Original Article

OPEN ACCESS

Clinical Predictors of Mechanical Ventilation in Patients with Guillain-Barré Syndrome

Javeria Qadeer Abbasi[1], Mansoor Iqbal[2], Asmatullah Khan Solizay[3]

[1]Post Graduate Resident, [2]Head of Department, [3]Resident,

(Department of Neurology, Pakistan Institute of Medical Sciences, Islamabad)

Author`s Contribution

[1,3]Substantial contributions to the conception or design of the work; or the acquisition, Drafting the work or revising it critically for important intellectual content, [2]Final Approval

Funding Source: None
Conflict of Interest: None

Received: June 23, 2026
Revised: Aug 19, 2026
Accepted: Aug 23, 2026

Address of Correspondent
Dr. Javeria Qadeer Abbasi
Post Graduate Resident
Department of Neurology, Pakistan Institute of Medical Sciences, Islamabad
ja.abbasi764@gmail.com

This article is licensed under the Creative Commons Attribution–NonCommercial 4.0 International License.
https://creativecommons.org/licenses/by-nc/4.0/

ABSTRACT

Objective: To determine the frequency of mechanical ventilation among patients with Guillain Barre Syndrome and to compare patients with and without mechanical ventilation for factors leading to mechanical ventilation.

Methodology: This observational analytical cross sectional study was conducted at the Neurology Department of PIMS, Islamabad, enrolling 98 patients aged 13–70 years diagnosed with Guillain-Barré syndrome using Brighton criteria. Demographic and clinical data, including mechanical ventilation and its clinical predictors like autonomic dysfunction, bulbar dysfunction, ascending weakness pattern, and ophthalmoplegia was recorded.

Results: Mechanical ventilation was required in 9 (9.2%) patients. Bulbar dysfunction (77.8% vs. 13.5%, $p < 0.001$) and autonomic dysfunction (33.3% vs. 7.9%, $p = 0.025$) were significantly more frequent in ventilated compared to non-ventilated patients. Stratified analysis showed male sex was significantly associated with mechanical ventilation (62.2%, $p = 0.031$), while age, BMI, weakness duration, and comorbidities showed no significant differences.

Conclusion: Bulbar and autonomic dysfunction were significantly associated with mechanical ventilation in Guillain-Barré syndrome. Early recognition of these clinical features may help identify high-risk patients and guide timely respiratory intervention.

Key words: Guillain Barre Syndrome, Mechanical Ventilation, Clinical Predictors .

Cite this article as: Abbasi JQ, Iqbal M, Solizay AK. Clinical Predictors of Mechanical Ventilation in Patients With Guillain-Barré Syndrome.. Ann Pak Inst Med Sci. 2026; 22(4):426-431. doi. 10.48036/apims.v22i4.1721.

Introduction

Guillain Barre Syndrome (GBS) was first described in earlier decades of 20th century. It is an autoimmune disorder of nervous system that primarily affects the motor nervous system resulting in flaccid paralysis.[1] GBS is a diagnosis of exclusion. Patients often presents with ascending non-traumatic weakness in the limbs.[2] Global annual incidence is 1-2 cases per 100,000 population. Men with advanced age are frequently affected. The typical presentation include bilateral lower limb weakness that is sudden in onset and gradually progresses from below upwards.[3] The peak symptoms appear in a period of 4 weeks. Poor respiratory drive and autonomic dysfunction are signs of worst prognosis. Overall mortality ranges from 1% to 18%.[4]

Though the etiology is unclear, substantial evidence suggests the role of environmental toxins and infections such Campylobacter jejuni triggers the immune mediated damage to neurons. Pathogens from other organ system may also initiate the disease process.[5] The clinical spectrum of disease is broad including motor axonal neuropathy, sensory axonal neuropathy and demyelinating neuropathy reporting from various regions of Europe, Latin America and North America with each region showing characteristic injury pattern. However, cases from low- and middle-income countries are not uncommon.[6]

Case fatality rate of GBS is 10 to 20% and majority of the deaths result from respiratory failure, complicated pneumonias and sepsis and other fatal cardiopulmonary events. Mechanical ventilation is advocated in complicated GBS with respiratory muscle paralysis.[7] Approximately a third of cases with GBS require mechanical invasive ventilation. Several factors determine the need for mechanical ventilation including

advanced age, male gender, presence of early cranial nerve involvement, rapid disease progression, delayed hospitalization and presence of autonomic dysfunction.[8]

In a retrospective study of 222 patients by Mendez et al, the age range was 15 to 79 years and mean age of the participants was 39.7 ± 16.51 years. 135 (60.81%) were men and 87 (39.19%) were women. Invasive mechanical ventilation was required in 38/222 (17.12%) patients and 184/222 (82.88%) did not require mechanical ventilation. Predictors of mechanical ventilation included dysautonomia (n = 29/38, 76.3%), bulbar dysfunction (31/38, 81.57%), ascending pattern of weakness progression (27/38, 71%) and ophthalmoplegia (8/38, 21%) respectively. In patients who did not require mechanical ventilation, dysautonomia was recorded in (52/184, 28.26%), bulbar dysfunction (34/184, 18.47%), ascending pattern of weakness progression (125/184, 67.93%) and ophthalmoplegia (23/184, 12.5%) respectively.[1]

The ability to predict requirement for mechanical ventilation in GBS can guide early intervention and resource allocation, and it can also inform the counseling of patients and their families about the potential course of the disease. By identifying clinical factors associated with respiratory failure, healthcare providers can better monitor and intervene early in high-risk patients, potentially improving patient outcomes and reducing the burden of preventable complications. Data regarding the reliable set of predictors remains limited from local settings is scarce. Hence the study has been planned. Understanding these clinical predictors can help clinicians identify high-risk patients earlier in their disease course, optimize ventilatory support, and improve the overall management of GBS. The study aimed to determine the frequency of mechanical ventilation among patients with Guillain Barre Syndrome and to compare patients with and without mechanical ventilation for factors leading to mechanical ventilation.

Methodology

This observational analytical cross-sectional study was carried out at Neurology department, PIMS, Islamabad during the period January 2026 till June 2026 after taking approval from research review board reference no. F-5-2/2024(ERRC)/PIMS. Male and female patient aging 13 to 70 years diagnosed with Guillain Barre Syndrome according to Brighton criteria were enrolled and assessed for mechanical ventilation and clinical factors leading to mechanical ventilation. Patients with prior history of cerebrovascular accidents, COPD, any other neuromuscular disorder leading to limb weakness were excluded. Guillain Barre Syndrome was confirmed by Brighton criteria for case definition of Guilain-Barre syndrome which included: 1) Bilateral and flaccid weakness of the limbs; AND 2) Decreased or absent deep tendon reflexes in weak limbs; AND 3) Monophasic illness pattern; and interval between onset and nadir of weakness between 12 hours and 28 days; and subsequent clinical plateau; AND 4) Absence of identified alternative diagnosis for weakness; AND 5) CSF total white cell count <50 cells/mm^3 (with or without CSF protein elevation above laboratory value); OR Electrophysiologic studies consistent with GBS if CSF not collected or results not available. Patients were intubated for mechanical ventilation in the presence of any including a) clinical evidence of the use of accessory muscles, b) Evidence of fatigue of respiratory muscles, c) Presence of severe bulbar weakness with risk of aspiration d) Arterial blood gas showing pO2 <70 mm Hg or pCO2 > 45 mm Hg. Clinical predictors of mechanical ventilation included: 1) Autonomic dysfunction: confirmed when drop in systolic blood pressure by more than 20mmHg when the change in position from supine to sitting up. 2) Bulbar dysfunction: confirmed clinically by the presence of a weak cough reflex, weak or absent gag reflex evoked by touching the back of the throat with tongue depressor or difficulty in swallowing. 3) Ascending Direction of weakness: confirmed on history. Patient reporting initiation of weakness (MRC<4/5) in the feet and going up along the legs and thighs to the truck and upper extremities. 4) Ophthalmoplegia: confirmed with finger H test. Failure to roll the eyeball in all of the six directions. Sample size was 98, calculated using WHO sample size calculator taking anticipated frequency patients with GBS requiring mechanical ventilation = 17.12%, margin of error = 7.5% and confidence level = 95%.[1] Participants were enrolled using non-probability consecutive sampling technique. Informed consent was obtained from all participants, with confidentiality assured and no anticipated risks explained.

Baseline information and demographics like age, gender, BMI, smoking history, diabetes (Hba1c >6.5%) and hypertension history (blood pressure >140/90mmHg) and duration of weakness (days) was noted.

The decision to initiate mechanical ventilation was made by the consultant neurologist based on oxygen saturation measured by pulse oximetry while receiving supplemental oxygen. Patients with persistent SaO_2

<90% were mechanically ventilated. Patients with and without mechanical ventilation were noted. Detailed history was taken about the site of onset of weakness and the direction of progression of weakness. Blood pressure was measured in supine position using sphygmomanometer followed by measurement in sitting up position in the bed. Drop in blood pressure upon sitting up was noted. Gaze (movement of eyeball) was assessed with finger H test. While sitting at the level of patient, finger H test was performed. Failure to roll the eye ball in any direction was noted.

Data was analyzed using statistical analysis program IBM SPSS version 26. Means ± S.D or median (IQR) was recorded for continuous variables like age, BMI and duration of weakness after checking the normality of the data with Shapiro wilk test while frequencies and percentages were recorded for categorical variables like gender, smoking, diabetes, hypertension, mechanical ventilation and clinical predictors. Clinical predictors in patients with and without mechanical ventilation were compared using chi square or fisher exact test at 5% level of significance. Mechanical ventilation and clinical predictors were stratified by age, gender, BMI, smoking, diabetes and hypertension to control confounders. Post stratification chi square test was applied. p value ≤0.05 was considered statistically significant.

Results

The study included 98 patients with a median age of 32.0 years (IQR: 23.0–45.0), with majority in the age group 19–35 years (n=48, 49.0%). Most patients had a normal BMI (18.5–24.9 kg/m²; n=73, 74.5%). Weakness duration was ≤7 days in 55.1% (n=54) and >7 days in 44.9% (n=44). Males (n=61, 62.2%) outnumbered females (n=37, 37.8%). Mechanical ventilation was recorded in 9 (9.2%) patients. Among clinical predictors of mechanical ventilation, ascending weakness pattern was most common (n=88, 89.8%), followed by autonomic dysfunction (n=10, 10.2%), bulbar dysfunction (n=19, 19.4%), and ophthalmoplegia (n=6, 6.1%) as reported in table I.

Patients who were ventilated, had significantly higher rates of bulbar dysfunction (77.8% vs. 13.5%, p < 0.001) and autonomic dysfunction (33.3% vs. 7.9%, p = 0.025) compared to non-ventilated patients. No significant differences were observed for ascending weakness pattern (100% vs. 88.8%, p = 0.552) or ophthalmoplegia (11.1% vs. 5.6%, p = 0.363). (Table II)

Table I: Baseline characteristics, mechanical ventilation and clinical predictors among study participants. (N=98)

Variable	n (%)
Median (IQR): 32.0 (23.0 - 45.0), Shapiro-Wilk p < 0.001	
Age (years)	
13-18	18 (18.4)
19-35	48 (49.0)
36-70	32 (32.7)
BMI (kg/m²)	
Median (IQR): 23.0 (22.0 - 24.0), Shapiro-Wilk p < 0.001	
(<18.5)	3 (3.1)
(18.5 - 24.9)	73 (74.5)
(≥25.0)	22 (22.4)
Weakness duration (days) Median (IQR): 7.0 (4.0 - 10.0), Shapiro-Wilk p < 0.001	
(≤7 days)	54 (55.1)
(>7 days)	44 (44.9)
Gender	
Male	61 (62.2)
Female	37 (37.8)
Diabetes Mellitus (DM)	
Yes	5 (5.1)
No	93 (94.9)
Hypertension (HTN)	
Yes	11 (11.2)
No	87 (88.8)
Smoking	
Yes	2 (2.0)
No	96 (98.0)
Mechanical Ventilation	
Yes	9 (9.2)
No	89 (90.8)
Autonomic Dysfunction	
Yes	10 (10.2)
No	88 (89.8)
Bulbar Dysfunction	
Yes	19 (19.4)
No	79 (80.6)
Ascending Weakness Pattern	
Yes	88 (89.8)
No	10 (10.2)
Ophthalmoplegia	
Yes	6 (6.1)
No	92 (93.9)

Stratified analysis showed that male patients were significantly more likely to require mechanical ventilation (100% of ventilated patients vs. 58.4% of non-ventilated patients, p = 0.031). No other significant differences were observed across subgroups. Age distribution was similar between groups (p = 0.563), with most ventilated patients aged 19–35 years (55.6%). BMI categories (p = 0.702), weakness duration ≤7 days (77.8% vs. 52.8%, p = 0.258), and comorbidities including smoking, diabetes mellitus, and hypertension (all p = 0.999) did not differ significantly between ventilated and non-ventilated patients. (Table III)

Stratified analyses across age groups, gender, BMI categories, weakness duration, smoking status, diabetes mellitus, and hypertension revealed no statistically significant associations with any of the four clinical

features—autonomic dysfunction, bulbar dysfunction, ascending weakness, or ophthalmoplegia (all $p > 0.05$). (Table IV)

Table II: Comparison of Clinical Predictors in Patients with and Without Mechanical Ventilation. (N=98)

Variable	Mechanical Ventilation = YES (n=9)	Mechanical Ventilation = NO (n=89)	p-value
Autonomic Dysfunction			0.025**
Yes	3 (33.3)	7 (7.9)	
No	6 (66.7)	82 (92.1)	
Bulbar Dysfunction			<0.001**
Yes	7 (77.8)	12 (13.5)	
No	2 (22.2)	77 (86.5)	
Ascending Weakness Pattern			0.552**
Yes	9 (100)	79 (88.8)	
No	0 (0)	10 (11.2)	
Ophthalmoplegia			0.363**
Yes	1 (11.1)	5 (5.6)	
No	8 (88.9)	84 (94.4)	

Table III: Stratified Analysis of Mechanical Ventilation by Demographic and Clinical Variables. (N=98)

Stratification Variable	Subgroup	MV = YES (n=9)	MV = NO (n=89)	p-value*
Age (years)				
	(13-18)	2 (22.2)	16 (18.0)	
	(19-35)	5 (55.6)	43 (48.3)	0.563
	(36-70)	2 (22.2)	30 (33.7)	
Gender				
	Male	9 (100)	52 (58.4)	**0.031**
	Female	0 (0)	37 (41.6)	
BMI Category				
	(<18.5)	0 (0)	3 (3.4)	
	(18.5 - 24.9)	7 (77.8)	66 (74.2)	0.702
	(≥25.0)	2 (22.2)	20 (22.5)	
Weakness Duration				
	(≤7 days)	7 (77.8)	47 (52.8)	0.258
	(>7 days)	2 (22.2)	42 (47.2)	
Smoking				
	Yes	0 (0)	2 (2.2)	0.999
	No	9 (100)	87 (97.8)	
Diabetes Mellitus (DM)				
	Yes	0 (0)	5 (5.6)	0.999
	No	9 (100)	84 (94.4)	
Hypertension (HTN)				
	Yes	1 (11.1)	10 (11.2)	0.999
	No	8 (88.9)	79 (88.8)	

Discussion

In the present study, 9.2% of patients with Guillain Barre Syndrome (GBS) received mechanical ventilation (MV). In a Latin American GBS cohort, Rodríguez-Méndez et al. (2024) found an MV rate of 12.5%.[1] In the same manner, Malaga et al. (2021) found that in a Peruvian community, 14.3% patients needed MV.[7] On the other hand, several Asian cohorts have been shown to have higher MV rates; Wen et al. 2021 found that 22.5% of Chinese GBS patients required respiratory assistance.[8]

Variations in GBS variants, geographical conditions, healthcare availability, and hospital arrival timing are probably the reasons for the variance in MV prevalence between studies.[3,4] As stated by Papri et al. (2021) in their assessment of GBS in low- and middle-income countries[4], bias during selection or the inclusion of milder GBS patients may potentially contribute to lower MV rates in some situations. Notwithstanding these differences, our result of 9.2% is within the wider range of 9–30% reported worldwide.[2,3,10,13]

Table IV: Stratified Analysis of Clinical Factors by Demographic and Clinical Variables. (N=98)

Variable	Sub group	Autonomic Dysfunction n (%)	Bulbar Dysfunction n (%)	Ascending Weakness n (%)	Ophthalmoplegia n (%)
Age (years)	(13-18)	2 (11.1)	5 (27.8)	16 (88.9)	1 (5.6)
	(19-35)	5 (10.4)	8 (16.7)	44 (91.7)	3 (6.3)
	(36-70)	3 (9.4)	6 (18.8)	28 (87.5)	2 (6.3)
p-value		0.999	0.421	0.876	0.999
Gender	Male	7 (11.5)	13 (21.3)	54 (88.5)	4 (6.6)
	Female	3 (8.1)	6 (16.2)	34 (91.9)	2 (5.4)
p-value		0.742	0.603	0.742	0.999
BMI (kg/m²)	(<18.5)	0 (0)	0 (0)	2 (66.7)	0 (0)
	(18.5-24.9)	9 (12.3)	16 (21.9)	67 (91.8)	5 (6.8)
	(≥25.0)	1 (4.5)	3 (13.6)	19 (86.4)	1 (4.5)
p-value		0.432	0.259	0.207	0.876
Weakness Duration	(≤7 days)	5 (9.3)	12 (22.2)	51 (94.4)	4 (7.4)
	(>7 days)	5 (11.4)	7 (15.9)	37 (84.1)	2 (4.5)
p-value		0.751	0.450	0.119	0.691
Smoking	Yes	0 (0)	1 (50.0)	2 (100)	0 (0)
	No	10 (10.4)	18 (18.8)	86 (89.6)	6 (6.3)
p-value		0.999	0.345	0.999	0.999
Diabetes Mellitus	Yes	0 (0)	0 (0)	4 (80.0)	0 (0)
	No	10 (10.8)	19 (20.4)	84 (90.3)	6 (6.5)
p-value		0.999	0.585	0.458	0.999
Hypertension	Yes	0 (0)	2 (18.2)	10 (90.9)	0 (0)
	No	10 (11.5)	17 (19.5)	78 (89.7)	6 (6.9)
p-value		0.607	0.999	0.999	0.999

While ascending weakness distribution and ophthalmoplegia did not significantly correlate with mechanical breathing, bulbar dysfunction and autonomic dysfunction were found to be significant predictors. Our cohort's correlation between bulbar dysfunction and MV is in line with previous research. Bulbar symptoms at

admission considerably raised the likelihood of needing intubation during the first week of hospitalization, as Walgaard et al. showed.[10] Additionally, Shahrizaila et al stressed that cranial nerve inflammation, especially bulbar symptoms, should initiate thorough respiratory monitoring since it frequently precedes diaphragmatic weakening.[2] Bulbar dysfunction exhibited a sensitivity of more than 70% for predicting eventual MV in a sample of 114 GBS patients, according to Durand et al.[11] Additionally, individuals with bulbar involvement were three times more likely to experience respiratory difficulties than those without [13], according to Van den Berg et al.[21]

Autonomic dysfunction has been consistently linked to respiratory failure in recent GBS cohorts, and our findings align with this literature. Wen et al. (2021) found autonomic dysfunction an independent predictor of mechanical ventilation after multivariate adjustment ($p < 0.05$) in 155 patients, paralleling our finding of significantly higher autonomic dysfunction in ventilated versus non-ventilated patients (33.3% vs 7.9%, $p = 0.025$).[8] Zhang et al. (2025) reported an OR of 3.804 (95% CI 1.058–13.679, $p = 0.041$) in 159 patients, consistent in direction and magnitude with our results, though our unadjusted comparison cannot be equated to their adjusted estimate.[14] Galassi et al identified dysautonomia as an independent predictor of both mechanical ventilation and tracheostomy failure in 230 patients, extending our observation to ventilator dependence.[15] López-Hernández et al found dysautonomia more frequent in patients requiring prolonged ventilation (42.3% vs 19.4%, $p = 0.037$); our 33.3% falls between their groups, likely because we included all ventilated patients rather than only those with prolonged ventilation.[16] Overall, our effect direction is concordant across all four cohorts, with differences in absolute frequencies attributable to dysautonomia definitions, outcome definitions, and cohort composition rather than a divergent association.

It's interesting to note that there was no discernible difference in the weakness pattern between ventilated and non-ventilated individuals. This implies that although ascending weakness is a characteristic of GBS, respiratory failure cannot be accurately predicted by its existence alone.[2,3] In line with the Miller Fisher type of GBS, which often has a better prognosis and a reduced incidence of respiratory failure, ophthalmoplegia was also not substantially linked to MV.[9] Funakoshi et al found ophthalmoplegia occurring without subsequent limb weakness—was associated with a 0% ventilation rate, whereas Fisher/GBS overlap with descending tetraparesis required mechanical ventilation significantly more often than typical GBS (24% vs 10%, $p = 0.04$).[17]

These observations are consistent with our finding that ophthalmoplegia per se was not associated with ventilation (11.1% vs 5.6%, $p = 0.363$), and suggest that the predictive signal resides in the descending pattern of weakness rather than in ophthalmoplegia as an isolated clinical feature.

Male sex was found to be strongly linked with MV using stratified analysis; this conclusion has been differently stated in the literature. The occurrence of GBS is more common in men worldwide, according to Bragazzi et al. (2021), although the relationship between sex and severity is still up for discussion.[3] Cheng et al. (2022) reported male sex as an independent risk factor for mechanical ventilation in a cohort of 252 Chinese GBS patients (OR 3.720, 95% CI 1.155–11.985, $p < 0.05$), consistent with our finding,[18] whereas Islam et al found that although ventilated patients in Bangladesh were predominantly male (68%), gender did not remain an independent predictor after adjustment.[19] This inconsistency suggests that the male-sex association may be influenced by sample size, geographic characteristics, and the covariates included in each model. Other clinical or demographic parameters, such as age, BMI, duration of weakness, smoking, diabetes, or hypertension, did not significantly correlate with MV, which is in line with earlier findings that these variables are not reliable indicators of respiratory failure.[1,7,8] Our results are consistent with Shangab et al, conclusion that age, in the absence of additional risk variables, does not consistently predict MV.[20]

The single-center design, sample size, and small proportion of ventilated patients are some of the shortcomings that should be acknowledged since they may lower statistical power and generalizability. Our capacity to completely describe respiratory risk trajectories was further limited by the lack of electrophysiological categorization, serial pulmonary function tests, and long-term follow-up data. Despite these limitations, the study provided vital information regarding the predictors of ventilation in GBS patients, such as the repeated incidence of bulbar and autonomic dysfunction as important determinants supports their population-based validation for clinical risk segmentation, and these results add South Asian data sets to a literature predominately composed of other

population cohorts. To confirm these results and improve risk classification models for mechanical ventilation in Guillain-Barré syndrome, future multicenter prospective studies with bigger cohorts, consistent electrodiagnostic procedures, and serial vital capacity measures are advised.

Conclusion

While ascending weakness pattern and ophthalmoplegia did not significantly correlate with mechanical ventilation in individuals with Guillain-Barré syndrome, bulbar dysfunction and autonomic dysfunction were found to be significant predictors. According to stratified analysis, mechanical ventilation had a significant association with male sex, but not with age, BMI, duration of weakness, smoking, diabetes, or hypertension. Early detection of autonomic and bulbar dysfunction may help identify individuals at risk for respiratory failure and direct prompt clinical decision-making.

References

1. Rodríguez-Méndez AA, Briseño-Ramírez J, Rivas-Ruvalcaba FJ, Solis-Estrada J, Alcázar-García LB, Díaz-Ramírez K, et al. Clinical predictors for mechanical ventilation assistance in Guillain-Barré syndrome. Front Neurol. 2024;15:1385945. https://doi.org/10.3389/fneur.2024.1385945
2. Shahrizaila N, Lehmann HC, Kuwabara S. Guillain-Barré syndrome. Lancet. 2021;397:1214-28. https://doi.org/10.1016/S0140-6736(21)00517-1
3. Bragazzi NL, Kolahi AA, Nejadghaderi SA, Lochner P, Brigo F, Naldi A, et al. Global, regional, and national burden of Guillain-Barré syndrome and its underlying causes from 1990 to 2019. J Neuroinflammation. 2021;18:264. https://doi.org/10.1186/s12974-021-02319-4
4. Papri N, Islam Z, Leonhard SE, Mohammad QD, Endtz HP, Jacobs BC. Guillain-Barré syndrome in low-income and middle-income countries: challenges and prospects. Nat Rev Neurol. 2021;17:285-96. https://doi.org/10.1038/s41582-021-00467-y
5. van Wagenberg CPA, Delele TG, Havelaar AH. Patient-related healthcare costs for diarrhoea, Guillain-Barré syndrome and invasive non-typhoidal salmonellosis in Gondar, Ethiopia, 2020. BMC Public Health. 2022;22:2091. https://doi.org/10.1186/s12889-022-14539-1
6. Melone MA, Heming N, Meng P, Mompoint D, Aboab J, Clair B, et al. Early mechanical ventilation in patients with Guillain-Barré syndrome at high risk of respiratory failure: a randomized trial. Ann Intensive Care. 2020;10:128. https://doi.org/10.1186/s13613-020-00742-z
7. Malaga M, Rodriguez-Calienes A, Marquez-Nakamatsu A, Recuay K, Merzthal L, Bustamante-Paytan D, et al. Predicting mechanical ventilation using the EGRIS in Guillain-Barré syndrome in a Latin American country. Neurocrit Care. 2021;35:775-82. https://doi.org/10.1007/s12028-021-01218-z
8. Wen P, Wang L, Liu H, Gong L, Ji H, Wu H, et al. Risk factors for the severity of Guillain-Barré syndrome and predictors of short-term prognosis of severe Guillain-Barré syndrome. Sci Rep. 2021;11:11578. https://doi.org/10.1038/s41598-021-91132-3
9. Sejvar JJ, Kohl KS, Gidudu J. Guillain-Barré syndrome and Fisher syndrome: case definitions and guidelines for collection, analysis, and presentation of immunization safety data. Vaccine. 2011;29:599. https://doi.org/10.1016/j.vaccine.2010.06.003
10. Walgaard C, Lingsma HF, Ruts L, van Doorn PA, Steyerberg EW, Jacobs BC. Prediction of respiratory insufficiency in Guillain-Barré syndrome. Ann Neurol. 2010;67(6):781-7. https://doi.org/10.1002/ana.21976
11. Durand MC, Porcher R, Orlikowski D, Aboab J, Devaux C, Clair B, et al. Clinical and electrophysiological predictors of respiratory failure in Guillain-Barré syndrome: a prospective study. Lancet Neurol. 2011;10(5):435-43.
12. Fournier AM, Jallut Y, Courcelle R, Hebert G, Charra F, Millet H, et al. Bulbar involvement as a predictor of mechanical ventilation in Guillain-Barré syndrome. Rev Neurol (Paris). 2014;170(5):345-50.
13. Van den Berg B, Bunschoten C, van Doorn PA, Jacobs BC. Mortality in Guillain-Barré syndrome. Neurology. 2013;80(18):1650-4. https://doi.org/10.1212/WNL.0b013e3182904fcc
14. Zhang W, Yao Q, Wang Y, Yin J, Yang X. Clinical study of the relationship between hepatitis B core antibody and mechanical ventilation in patients with Guillain-Barré syndrome. Front Neurol. 2025;16:1530286. https://doi.org/10.3389/fneur.2025.1530286
15. Galassi G, Marchioni A, Tondelli M, Bedin R, Marzullo D, Bastia E, et al. Predictors of respiratory failure in Guillain-Barré syndrome: a 22 year cohort study from a single Italian centre. Eur J Neurol. 2024;31(1):e16090. https://doi.org/10.1111/ene.16090
16. López-Hernández JC, Vargas-Cañas ES, Galnares-Olalde JA, López-Alderete JA, López-Pizano A, Rivas-Cruz MA, et al. Factors predicting prolonged mechanical ventilation in Guillain-Barré syndrome. Can J Neurol Sci. 2024;51(1):98-103. https://doi.org/10.1017/cjn.2023.23
17. Funakoshi K, Kuwabara S, Odaka M, Hirata K, Yuki N. Clinical predictors of mechanical ventilation in Fisher/Guillain-Barré overlap syndrome. J Neurol Neurosurg Psychiatry. 2009;80(1):60-4. https://doi.org/10.1136/jnnp.2008.154351
18. Cheng Y, Liu K, Li C, Zhang W, Wu X, Fang S. Risk factors for mechanical ventilation in patients with Guillain-Barré syndrome. Neurocrit Care. 2022;37(1):121-8. https://doi.org/10.1007/s12028-022-01457-8
19. Islam Z, Papri N, Ara G, Ishaque T, Alam AU, Jahan I, et al. Risk factors for respiratory failure in Guillain-Barré syndrome in Bangladesh: a prospective study. Ann Clin Transl Neurol. 2019;6(2):324-32. https://doi.org/10.1002/acn3.706
20. Shangab M, Al Kaylani M. Clinical predictors for mechanical ventilation and prognosis in patients with Guillain-Barré syndrome: a 10-year experience. Neurol Sci. 2021;42(12):5305-9. https://doi.org/10.1007/s10072-021-05251-w
21. Van den Berg B, Bunschoten C, van Doorn PA, Jacobs BC. Mortality in Guillain-Barré syndrome. Neurology. 2013;80(18):1650-4. https://doi.org/10.1212/WNL.0b013e3182904fcc