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Original Article

# Epidemiologic and Clinical Characteristics of Guillain-Barré Syndrome in Patients Referred to Sina Hospital in Hamadan in 2018

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**Abstract**

**Background and aims:** Guillain-Barré syndrome (GBS) has several types, some of which damage myelin and some others cause axonal damage. Detecting the type of GBS is important in determining the type of treatment and its prognosis. This study was conducted to investigate the epidemiological characteristics of GBS and its variants in patients referred to Sina hospital in Hamadan, Iran, in 2018.

**Methods:** In this cross-sectional study, 51 patients who were admitted to Sina hospital and diagnosed with GBS in 2018 were examined. Demographic data, GBS type, disease outcomes, and pre-clinical and clinical findings of patients were collected. Data were then analyzed using the Stata software version 12, and *P* value < 0.05 was considered statistically significant.

**Results:** Of the 51 investigated patients, 34 (66.66%) were male. The most common variant type was acute inflammatory demyelinating polyneuropathy (AIDP) with 27.45% of cases followed by acute motor axonal neuropathy (AMAN) with 19.61% of cases. Further, the highest average hospitalization days (11.1 ± 11.7 days) were for chronic inflammatory demyelinating polyneuropathy (CIDP) patients, while the lowest (6.85 ± 1.91 days) was for AIDP patients ($P < 0.001$). All CIDP cases occurred in spring, and 71.43% of AIDP cases occurred in summer. Moreover, all 7 cases with acute motor and sensory axonal neuropathy (AMSAN) syndrome and the only case with the miller-fisher syndrome (MFS) occurred in fall ($P < 0.001$).

**Conclusion:** According to the results of this study, most variants of GBS in Hamadan province were AIDP in demyelinating form and AMAN variant in the axonal deterioration form. However, studies with a larger sample size are recommended in the west of Iran to better understand the epidemiology and to ensure common types of GBS.

**Keywords:** Guillain-Barré syndrome, Epidemiology, Sub-type, Iran

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## Introduction

Guillain-Barré syndrome (GBS) is an autoimmune neurological disease characterized by rapidly progressive symmetrical weakness of the extremities.[1] This post-infectious disease is considered the most severe acute paralytic neuropathy so that annually nearly 100 000 people can develop this disorder worldwide.[2] With regard to age distribution, the annual incidence rate of GBS ranges from 0.6 per 100 000 in children to 2.7 per 100 000 in people over 80 years old, and the male-to-female ratio is slightly greater than one.[3]

GBS is characterized by an acute onset and rapid progression. Symptoms begin with symmetric muscle weakness, bilateral limb weakness, and areflexia.[4,5] The paralysis is ascending in GBS, starting with weakness in the legs and spreading to the upper limbs.[6] The disease can progress for up to six weeks after onset, and this time some patients may develop a few complications such as respiratory failure, sepsis, and cardiac arrhythmia.[6] The case fatality of GBS is 3%-7%.[7]

Similar to other autoimmune diseases, the etiology of GBS is multifactorial involving genetic and environmental factors.[8] It has been previously found that GBS is associated with chikungunya virus,[9] influenza,[10,11] *Campylobacter jejuni*,[12] poliovirus,[13] and hepatitis E.[14] In their study, Liu et al showed a strong association (OR = 9.5) between *C. jejuni* infection and GBS.[12] This strong association indicates that some infections as strong environmental agents are involved in the onset of GBS through several mechanisms. Regarding the relation between vaccinations and an increase in the risk of GBS, the results of most studies indicated no significant causal association[15,16]; however, Melnick et al reported a strong association (OR = 7.27) between polio vaccination and the development of GBS.[17]

Likewise, De Wals et al in their study in Canada found that the influenza A (H1N1) vaccine is associated with a small but significant risk of GBS.[18]

According to the clinical and pathologic spectrum, GBS has various clinical manifestations ranging from classic acute inflammatory demyelinating polyneuropathy (AIDP) and axonal variants to several clinical variants.[19] Determining the type of GBS is very important in allocating the proper treatment and predicting its prognosis. Failure to recognize GBS variants can lead to erroneous diagnoses and consequently inappropriate treatment. Given the superiority of some variants in each region, it is necessary to take medical actions and make economic decisions. Since epidemiological studies are the basis for choosing the type of treatment, this epidemiological study was conducted on GBS to determine its dominant variants in Hamadan, Iran.

## Material and Methods

### *Study Design and Setting*

This register-based cross-sectional study was conducted on all GBS patients referred to Sina hospital affiliated with Hamadan University of Medical Sciences as a referral center in Hamadan province for one year in 2018.

### *Eligibility Criteria*

Only patients who were compatible with defined criteria according to the published international research diagnostic criteria by Asbury et al were included in this study.[20] These criteria were the presence of roughly symmetrical motor weakness over a period ranging from days to 4 weeks and a decrease or disappearance in deep tendon reflexes. Patients with diabetes mellitus or HIV/AIDS were excluded from the study because these diseases were related to AIDP, thus increasing the possibility of detection bias

### *Data Collection Tool*

A researcher-developed checklist was used for gathering the data. Based on this checklist, patients' information, including age, sex, age of morbidity, length of hospitalization, clinical symptoms such as initial symptoms, neural findings, and laboratory and para-clinic findings. Other medical conditions were also collected, including familial history, underlying diseases, smoking, vaccination, complications, and special treatments (e.g., plasma purification and intravenous immunoglobulin). Further, the clinical data were collected from medical records of the hospitalized GBS patients during the study period. According to the telephone number in the medical records, patients were contacted to complete the incomplete information as well as disease progression.

### *Statistical Analysis*

Descriptive analysis was used, including a frequency table, chart, mean, and standard deviation (SD) to describe and summarize data. Statistical analysis was run using the student's *t* test and one-way ANOVA for continuous variables, whereas the chi-square and Fisher's exact tests were used for categorical variables as appropriate. A level of 0.05 was considered significant for all statistical tests. Then, Stata software version 12 (StataCorp, College Station, TX, USA) was used to perform all the analytical operations.

## Results

During one year, 51 cases of GBS were examined**.** The mean age of the patients was 54 ± 16.7 years (Ranges: 22-84 year), and 34 (66.67%) of them were male with a 54.29 ± 17.49 morbidity age. The most common variant type was AIDP with 27.45% of cases followed by acute motor axonal neuropathy (AMAN) with 19.61% of cases. Further, the clinical type was unknown in 10 patients. Patients with AMAN type had the lowest morbidity age (45.6 ± 13.5). Respiratory and gastrointestinal infections with 35.29% and 25.49% were the major etiology of GBS, respectively (Table 1).

As shown in Figure 1, none of the patients mentioned the family history of GBS in their first-degree relatives. Regarding risk factors and underlying disorders, 15.68% of them had a history of smoking, 23.52% had high blood pressure, 17.64% had lipid disorder, and 13.72% had cardiovascular disease.

According to Table 2, the average days of hospitalization in patients with determined variant type were 9.61+5.97 days with a range of 4-45 days. The highest average hospitalization days were for chronic inflammatory demyelinating polyneuropathy (CIDP) patients (11.1 ± 11.7 days), and the lowest average hospitalization

**Table 1.** Gender and Age Distribution, Variant Type, and Etiology of GBS in Studied Patients

| Variable | | No. (%) | Morbidity Age (SD) |
|---|---|---|---|
| Gender | Male | 34 (66.67) | 54.29 (17.49) |
| | Female | 17 (33.33) | 57.06 (16.98) |
| Variant type | CIDP | 9 (17.65) | 49.22 (19.84) |
| | AIDP | 14 (27.45) | 54.43 (16.65) |
| | AMAN | 10 (19.61) | 45.6 (13.5) |
| | AMSAN | 7 (13.73) | 64.42 (12.31) |
| | MFS | 1 (1.96) | 82 |
| | No data | 10 (19.61) | 62.2(16.44) |
| Etiology | Without history | 14 (27.45) | 53.5 (12.44) |
| | Vaccinating | 1 (1.96) | 54 |
| | Gastrointestinal infections | 13 (25.49) | 53.54 (16.5) |
| | Respiratory infections | 18 (35.29) | 57.22 (21.34) |
| | Chemotherapy | 3 (5.88) | 53.67 (26.41) |
| | Surgery | 1 (1.96) | 70 |
| | Delivery | 1 (1.96) | 44 |

*Note.* GBS: Guillain-Barré syndrome; SD: Standard deviation; CIDP: Chronic inflammatory demyelinating polyneuropathy; AIDP: Acute inflammatory demyelinating polyneuropathy; AMAN: Acute motor axonal neuropathy; AMSAN: Acute motor and sensory axonal neuropathy; MFS: Miller-fisher syndrome.

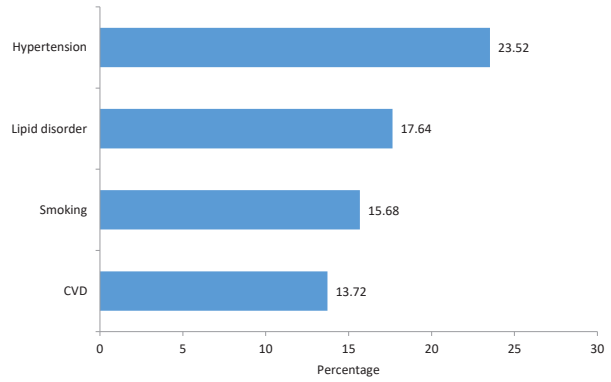


**Figure 1.** Risk Factors and Underlying Disorders Related to Investigated Patients.

days (6.85 ± 1.91 days) were for AIDP patients ($P < 0.001$). Moreover, there was no significant difference between age group and gender with syndrome type ($P > 0.05$). In 41 patients with determined syndrome type, 36.58% occurred in summer followed by 31.71% in spring. All CIDP cases occurred in spring and 71.43% of AIDP cases occurred in summer. All 7 cases with acute motor and sensory axonal neuropathy (AMSAN) syndrome and only one case with the miller-fisher syndrome (MFS) occurred in fall ($P < 0.001$).

The outcome of GBS according to GBS disorder type (demyelinating-axonal) is presented in Table 3. As it can be observed, from 40 cases with known GBS disorder, 90% were recovered, of which 86.96% were in demyelinating and 94.12% in the axonal disorder type ($P = 0.62$). Further, 25% of cases had partial recovery, and 10% were completely disabled. Overall, patients with the demyelinating disorder had a better prognosis; that is, 65.22% had complete recovery in these patients compared to 41.18% in the patients with axonal disorder ($P = 0.38$). The most commonly observed complication was autonomic impairment, accounting for 67.5% of the cases, 10% had pulmonary infections, and 10% had respiratory and ventilation disorders.

## Discussion

The present study was conducted to investigate the epidemiological characteristics of GBS and its variants in Hamadan province, Iran. According to the findings, AIDP in demyelinating form and AMAN variant in the axonal deterioration form were the most common GBS variants in Hamadan.

In other studies conducted in different geographical areas, different incidence of GBS has been reported. In Europe and North America, more than 90% of reported cases were AIDP type,[21] while in Asian countries, the type of axonal with 40-60% of cases is more prevalent.[22] In North America, MFS was slightly prevalent, accounting for 1% to

**Table 2.** Relation Between Variant Type and Hospitalization Duration, Age Group, Gender and Season

| Variable | | CIDP | AIDP | AMAN | AMSAN | MFS | Total | *P* Value |
|---|---|---|---|---|---|---|---|---|
| Duration (day) | | 11.7 (11.1) | 6.85 (1.91) | 11.5 (3.9) | 10 (3.36) | 8 | 9.61 (5.97) | <0.001 |
| Age group (y) | 22-30 | 1 (16.67) | 2 (33.33) | 2 (33.33) | 1 (16.67) | 0 (0) | 6 (14.63) | 0.72 |
| | 31-50 | 4 (36.36) | 2 (18.18) | 4 (36.36) | 1 (9.09) | 0 (0) | 11 (26.83) | |
| | 51-72 | 4 (16.67) | 10 (41.67) | 4 (16.67) | 5 (20.83) | 1 (4.17) | 24 (58.54) | |
| Gender | Male | 6 (21.43) | 10 (35.71) | 7 (25.0) | 4 (14.29) | 1 (3.57) | 28 (68.29) | 0.92 |
| | Female | 3 (23.08) | 4 (30.77) | 3 (23.08) | 3 (23.08) | 0 (0) | 13 (31.71) | |
| Season | Spring | 9 (100.0) | 4 (28.57) | 0 (0) | 0 (0) | 0 (0) | 13 (31.71) | <0.001 |
| | Summer | 0 (0) | 10 (71.43) | 5 (50.0) | 0 (0) | 0 (0) | 15 (36.58) | |
| | Fall | 0 (0) | 0 (0) | 5 (50.0) | 7 (100.0) | 1 (100.0) | 13 (31.71) | |

*Note.* CIDP: Chronic inflammatory demyelinating polyneuropathy; AIDP: Acute inflammatory demyelinating polyneuropathy; AMAN: Acute motor axonal neuropathy; AMSAN: Acute motor and sensory axonal neuropathy; MFS: Miller-fisher syndrome.

**Table 3.** The Outcome of GBS According to GBS Disorder Type

| Variable | | Demyelinating | Axonal | Total | *P* Value |
|---|---|---|---|---|---|
| Survival status | Alive | 20 (86.96) | 16 (94.12) | 36 (90.0) | 0.62 |
| | Expire | 3 (13.04) | 1 (5.88) | 4 (10.0) | |
| Response | Complete recovery | 15 (65.22) | 7 (41.18) | 22 (55.0) | 0.17 |
| | Complete disable | 2 (8.7) | 2 (11.76) | 4 (10.0) | |
| | Partial recovery | 3 (13.04) | 7 (41.18) | 10 (25.0) | |
| | Expire | 3 (13.04) | 1 (5.88) | 4 (10.0) | |
| Complication | Autonomic impairment | 15 (65.22) | 12 (70.59) | 27 (67.5) | 0.38 |
| | Respiratory | 1 (4.35) | 3 (17.65) | 4 (10.0) | |
| | UTI | 1 (4.35) | 1 (5.88) | 2 (5.0) | |
| | Pulmonary infection | 3 (13.04) | 1 (5.88) | 4 (10.0) | |
| | Ventilator dependent | 3 (13.04) | 0 (0) | 3 (7.5) | |

*Note.* GBS: Guillain-Barré syndrome; UTI: Urinary tract infections.

7% of the GBS cases,[23] while in Japan and Taiwan, MFS accounted for more than 19% of GBS cases.[24] In this study, only 2% of patients had MFS. In Iran, adequate studies have not been conducted to address the epidemiology of this syndrome, especially in adults. In the conducted study by Ansari et al[25] in Isfahan, unlike the results of the present study, the AMSAN variant with 26% of cases was the most reported form. Consistent with the present findings, in the study by Yadegari et al[26] in Tehran, the AIDP variant was the most common form in 55.3% of cases. In another study by Salehiomran et al[27] in Babol, the results revealed that 17.6%, 12.6%, and 11.8% of cases were AMAN, AIDP, and AMSAN, respectively. Considering the high mean age of patients in the present study, the findings cannot be compared with Salehiomran et al. It should be noted that in the present study, the syndrome of about 20% of patients was not identified; therefore, the epidemiology of this self-immune syndrome cannot be adequately judged. The reason for these differences in the different regions of the world is still not well-known, but genetic factors, risk factors, and infections may play a role in this regard.[28]

GBS is more common in men than in women and has a lower rate in children than in adults. In the current study, the proportion of males to females was two, and the mean age of patients was 54 years. In most studies, the prevalence of the disease is more common in males than in females. The reason for this increased incidence with increasing age and high incidence in men is not yet clear. In autoimmune diseases, the incidence of the disease in women is higher than that of men, which is not the case with GBS. In this study, none of the patients reported a family history of GBS in their first-degree relatives.

Consistent with the results of the current study, in the study by Mazaheri et al[29] in Hamadan province in 2007, from 51 cases, 70% of them were male. Likewise, in the present study, 66% of patients were male. In the cross-sectional study conducted by Rahimi Jaberi et al[30] in 2013 in Shiraz, 214 patients were studied of whom 119 (55.6%) were male. In a study in Spain in 2015, of 45 patients with GBS, the male/female ratio was 1.4, and the mean age of patients was 48 years old, which was in agreement with the findings of this study.[31]

The findings of the current study indicated that among 51 patients, 37 (72.54%) had a history of a precursor event before the onset of the disease, 18 (48.64%) had respiratory infections, and 13 (35.13%) reported gastrointestinal infections. Based on the results of previous studies, in two-thirds of the patients before the onset of GBS, a precursor event (often an infectious disease) occurs, especially respiratory infections and gastrointestinal. In the present study, more than 70% of patients had a prognosis, nearly half of them had respiratory infections, and about 35% of them had gastrointestinal diseases. In a study by de la O-Peña et al[31] in Spain in 2015, 45 patients were diagnosed with GBS, 40% had respiratory infections, and 24.4% had a gastrointestinal infection, which is consistent with the findings of this study. One possibility is that the mechanisms of infectious diseases by stimulating the immune system damage the myelin or the axons. Campylobacter is the most important microorganism detected in these patients and is detected in more than 30% of patients. Other factors include the Epstein-Barr virus, mycoplasma, para-influenza, HIV, and Zica virus.[32] Consistent with the results of the present study, in a study in the United States in 2009, respiratory and gastrointestinal infections were the most reported cases in GBS patients. In the study by Yazdchi et al on 43 patients diagnosed with GBS in Tabriz in 2005, 60% of patients had autonomic system involvement.[33] In the present study, the most common observed complications were autonomic dysfunctions (64.70%), and 19.60% of cases needed ventilation. In de la O-Peña and colleagues' study[31] in Spain, the highest number of cases were diagnosed in the summer as in the present study, and the most common episodes of symptoms were in the summer and autumn.

The present study suffered from a few limitations. Firstly, the collected data are based on registered medical records, and question from patients for incomplete variables is prone to information bias. Secondly, due to the small sample size, the generalizability of data should be made with caution.

## Conclusion

According to the study, the most variants of GBS in Hamadan province were AIDP in demyelinating form and AMAN variant in the axonal deterioration form. Further, there is a seasonal variation in variant types of GBS in Hamadan. However, studies with a larger sample size are recommended in different parts of Iran to better understand the epidemiology and to ensure common types of GBS.

### Acknowledgments

Deputy of Research and Technology of Hamadan University of Medical Sciences approved our study. We would like gratefully acknowledge the contribution of all patients who were answered to our study questions as well as all medical students who gathered the data.

### Conflict of Interest Disclosures

The author claimed no conflict of interest.

### Ethical Approval

The ethics approval was obtained from Hamadan University of Medical Sciences (with the ethical code IR.UMSHA.REC.1398.037).

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