB, Sepehrar M, Khorram H, Bangalore Raja Sh, Kothandapani Sh, et al. Guillain-Barré syndrome: Clinical profile and management. Ger Med Sci. 2015 Sep; 13:Doc16, https://doi.org/10.3205/000220.

11. Asiri S, Altwaijri WA, Ba-Armah D, Al Rumayyan A, Alrifai MT, Salam M, et al. Prevalence and outcomes of Guillain-Barré syndrome among pediatrics in Saudi Arabia: a 10-year retrospective study. Neuropsychiatr Dis Treat. 2019; 15: 627–635, https://doi.org/10.2147/NDT.S187994.

12. Delannoy A, Rudant J, Chaignot Ch, Bolgert F, Mikaeloff Y, Weill A. Guillain-Barré syndrome in France: a nationwide epidemiological analysis based on hospital discharge data (2008-2013). J Peripher Nerv Syst. 2017 Mar; 22(1): 51–58, https://doi.org/10.1111/jns.12202.

13. Tang J, Dai Y, Li M, Cheng M, Hong S, Jiang L, et al. Guillain-Barré syndrome in Chinese children: A retrospective analysis. Pediatr Neurol. 2011 Oct; 45(4): 233–237, https://doi.org/10.1016/j.pediatrneurol.2011.06.007.

14. Huang W, Lu Ch, Chen S. A 15-year nationwide epidemiological analysis of Guillain-Barré syndrome in Taiwan. Neuroepidemiology. 2015; 44(4): 249–254, https://doi.org/10.1159/000430917.

15. Amin R, Akbari A, Al e Yasin S, Rafiei SM. Guillain-Barré syndrome in children: A 20-year study. Feiz. 2004; 32: 63–68.

16. Afshari Aliabadi D, Moradian N, Rahmanian E, Mohammadi M. Characteristics of Guillain-Barré syndrome: brief report. Tehran Univ Med J. 2020 Jun; 78(3): 178–182.

17. Ansari B, Basiri K, Derakhshan Y, Kadkhodaei F, Okhovat AA. Epidemiology and clinical features of Guillain-Barre´ syndrome in Isfahan, Iran. Adv Biomed Res. 2018 May; 7:87, https://doi.org/10.4103/abr.abr_50_17.

18. Khandagi R, Hashemilar M. Guillain-Barre´ syndrome a series obseved at Tabriz Imam Khomeini hospital (1981-1996). Medical Journal of Tabriz University of Medical Sciences. 2000; 34(45): 43–48.

19. Levison LS, Thomsen RW, Markvardsen LK, Christensen DH, Sindrup SH, Andersen H. Pediatric Guillain-Barre´ syndrome in a 30-year nationwide cohort. Pediatr Neurol. 2020 Jun; 107: 57–63, https://doi.org/10.1016/j.pediatrneurol.2020.01.017.

20. Peric S, Milosevic V, Berisavac I, Stojiljkovic O, Beslac-Bumbasirevic L, Marjanovic I, et al. Clinical and epidemiological features of Guillain-Barré syndrome in the Western Balkans. J Peripher Nerv Syst. 2014 Dec; 19(4): 317–321, https://doi.org/10.1111/jns.12096.

21. Karalok ZS, Taskin BD, Yanginlar ZB, Gurkas E, Guven A, Degerliyurt A, et al. Guillain-Barré syndrome in children: Subtypes and outcome. Childs Nerv Syst. 2018 Nov; 34(11): 2291-2297, https://doi.org/10.1007/s00381-018-3856-0.

22. Chroni E, Papapetropoulos S, Gioldasis G, Ellul J, Diamadopoulos N, Papapetropoulos T. Guillain–Barre´ syndrome in Greece: Seasonality and other clinico-epidemiological features. Eur J Neurol. 2004 Jun; 11(6): 383–388, https://doi.org/10.1111/j.1468-1331.2004.00799.x.

23. Markoula S, Giannopoulos S, Sarmas I, Tzavidi S, Kyritsis AP, Lagos G. Guillain-Barre´ syndrome in northwest Greece. Acta Neurol Scand. 2007 Mar; 115(3): 167–173, https://doi.org/10.1111/j.1600-0404.2006.00731.x.

24. Rivera-Lillo G, Torres-Castro R, Burgos P, Varas-Díaz G, Vera-Uribe R, Puppo H, et al. Incidence of Guillain-Barré syndrome in Chile: A population-based study. Peripher Nerv Syst. 2016 Dec; 21(4): 339–344, https://doi.org/10.1111/jns.12182.

25. Deceuninck G, Boucher RM, De Wals Ph, Ouakki M. Epidemiology of Guillain-Barré syndrome in the province of Quebec. Can J Neurol Sci. 2008 Sep; 35(4): 472–475, https://doi.org/10.1017/s0317167100009136.

26. Jasem J, Marof K, Nawar A, Khalaf Y, Aswad S, Hamdani F, et al. Guillain-Barré syndrome as a cause of acute flaccid paralysis in Iraqi children: A result of 15 years of nation-wide study. BMC Neurol. 2013; 13:195, https://doi.org/10.1186/1471-2377-13-195.

27. Matsui N, Nodera H, Kuzume D, Iwasa N, Unai Y, Sakai W, et al. Guillain-Barré syndrome in a local area in Japan, 2006-2015: An epidemiological and clinical study of 108 patients. Eur J Neurol. 2018 May; 25(5): 718–724, https://doi.org/10.1111/ene.13569.

28. A J S Webb A, A E Brain S, Wood R, Rinaldi S, Turner MR. Seasonal variation in Guillain-Barré syndrome: A systematic review, meta-analysis and Oxfordshire cohort study. J Neurol Neurosurg Psychiatry. 2015 Nov; 86(11): 1196–1201. https://doi.org/10.1136/jnnp-2014-309056.

29. Al-Hakem H, Sindrup SH, Andersen H, Dornonville de la Cour Ch, Lassen LL, Van den Berg B, et al. Guillain–Barré syndrome in Denmark: A population-based study on epidemiology, diagnosis and clinical severity. J Neurol. 2019 Feb; 266(2):440-449, https://doi.org/10.1007/s00415-018-9151-x.

30. Ashrafi MR, Mohammadalipoor A, Ranjbar Naeini A, Amanat M, Tavasoli AR, Heidari M, et al. Clinical characteristics and electrodiagnostic features of Guillain-Barré syndrome among the pediatric population. J Child Neurol. 2020 Jun; 35(7): 448-455, https://doi.org/10.1177/0883073820905157.