**Guillain-Barré Syndrome (GBS) – More Haste, Less Speed**

**Introduction:**

Guillain-Barré Syndrome (GBS) is classically characterized by acute or subacute weakness in the limbs or muscles innervated by cranial nerves, and is associated with absent or sluggish deep tendon reflexes. Characteristic findings include albumin-cytological dissociation on analysis of the cerebrospinal fluid (CSF) and supportive findings from neurodiagnostic studies (1). The pathophysiology of GBS is poorly understood, and is thought to be an aberrant immune-mediated process, resulting from the reaction of autoimmune antibodies and a variety of inflammatory cells with epitopes of the peripheral nerves, including the nerve roots. This is thought to lead to the widespread demyelination or axonal degeneration that is seen in GBS (2). The annual global incidence of is approximately 1-2 per 100,000 population annually (3). The diagnostic pyramid of GBS is centered around clinical physiological and neurological examination, however the increased use of diagnostic imaging over the last 2 decades has cast doubt over the use of physical examination in these cases (4). Many components of physical examination are still critical for diagnosis, and incomplete or omitted neurological examination leads to clinical errors. The use of clinical examination was established when there were no alternative methods of diagnosing neurological disease, although this approach has its limitations. The diagnosis and localization of disease were carried out exclusively using clinical examination before carrying out any neurological or neurosurgical procedures. Diagnostic imaging was used to bypass the need for clinical findings in the diagnosis stage and contribute to treatment planning, but their specific role in the case of GBS is only theoretical and provides no practical use. The involvement of diagnostic imaging once a diagnosis of GBS has been achieved can lead to overtreatment and the depletion of resources, and may also detract from other clinical findings leading to the patient receiving the incorrect, or delayed, treatment.

The diagnosis of GBS is based primarily on clinical evaluation, which is later confirmed by neurophysiology and CSF analysis showing protein-cell dissociation. Many GBS patients being referred from different hospital and clinic settings will have undergone unnecessary neuroimaging. As such, the aim of this study was to investigate the practice of over-investigation of patients during the diagnosis of GBS, irrespective of the results of clinical examination.

**Methods and Material:**

This study recruited patients with acute flaccid paralysis who presented to the Neurology department of the teaching hospital attached to Shaheed Zulfiqar Ali Bhutto Medical University, Pakistan Institute of Medical Sciences (PIMS), Islamabad. A total of 148 participants aged 12 or over were recruited between January 2017 and March 2020. Participants were asked whether they had undergone radiological investigation either before or after they were admitted to hospital, and in the case of a CT scan, what the purpose of this investigation was. Participants were asked whether they had undergone fundoscopy prior to lumbar puncture, and the level of certainty was determined based on the Brighton Criteria. The Brighton Criteria were developed by the Brighton Collaboration to improve the diagnosis and registration of GBS cases worldwide. Their criteria comprise the relevant symptoms of the disease and diagnostic tools that aid in the identification and monitoring of GBS (5). The different level of certainty provided by the Brighton Criteria are described in Table 1 (6).

Ethical approval for the study was granted by the ethical review board of Shaheed Zulfiqar Ali Bhutto Medical University, Islamabad.

**Analysis:**

Data were analyzed using SPSS (version 23). Frequencies were calculated for variables such as gender, variant, type of radiology performed, and level of certainty. Means and standard deviations were calculated for age, mean time to interact neurologist.

## Results:

All results are provided in Table 2. Among the 148 participants with GBS, 107 (72%) were male and 41 (28%) were female. The mean participant age 42.85±18.42 years, ranging from 13 to 75. The mean interactive time to interact with a neurologist was 5.2±4.01 days, ranging from 1 to 14 days. 92 (62%) participants had been diagnosed with the demyelinating variant of GBS, and 56 (38%) the axonal variant. 113 (76%) patients presented with level 1 certainty, 30 (20.3%) with level 2, and 5 (3.7%) with level 3. Pre-lumbar puncture CT was performed in 121 (81.2%) patients, but not in the remaining 27 (18.2%). MRI brain and spine were performed in 48 (32%) and 58 (39%) patients respectively. The only imaging that was ordered once the patient had been seen by a neurologist was the CT scan brain prior to lumbar puncture (n=121; 82%).

**Discussion:**

GBS is an uncommon disorder. A good clinical history and a thorough neurological examination are essential to establishing the diagnosis of GBS. Neuroimaging is an important tool which can be used to rule out a differential diagnosis in cases of an unclear and confusing clinical presentation. However, easy access and widespread availability of neuroimaging, together with shortcomings in the completeness of the clinical evaluation performed have led to the over-use of this expensive diagnostic resource. The findings of this study support the assertion that unnecessary neuroimaging investigations are often conducted in patients diagnosed and treated with GBS.

Regardless of the influence of diagnostic imaging, the main diagnostic component of the physical examination conducted by the referring doctor is still very relevant, and gives patients a sense of satisfaction that they have been "seen". In recent years, there has been an increase in the popularity and availability of radiological services. This has driven over-consumption which has caused unnecessary investigations to take place through several mechanisms: ordering imaging investigations inappropriately, ordering repeated investigations, and ordering investigations where none are necessary (4).

This increase in overutilization has consequent impacts on the cost, associated risks, and the provision of national healthcare services (7). As a developing country, Pakistan has limited health and economic opportunities (8). A study conducted by Javed H. et al. reported the failure to conduct a clinical examination and the absence of an adequate clinical history (p=0.04) to be one of the leading causes of false or inaccurate radiological reporting (9). GBS is conventionally diagnosed using neurophysiology and CSF analysis in the context of a thorough clinical history and examination according to the Brighton Criteria. Neuroimaging has a minimal impact on the diagnosis of GBS. Substantial sums of money are being wasted on conducting unnecessary diagnostic imaging investigations. Fundoscopic examination is performed before the lumbar puncture to assess the intracranial pressure. Therefore, any brain imaging findings from CT or MRI brain are likely to be irrelevant in cases of acute peripheral neuropathy. MRI spine is conventionally a lower priority compared to the utility of a complete neurological history and examination. The majority of patients (76%) in the present study fulfilled the highest level of diagnostic certainty as indicated by Brighton Criteria level 1. A lack of awareness of the Brighton Criteria impedes the physician’s ability to clinically diagnose GBS. This leads to unnecessary investigations, placing a greater burden on patients and their families and in turn exacerbating limited healthcare facilities and resources. It is essential for physicians to maintain continuing professional development (CPD) to acquire up-to-date clinical and diagnostic tools pertinent for diagnosing complex conditions such as GBS. Increasing awareness will help clinicians to order the correct investigations in the first instance, thus avoiding the cost of unnecessary neuroimaging investigations in cases where the findings are not of direct clinical use.

**Conclusion:**

Clinical examination is fundamental to GBS diagnosis. Neuroimaging may be irrelevant and represents a wastage of resources and time, particularly with respect to investigating peripheral neuropathy.

**Funding: N/A**

**Conflict of Interest: N/A**

**Acknowledgement: N/A**

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**Table No.1: Brighton Criteria**

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| --- | --- | --- | --- | --- |
| **Diagnostic Criteria** | **Level of diagnostic certainty** | | | |
|  | **Level I** | **Level II** | **Level III** | **Level IV** |
| **Absence of alternative diagnosis for weakness** | **+** | **+** | **+** | **+** |
| **Diminished or absent deep tendon reflex in weak limbs** | **+** | **+** | **+** | **+/-** |
| **Monophasic course and time between onset and nadir, 12 hours to 28 days** | **+** | **+** | **+** | **+/-** |
| **Bilateral and flaccid weakness of limbs** | **+** | **+** | **+** | **+/-** |
| **CSF cell count < 50 cells/microL** | **+** | **+** | **-** | **+/−** |
| **CSF protein concentration > normal value** | **+** | **+/−** | **-** | **+/−** |
| **NCS findings consistent with one of the subtypes of GBS** | **+** | **+/−** | **-** | **+/−** |

**Table No.2: Results**

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| No. | Variables | Values |
| 1 | Male: Female | 107:41 (2.6:1) |
| 2 | Age (Mean±SD) | 42.85± 18.4 years |
| 3 | Variant of GBS   * Demyelinating Variant * Axonal Variant | 92(62%)  56(38%) |
| 4 | Mean to interact with Neurologist | 5.2±4.01 days |
| 5 | Brighton Criteria   * Level 1 Certainty * Level 2 Certainty * Level 3 Certainty | 113(76%)  30 (20.3%)  5 (3.7%) |
| 6 | Purpose of CT Scan Brain   * Before Lumbar Puncture (LP) {either inside or outside hospital including refusal of LP later on) * Relay on Fundoscopic for LP | 121(82%)  27 (18%) |
| 7 | MRI Brain Plain   * Performed before admission * Not Performed before admission | 48 (32%)  100(68%) |
| 8 | MRI Spine (either with contrast or without contrast)   * Performed before admission * Not Performed before admission | 58(39%)  90(61%) |