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# Clinical and electrophysiological study of Gullian Barre Syndrome with reference to prognosis

KEYWORDS: Guillain Barre Syndrome(GBS), Electrophysiological studies

**Dr.P. RAJASEKHAR**
Professor of Medicine, Government General Hospital, Kurnool Medical College, Kurnool.

**Dr. C. SREENIVASULU**
Associate Professor of Neurology, Government General Hospital, Kurnool Medical College, Kurnool.

**Dr. BHARATH BHUSHAN REDDY**
Resident in General Medicine, Government General Hospital, Kurnool Medical College, Kurnool

**Dr. PRATHAP BINGI**
Resident in General Medicine, Government General Hospital, Kurnool Medical College, Kurnool.

**ABSTRACT** *Guillain Barre Syndrome(GBS) or Acute Polyradiculoneuritis is an acute, diffuse post-infective- disorder of the nervous system involving the spinal roots, the peripheral nerves and cranial nerves.The etiology is thought to be widespread demyelination of the spinal roots and the peripheral nerves due to a cross reaction between myelin and unconfirmed agents like viruses. Although GBS often has a benign prognosis, 7% of patients die and further 16% suffer residual disability.The modalities of treatment of GBS are physiotherapy supportive treatment ventilator management, plasma exchange and of late intravenous immunoglobulins. Early diagnosis of GBS favours a good outcome after treatment, this study was carried out to analyse the electrophysiological abnormalities. Electrophysiological studies play an important role in the early detection, characterization and treatment of GBS.*

*This study was undertaken to study the clinical profile of GBS in Government General Hospital and to attempt to correlate certain clinical and electrophysiological features with prognosis.*

**OBJECTIVES**

- To analyse the clinical profile of GBS.
- To study the prognosis in GBS with reference to

a. Age.
b. Time taken to develop peak deficit from onset (in days).
c. Duration of plateau phase.
d. Time taken to onset of improvement.
e. Requirement of ventilatory support.
f. Cerebrospinal fluid protein level.
g. Nerve conduction studies

**MATERIALS AND METHODS:**

A total of 30 patients admitted to Government General Hospital Kurnool were studied. All patients were hospitalized and the average duration of hospital stay was 15.5 days.

**OBSERVATIONS AND RESULTS**

**Age and Sex distribution:**

The age of patients ranged from 13 to 67 years (Mean 35 years) with the maximum number (46.67%) of patients in the 31- 40 age group.24 patients were males(80%) and 6 patients were females.(20%)

**Seasonal incidence :**

The least number of cases were seen in the months of January to March. However no significant increased incidence in any particular season could be inferred.

**Preceding illness:**

Sixteen(53.3%) patients had some antecedent event prior to the development of GBS . The most common antecedent illness was upper respiratory tract infection. In patients with a history of preceding illness, the mean duration between onset of GBS and the preceding illness was 15 days (+/-5 days).

**First Symptom of illness:**

The first symptom of the illness was in the form of motor weakness in 11 (36.67%) patients and it was sensory in the form of pain, paraesthesiae or numbness in the remaining 19(63.33%) patients.

**Mode of onset:**

Twenty three patients (76.67%) had ascending form of paralysis. Seven patients (23.33%) had simultaneous involvement of all four limbs.

**Maximal grades of disability:**

Twelve patients took upto 1 week to reach maximal weakness, 15 patients took upto 2 weeks, 2 patients took upto 3 weeks and 1 patient took longer than 3 weeks(24 days).The maximum number of admitted patients (40%) reached grade 4 disabilities at peak.

Ten patients(33.33%) developed respiratory paralysis and required mechanical ventilation.

**Sensory Deficit:**

Objective sensory loss was elicited in only 3(10%) out of the 30 patients. The sensory deficit was in the form of diminished touch, vibration and joint position sense, which occurred in a glove and stocking distribution.

**Cranial Nerve Dysfunction:**

Ten patients(33.33%) had cranial nerve dysfunction. Seven patients had facial nerve palsy, among which 5 were bilateral. Three patients had involvement of $9^{th}$ and $10^{th}$ cranial nerves.

**9. Autonomic dysfunction:**

Patients who were in Grade 4 disability or more were not subjected to standing blood pressure recordings. In patients who were on ventilator, the spontaneous changes in

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heart rate and blood pressure were noted. Autonomic dysfunction was detected in 13(43.33%) patients.

**Cerebrospinal Fluid (CSF) Analysis:**
CSF pressure was normal and CSF was clear in all patients. CSF glucose was also normal (approximately half the blood glucose level) in all patients.

CSF protein concentration was raised above 50 mg% in 20(66.67%) patients at one week.

**Electrophysiological studies:**
Nerve conduction studies were conducted in all patients. Twenty patients were found to have reduced motor conduction velocities consistent with demyelinating neuropathy. Five patients were found to have decreased amplitude of action potentials consistent with axonal pattern of neuropathy. Three patients had mixed pattern of neuropathy. The remaining 2 patients had normal conduction studies.

**Complications:**
Patients experienced complications of aspiration pneumonia(8), septicemia (20), UTI (10).

**Treatment:**
All patients received physiotherapy and the 10 patients who developed respiratory failure were put on mechanical ventilation. Five patients received intravenous immunoglobulins in addition to conservative therapy. There was improvement in 4 patients and one patient died due to cardiac arrest.

**Mortality:**
Eight patients(13.33%) died in this study. All eight patients developed respiratory failure and required assisted mechanical ventilation. One patient developed aspiration pneumonia and later died due to septicaemia and shock. The other 7 patients died while on ventilation due to cardiac arrest. In these 7 patients, severe autonomic dysfunction was observed. These patient had fluctuating blood pressure and sinus tachycardia followed by sinus bradycardia unresponsive to atropine. They finally died due to cardiac arrest.

**Analysis of prognostic factors:**
Twenty two out of 30 patients were analysed for prognostic factors in GBS at the end of 3 months. The rest 8 patients were succumbed to death. Patients were divided into two groups. A 'Good Outcome' group which had a disability grade of 3 or less at the end of 3 months and a 'Poor Outcome' group which had a disability grade of greater than 3 at end of 3 months. Eighteen (81.81%) patients were found to have a good outcome while 4 (18.19%) had a poor outcome.

**FEATURES OF GOOD AND POOR OUTCOME GROUPS:**
**Table 1. Features of good and poor outcome groups**

| Features | Good Outcome | Bad Outcome |
|---|---|---|
| **Mean time to peak (days)** | 10.7 (± 3.24) | 7.29(± 2.16) |
| **Median time to onset of improvement** | 14 days | 22 days |
| **Median plateau time (days)** | 4 days | 10 days |
| **Median C.S.F. protein** | 61 mg% | 63 mg% |

Patients were then analysed using Fisher's Exact Probability Test with reference to various prognostic factors and their significance determined.

**PROGNOSTIC NEUROGLOGICAL FACTORS**
**AGE:**
Patients were grouped into two categories : a) 40 years and below(16 patients) and b) above 40 years of age(6 patients). Good outcome was seen in 13(81.25%) in group a and 5(83.33%) in group b. Age is not a significant factor in prognosis.

**CRITICAL TIME PERIODS**
**Outcome was determined with reference to:**
Time taken from onset of GBS to peak deficit: - The outcome in patients who attained peak paralysis in 1 week was compared with those who attained peak paralysis after 1 week. Six patients had peak paralysis within the first week and the remaining 16 patients attained peak paralysis only after 1 week. Fifteen patients in the delayed peak deficit group and 3 patients in the early peak deficit group had a good outcome. Three patients in the former group and one patients in the latter had a poor outcome.

Duration of Plateau Phase:- Outcome in patients with a peak paralysis period (Plateau phase ) of 1 week or less, was compared with outcome in those with a peak paralysis period of more than 1 week. Sixteen patients had a peak paralysis period of upto 1 week, while the remaining 6 patients had a plateau phase of more than 1 week. Fifteen patients in the former group and 3 in the latter group, had a good outcome. Only 1 patients in the former group had a poor outcome, whereas 3 patients in the latter group had a poor outcome.

Duration from onset of GBS to recovery:- The outcome of patients with duration from the onset of GBS to onset of recovery of upto 3 weeks was compared with outcome of those who took more than 3 weeks to recover. Eighteen patients started recovering within 3 weeks of onset while 4 patients took longer than 3 weeks. Sixteen patients in the former group and 2 in the later group had a good outcome. Two patients in the former and 2 in the later group had a poor outcome.

**OTHERS:** Other possible prognostic factors were analysed similarly as shown in the Table-2.

**Table 2. Other possible prognostic neurological signs**

| Neurological sign | Number of patients | Good outcome number (%) | Bad outcome number (%) |
|---|---|---|---|
| **Severity of paralysis** | | | |
| **Power grade 0 – 1** | 4 | 1 (25) | 3 (75) |
| **Power grade 2 – 4** | 18 | 17 (88.9) | 1 (11.1) |
| **Sensory loss (Obj.)** | | | |
| **Present** | 3 | 3(100) | 0 |
| **Absent** | 19 | 15 (78.94) | 4(21.06) |
| **Sphincter dysfunction** | | | |
| **Present** | 0 | 0 | 0 |
| **Absent** | 22 | 18 (81.82) | 4 (18.18) |
| **Bulbar paralysis** | | | |
| **Present** | 3 | 1(33.33) | 2(66.67) |
| **Absent** | 19 | 17 (89.47) | 2 (10.53) |
| **Autonomic dysfunction** | | | |
| **Present** | 13 | 10(76.93) | 3(23.07 |
| **Absent** | 9 | 8 (88.88) | 1 (11.12) |

The outcome at the end of 3 months was correlated with the severity of paralysis (MRC grading) at plateau period. Four patients had the power of 0 – 1, among

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whom 1 patients had a good outcome and 3 had a poor outcome. Eighteen patients had power of grade 2 – 4, among whom 17 had good outcome and 1 had a poor outcome. On applying Fisher's test, the difference in outcome in the two groups is found to significant regarding the severity of paralysis and final outcome (p=0.006).

The presence or absence of objective sensory loss was also compared with respect to outcome. All 3 patients who had sensory loss had good outcome. Among the remaining 19 patients with no sensory loss, 15 had a good outcome and 4 had poor outcome.

In 3 patients with evidence of bulbar paralysis, 1 had a good outcome and 2 had a poor outcome.In patients without bulbar paralysis, 17 and 2 patients had a good and poor outcome respectively.

Evidence of autonomic dysfunction was seen in 13 patients and 10 of them had a favourable outcome at 3 months.In patients without any autonomic dysfunction 8 out of 9 had a good outcome.

## DISCUSSION

Guillain Barre Syndrome(GBS) is a relatively symmetrical, predominantly motor neuropathy,frequently involving facial and other cranial motor nerves with partial or total areflexia for which no specific cause can be demonstrated, although it is commonly preceded by a viral infection. It reaches a peak of disability within four weeks and follows a monophasic course with recovery.

Both cellular and humoral immune mechanisms are being implicated in tissue damage in AIDP.Evidence suggests that all GBS results from immune response to non self antigens (infectious agents, vaccines) that misdirect to host nerve tissue through a resemblance of epitope(molecular mimicry)mechanism.

Circulating anti neural antibodies against a number of antigens have been demonstrated in GBS including against P-2 protein of nerve myelin and a variety of glycoconjugates like GM-1, GD 1b, SGPG and sulfatide. Antiganglioside antibodies, most frequently to GM1 ,are common in GBS,particularly in those preceded by C.jejuni infection. Anti –GQ1b IgG antibodies are found in>90% of patients with MillerFischer syndrome.

A causal link between a preceding infection and GBS has been constructed based on concept of molecular mimicry. An autoimmune response initially launched against the invading organism would secondarily produce damage to peripheral nerve.

Although symptoms are predominantly motor (ascending paralysis) , sensory abbreviations in the form of distal paresthesias and numbness are frequently described by the patient. Autonomic neuropathy is a common and important complication and may involve both sympathetic and parasympathetic fibers.

Diagnosis is based on the Brighton criteria. Treatment is usually with immunoglobulins or plasma exchange with adequate supportive care like mechanical ventilation.

In the present study maximum number of patients were in 31- 40 years age group (40%). Kaplan et al[1] reviewed 2575 cases and found the peak incidence to be between 50 and 74 years of age with lesser peak between 15 and 35 years. Similarly Peter C. Dowling[2] also reported two peaks. In Thakaran et al[3] series however, the mean age of study group was only 28 years.

There is a male preponderance in this study which is in conformity with the report by Robert M. et al.[4]

### SEASONAL INCIDENCE

No seasonal variation in incidence of GBS could be inferred from this study in conformity with the majority of studies in literature.

However a few studies have noted a seasonal clustering of cases.Kaur et al[5] reported an increased incidence in summer and autumn. Peter C. Dowling[2] also noted an increase in summer.

### PRECEEDING ILLNESS

Sixteen (53.3%) of our patients had a definite antecedent event prior to onset of illness. Winer etal[6] reported that over half of GBS patients experience symptoms of viral respiratory or gastrointestinal infections. Ropper et al[7] also reported a high incidence of 73%. In contrast a study by Kaur etal[8] showed a lower incidence of 32%.

### TIME INTERVAL BETWEEN PRODROME AND GBS

The interval between prodromal illness and onset of GBS is most frequently from 1-3 weeks. In this study there is a mean interval of 15+/-5 days. Kaur et al[5] reported a mean interval of 9.2 days. The most common antecedent illness was upper respiratory tract infection (26.67%) while diarrhoeal illness was seen in only two patients (6.67%).

### MODE OF ONSET

Ascending paralysis was noted in 76.66 (23 patients) and descending paralysis in 0% (0 patients), while 23.33%(7 patients) had simultaneous involvement of all four limbs. A metaanalysis of large series by Allan H. Ropper[8] showed ascending paralysis in 60%, descending paralysis in 20% and involvement of all four limbs simultaneously in 20% cases.

### FIRST SYMPTOM OF ILLNESS

In 63.33% patients, the first symptom of illness was sensory in the form of paraesthesia in hands and feet, numbness or pain whereas motor weakness was the first symptom in 36.67% of patients. However Robert et al reported first symptom as sensory in 83% and motor in 17% of patients.

### SENSORY DEFICIT

Objective sensory loss occurred in 3 patients (10%) in the form of diminished touch, vibration and joint position sense which occurred in glove and stocking distribution. This is much lower than the 40% reported by Allan H. Ropper[8] in his metaanalysis. Winer et al[6] noted sensory loss in 52% of his patients.

### MOTOR SYMPTOMS

All patients had involvement of the legs and involvement of limbs was symmetric in all cases. None of the patients had involvement of hands alone, which is in conformity to the observation of Winer etal[6] who said that the arms are not affected in isolation.

### RESPIRATORY FAILURE

Respiratory failure was present in 33.33% in this study. Allan H.Ropper in his meta analysis showed that 10% of patients have respiratory failure. Winer et al noted a 23%

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incidence of respiratory failure. The average duration of mechanical ventilation in present study was 16.12 days.

**MAXIMAL GRADES OF DISABILITY**
Twenty patients (66.66%) reached grade 4 or more disability (bedridden state). In the study by Winer et al[6] only 12% retained the ability to walk throughout the illness and the remaining 88% became bedridden. This is in contrast to the report by RDM Hadden et al[9] who said 40% patients become bedbound.

**ONSET OF PEAK PARALYSIS**
Overall, about 50% of patients with GBS reach maximal weakness by 1 week, 70% by 2 weeks, and 80% by 3 weeks in the course of illness. In this study 40% of patients reached peak deficit within 1 week of onset of illness, 90% by 2 weeks.

**CRANIAL NERVE DYSFUNCTION**
33.33% of patients in this study had cranial nerve dysfunction. This is in conformity with the 50% incidence reported by Winer et al[6] and 60% in Allan H. Ropper's[8] meta analysis. Kaur et al[5] reported an incidence of 41% in her study from North India.

**CRANIAL NERVES**
Facial Nerve was the most commonly involved (23.33%) in our series in concordance with most series. IX and X cranial nerves were involved in only 10% of patients in contrast to the reported incidence of 50% in Allan H. Ropper's meta analysis.

**AUTONOMIC DYSFUNCTION**
Autonomic dysfunction is reported to occur in upto 43.33% of GBS patients in this study. P. Hachenecker et al noted dysfunction in 69% of their patients. NK Singh etal documented 67% incidence.

**CEREBROSPINAL FLUID ANALYSIS**
CSF protein was raised above 50mg% in 20 patients.Winer et al[6] reported raised CSF protein in 80% patients while 90% was reported in Allan H.Ropper's[8] meta analysis.

The lower number of patients with raised CSF protein in this study was probably because all CSF studies were done between 1 and 2 weeks from onset and not repeated thereafter. It is possible that there may have been a rise in CSF protein later in the course of illness, which was not recorded. Furthermore, it has been noted in some studies that CSF protein may not rise throughout the course of illness in some patients with GBS. GuptaRC reports such patients did not show rise in CSF protein even at 6 weeks.

CSF pleocytosis was seen in three patients. CSF mononuclear cell counts of upto 50 per microlitre may be seen in GBS and does not rule out diagnosis of GBS.

**NERVE CONDUCTION STUDIES PATTERN**
Electrophysiological studies were conducted in all patients and 20 of them showed demyelinating pattern, 5 of them showed axonal pattern, 3 patients mixed pattern remaining 2 patients had normal pattern of nerve conduction studies and patients having mixed and axonal pattern showed poor prognosis compared to patients having demyelinating and normal nerve conduction study.

Many authors have found a proportion of patients to have normal nerve condution. The population varies from 9% to 20%. And is higher in the first few weeks of illness. This finding has been explained as due to 1) The patchy nature of pathology of GBS which means that studies confined to one or two nerves may miss abnormal findings. 2) Maximum conduction velocities may conceal abnormalities since conduction can occur normally in some fibres while being partially blocked in some others. 3) Lastly it is likely that proximal conduction blocks occur commonly in GBS that distal motor conduction would be unaffected.

**COMPLICATIONS**
Case fatality in this study was 26.66%. Mortality in GBS varies from 1.3% to 13% in different series with a mean of about 6% Winer et al[6] reported 13% mortality in his study of 100 patients. NK Singh et al noted 8% mortality.

**PROGNOSIS:**
Delayed onset of recovery from paralysis, requirement of mechanical ventilatory support are significant prognostic factors of outcome in GBS.

From the present study ,it is evident that when a patient presents with areflexic acute flaccid paralysis, he should undergo meticulous clinical examination to detect the severity of disease and patient should be observed in ICU as majority have autonomic dysfunction where the patient can land in sudden cardiac arrest due to arrhythmias.

The severity of disease can guide in managing the patient by giving immunoglobulin or doing plasmapheresis.

**Conclusion :**
The various clinical aspects and electrophysiological studies are compared with relative prognosis. Early diagnosis and timely intervention reduces the mortality and morbidity of the disease.

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