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<sup>1</sup>Dean, Faculty of  
Medicine, Director,  
School of Physiotherapy,  
RK University  
Rajkot-Bhavnagar  
Highway, Tramba,  
Rajkot – 360020, Gujarat,  
India

Clinical  
Neurophysiologist,  
Vishal Neurodiagnostic  
Center, Rajkot 360005,  
Gujarat, India

correspondence author:  
Prof. (Dr.) Priyanshu V.  
Rathod, Dean, Faculty of  
Medicine, Director,  
School of Physiotherapy,  
RK University, Rajkot  
[priyanshu.rathod@rku.ac.in](mailto:priyanshu.rathod@rku.ac.in)

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# Neurological autoimmune disease: retrospective analysis of nerve conduction studies to observe the pattern of axonal and demyelinating sensorimotor polyradiculoneuropathy among people with post covid 19 infections.

Prof. (Dr.) Priyanshu V. Rathod<sup>1</sup>   , Dr. Tejas Mehta<sup>2</sup>

## Abstract

**Background:** Coronavirus Disease 2019 (COVID-19) has shown numerous challenges to modern medicine in the 21st century. Several systemic signs and symptoms have been observed during and post COVID 19 Infection including post viral (COVID-19) fatigue syndrome (PVFS) among 10% of people as well as autoimmune neurological disease with ascending sensory motor weakness.

**Objectives:** To analyze nerve conduction study to observe the pattern of axonal and demyelinating sensory motor polyradiculopathy retrospectively after the subject has covid -19.

**Method:** 42 retrospective electrodiagnosis report was studied who have had covid -19 with predominant bilateral progressive weakness in lower extremities. The tested nerves are median, ulnar in upper limb and peroneal, sural, tibia in lower limb. In the peroneal nerve f-wave velocity and latency are considered. **Result:** Prevalence of GBS has increased after covid -19 outbreak. Retrospective study shows Reduce Amplitude of compound muscles action potential (except tibial and sural nerve), Normal Latency in both lower and upper limb nerve, Reduction in NCV all the reported nerve except sural nerve, F- wave observers prolonged and absent in several cases.

**Conclusion:** To reduce morbidity and mortality after covid -19 electrodiagnostic study of the nerves are one of the helpful methods to rule out autoimmune neurological disease like Guillain-Barre syndrome

**Key words:** Neurological Autoimmune Disease, COVID-19, Axonal and Demyelinating sensorimotor Polyradiculoneuropathy

## Introduction

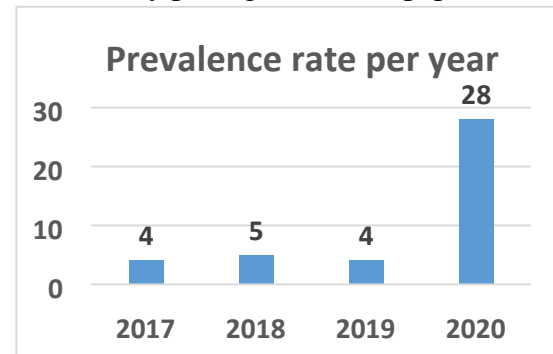
Rajkot is one of the leading cities of western part of India with 18 lakh population usually observing 4-5 cases of polyneuropathy per year at one of the electrodiagnostic centers in 12 months of span. The city has observed 35+ cases from March 2020 to December 2020 has alerted medical science to face possible autoimmune neurological disease among people with post COVID 19 statuses. Early symptoms mimicked with Post-viral fatigue syndrome may begin suddenly, sometimes after an acute viral infection, and commonly include incapacitating and persistent fatigue, muscle aches, joint pains, weakness after exercise, headaches, swollen glands, digestive disorders, inability to concentrate, memory loss, recurring minor infections or low-grade fevers, depression, an increasing sense of being unable to function, sleep disturbance, light sensitivity, food intolerance and environmental allergies. <sup>[1,2]</sup>

### Post viral - autoimmune Neurological diseases

It has been documented that certain microorganisms participate in the development of axonal and demyelinating subtypes of Gallium Barre Syndrome (GBS) include Epstein-Barr virus, Campylobacter jejuni, cytomegalovirus, influenza A virus, Haemophilus influenzae, and Mycoplasma pneumoniae.

Previously discovered types of coronaviruses (SARS-CoV and MERS) and Zika virus have been associated with demyelinating polyneuropathy (GBS) as well. The mechanism of the GBS incidence is based on molecular impression and anti-ganglioside antibodies after an infection in genetically

predisposed patients. These antibodies show the highest association with certain forms of GBS. A mechanism is an autoimmune reaction in which the antibodies on the pathogen, which are like the protein structures of the peripheral nerve components, lead to the damage of the nervous system. This likeness has been termed “molecular mimicry” which is defined as the theoretical possibility that sequence similarities between foreign and self-peptides are enough to lead to the cross activation of autoreactive B cell or T cell by pathogen-derived peptides <sup>[3]</sup>.



**Graph 1 – Prevalence Rate of GBS per year at Electrodiagnostic center at Rajkot**

### Prevalence of sensorimotor polyradiculoneuropathy

The electrodiagnostic center at Rajkot usually observes (Graph 1) 4-5 patients per year but during March 2020 December 2020 noted 42 cases mild to moderate axonal and demyelinating sensorimotor polyradiculoneuropathy among people with post COVID-19 Infection was alert for medical fertility about Autoimmune Neurological Disease or GBS.

### Statistical analysis

Means and standard deviations were calculated using Statistical analysis software

SPSS 20.0 version for Microsoft window

### RETROSPECTIVE DATA ANALYSIS, INTERPRETATION

Neurodiagnostic Center has observed 42 cases (Male 30, Mean Age 39 years) of post COVID-19 patients during March 2020 to December 2020 with predominant bilateral progressive weakness in lower extremities for electrodiagnostic studies. Electrodiagnostic studies of 42 cases observed following features suggesting the prevalence of sensorimotor polyradiculoneuropathy.

1. Significant reduction of Compound Muscle Action Potential (CMAP) for bilateral peroneal, mean amplitude reduced to 2.9 mV from normal 5.37 mV (reduced by 36%) and Conduction Velocity (CV) reduced 38 m/s from normal 49 m/s (reduced by 22%).
2. Bilateral tibial nerve mean amplitude has no significant change however, Conduction Velocity (CV) reduced by mean 34.5 m/s from normal 46 m/s (reduced by 23%).
3. Bilateral ulnar nerves, mean value of amplitude reduced to 5.0 mV from normal 11.38 (reduced by 56%), Conduction Velocity (CV) reduced 44 m/s from normal 56 m/s (reduced by 21%).
4. Bilateral median nerves – mean value of Amplitude reduced to 6.95 mV from normal 11.82 (reduced by 41%), and Conduction Velocity (CV) reduced 46 m/s from normal 54 m/s (reduced by 14%).
5. Bilateral Sural nerves, Amplitude (18.00 mV) and Conduction Velocity (54.00) m/s remain within normal limits.
6. Amplitude of compound muscles action potential showed significant involvement in both upper and lower extremities.
7. Distal Latency and CV showed insignificant involvement in both upper and lower extremities.
8. 12-15 NCV Studies observed with early demyelinating Pure motor peripheral polyneuropathy affecting both the lower extremities.
9. F wave observers are prolonged and absent in several cases.
10. Onset of involvement of both upper and lower extremities with sensorimotor Poly Radiculoneuropathy was noted after 2025 days of COVID19 infection.

Nerves	Mean	Std. deviation	Indian Normal Values <sup>(5)</sup>
Rt Peroneal LAT	3.7879	3.07344	04.14 ± 0.36
<b>Rt Peroneal AMP</b>	<b>3.064</b>	<b>3.7869</b>	<b>05.37 ± 0.97</b>
<b>Rt Peroneal NCV</b>	<b>37.95</b>	<b>6.897</b>	<b>49.03 ± 9.01</b>
Lt Peroneal LAT	3.8374	3.42068	04.14 ± 0.36
<b>Lt Peroneal AMP</b>	<b>2.695</b>	<b>2.6148</b>	<b>05.37 ± 0.97</b>
<b>Lt Peroneal NCV</b>	<b>38.27</b>	<b>7.873</b>	<b>49.03 ± 9.01</b>
Rt Tibial LAT	4.2838	2.64628	04.77 ± 0.36
Rt Tibial AMP	6.360	6.9193	06.22 ± 0.48
<b>Rt Tibial NCV</b>	<b>36.61</b>	<b>8.589</b>	<b>45.52 ± 3.04</b>
Lt Tibial LAT	4.9071	4.63443	04.77 ± 0.36
Lt Tibial AMP	7.586	9.1557	06.22 ± 0.48
<b>Lt Tibial NCV</b>	<b>33.86</b>	<b>8.979</b>	<b>45.52 ± 3.04</b>
Rt Sural LAT	1.9760	1.07190	2.47+0.50
Rt Sural AMP	17.745	13.3175	15.63+3.57
Rt Sural NCV	53.57	19.049	50.02+3.45
Lt Sural LAT	1.9076	1.02690	2.47+0.50
Lt Sural AMP	18.850	13.9370	15.63+3.57
Lt Sural NCV	55.4	18.419	50.02+3.45
Rt Peroneal F Wave LAT	23.64	25.390	
Rt Peroneal F Wave Velo	25.37	23.810	
Lt Peroneal F Wave LAT	23.340	25.1800	
Lt Peroneal F Wave Velo	25.58	23.365	
Rt Ulnar LAT	2.77	1.466	02.44 ± 0.36
<b>Rt Ulnar AMP</b>	<b>5.04</b>	<b>4.118</b>	<b>11.38 ± 0.87</b>
<b>Rt Ulnar NCV</b>	<b>44.03</b>	<b>12.446</b>	<b>55.58 ± 3.33</b>
Lt Ulnar LAT	2.59	1.483	02.44 ± 0.36
<b>Lt Ulnar AMP</b>	<b>5.06</b>	<b>4.251</b>	<b>11.38 ± 0.87</b>
<b>Lt Ulnar NCV</b>	<b>43.77</b>	<b>11.479</b>	<b>55.58 ± 3.33</b>
Rt Median LAT	3.85	2.001	03.53 ± 0.51
<b>Rt median AMP</b>	<b>7.35</b>	<b>5.214</b>	<b>11.82 ± 0.48</b>
<b>Rt Median NCV</b>	<b>45.63</b>	<b>10.577</b>	<b>53.62 ± 0.49</b>
Lt Median LAT	3.73	2.144	03.53 ± 0.51
<b>Lt Median AMP</b>	<b>6.54</b>	<b>4.801</b>	<b>11.82 ± 0.48</b>
<b>Lt Median NCV</b>	<b>45.51</b>	<b>9.316</b>	<b>53.62 ± 0.49</b>

**Table 1: Descriptive Analysis (mean values) of 42 electrodiagnostic studies of people with post COVID-19 status. Values are compared with Indian Motor NCV parameters.**

**Note: Rt = Right Limb LAT = latency in ms, AMP= Amplitude in mV, NCV = Nerve Conduction Velocity in m/s - bold rows are showing abnormal pattern**

## Conclusion

Analysis of post COVID 19 Infection Cases (after 20-25 days) with ascending type motor weakness reported at neuro diagnostic center Rajkot, Gujarat, India, observing axonal and demyelinating type of sensorimotor polyradiculoneuropathy affecting both upper and lower extremities, indicative of showing presence of autoimmune neurological disease associated with GBS. [4,6] Moreover, for suspected cases and early detection of such disease, NCV studies must be taken into consideration. Early detection and medical attention may reduce the rate of morbidity and mortality.

## Compliance with ethical standards

### Conflict of interest

the author declares no conflicts of interest.

### Ethical Approval

Ethical approval not applicable

### Literature search strategy

In this study, a literature search was done on PubMed, SCOPUS, Embase, Cochrane database, Ovid, and Google Scholar according to preferred reporting items for Nerve Conduction study (NCV) and Autoimmune Neurological Disorders related to COVID-19 infection. The keywords used were “COVID 19 infection” “autoimmune neurological disorders,” “Nerve Conduction study (NCV)”, “post viral fatigue syndrome”, “Guillain-Barré syndrome.”

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