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Original Research

Study of Acute Lower motor neuron weakness in adults from a rural tertiary centre of Eastern India

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ABSTRACT:

Background: Numerous studies are available regarding acute lower motor neuron (LMN) weakness or acute flaccid paralysis (AFP) in the paediatric population. However, few such studies have been conducted among adults. Our aim was to study the underlying causes of AFP in adults, their various clinical presentation and to study the outcome of disease in these adult patients. **Methods:** 150 patients presenting with acute LMN weakness in adults more than 15 years with duration less than 4 weeks, were clinically examined with proper history, followed by detailed blood testing, Electro diagnostic testing and CSF study in selected patients. **Results:** In our study we found Hypokalemic paralysis is the most common etiology of AFP. There is male preponderance and significant seasonal variation, predominant during summer. Our study showed that GB syndrome was predominant in young patients whereas Hypokalemic paralysis was predominant after third decade. There was a mortality of 6 out of 150 AFP patients. **Conclusion:** This is one of the few studies from Eastern India on Acute Lower motor weakness in adults - on their etiologies and clinical features. There was no much difference in the clinical profile of the patients of AFP in our study as compared to most of the previous studies. Larger sample size and longer duration of follow-up is necessary to identify other conditions causing acute flaccid paralysis and their long-term outcomes.

Keywords: LMN, AFP, Quadriparesis, Paraparesis, Hypokalemic paralysis, GB syndrome

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INTRODUCTION

Acute Lower motor neuron (LMN) weakness or acute flaccid paralysis (AFP) is a clinical syndrome, characterized by rapid onset weakness of lower motor neuron type with decreased tone and decreased or absent reflexes (flaccid weakness). They may present to the emergency department with acute onset of quadriparesis or paraparesis , including weakness of respiratory and pharyngeal muscles ,progressing to maximum severity within several days to weeks. If untreated, AFP may lead to death due to failure of respiratory muscles.

Acute LMN weakness has several aetiologies that vary remarkably with age, depending on age less than or more than 15 years of age. There should be an accurate and early diagnosis to seek a positive outcome.

Among the several causes of AFP, Guillain-Barre syndrome, acute toxic neuropathies (heavy metals, snake toxin), infectious diseases (diphtheria, Lyme disease), etc may present in the form of Radiculopathies and neuropathies**.** Acute anterior poliomyelitis, neurotropic viruses (e.g. enteroviruses and herpes viruses), Vaccine-associated paralytic polio may present in the form of Anterior horn cell diseases**.** Polymyositis, dermatomyositis, Post viral myositis, infective myositis like Trichinosis, use of Neuromuscular blocking agents, Periodic paralysis,etc present as Muscle disorders and diseases like Myasthenia gravis. Botulism, Neuroparalytic Snake bite, Tick bite paralysis present with Disorders of neuromuscular transmission. Again there are Systemic diseases like Critical illness neuropathy, Acute porphyrias, presenting with AFP.

Several studies have been done in the paediatric population (< 15 years) regarding AFP prevalence and differential diagnoses, while having a global polio eradication drive. However, studies conducted among adults are few.

Our aim was to study the underlying causes of Acute LMN weakness or Acute flaccid paralysis (AFP) in

Adults (more than 15 years), to study the various clinical presentation of AFP in these patients, and also to study the clinical outcome of these adult patients .

METHODS

Our present study was conducted from Indoor & Outdoor patients of the Department of Neurology and the indoor of The Dept of General Medicine of Burdwan Medical College & Hospital, Purba Bardhaman, West Bengal. The study was a prospective single centre observational study from March 2018 to February 2020 done over a period of two years.

Patients selected were of either sex with age more than 15 years presenting to indoor and outdoor of Neurology Department and indoor of Medicine Department with acute (less than 4 weeks in duration) weakness of limbs with or without bulbar or respiratory involvement .

Patients having age less than 15 years, with duration of the illness more than 4 weeks, with upper motor neuron signs, with history of trauma, and with abnormalities of MRI of spine were excluded from our study.

150 adult patients (age >15 years) with AFP of less than 4 weeks duration were selected.

A detailed history was taken which included age of patient, duration of weakness, nature of progression, associated sensory, bulbar or any other cranial nerve or autonomic symptoms, respiratory symptoms like dyspnea, gastrointestinal symptoms like diarrhea, vomiting, any convulsion, any diurnal variation of weakness , any history of trauma or snake-bite, any similar episode in past, preceding history of fever, respiratory tract, urinary tract or gastrointestinal tract infections, vaccination,.

Thorough clinical examination including general survey and other systemic examinations were done. In neurological examination, muscle bulk, tone, power, Deep Tendon Reflex, superficial reflexes, sensory examination of touch, pain, temperature, vibration, Joint Position sense, and cerebellar and autonomic tests were done. Blood examination for electrolytes like sodium, potassium, sugar, urea, creatinine, lipid profile, CPK, ANA with ANA profile, phorphobilinogen, were done. CSF examination for cell type, cell count, protein, sugar were done notice any Albuminocytological dissociation, which is characteristic of the Guillain-Barré syndrome. Electro diagnostic testing in the form of nerve conduction studies (NCS) and needle electromyography (EMG) were performed by RMS Machine after taking proper consent. Few patients giving history of diurnal variation of weakness, were sent for Repetitive Nerve Stimulation (RNST) to rule out Myasthenia Gravis.

Muscle biopsy sent in selected patients to rule out inflammatory myopathy patients.

Statistical Analysis: SPSS Statistics v25, SAS Studio 3.7 and Excel were primarily used for analyzing data. After collection of all data, the data were first arranged in SPSS data sheet and then analysed by SPSS software. Microsoft Excel were used for graphic analysis and tabulation. Once summary tables were generated using SPSS, the data was visualized using clustered bar charts and pie graphs . SAS Studio was used for data exploration and performing distribution analysis .Student's T test was used for testing statistical significances. A two tailed P value was used. A P-value of less than 0.05 was considered statistically significant.

RESULTS & ANALYSIS

Only the patients with history of AFP of less than 4 weeks duration have been included in this study. Demographic profile of the study population showed that the mean age of the study population was 42.76 (range 16-83) years with maximum of 83 years and minimum 16 years with Median 42.00. The mean duration of presentation is 6.42 days (range is 1-26 days).

There were total of 150 patients in our study, who were divided into three different age groups as described below.

There were Three groups of age population - 36% (54 patients) in age group of 15-35 years, 38% (57 patients) in age group of 36-55 years and 26% (39 patients) in age group of more than 55 years .

Out of the total 150 patients, male patients constituted for 114 cases (76%) and the number of female patients was 36 (24%).

The most common aetiology of acute flaccid paralysis in the total study population was **Hypokalemic paralysis** which was responsible for 54% (81 patients) of the cases, followed by the Guillain Barre Syndrome - 42 patients(28%) and Neuroparalytic snake bite-18 patients (12%) and Myasthenia gravis accounting for 4%.(6 patients).3 patients(2%) had inflammatory myopathy.

Most common cause of AFP in this study among **the age group of 15-35 years** (N=54) was **GB syndrome - 36** (66.67%) followed by Hypokalemic paralysis 16(29.6%) followed by neuroparalytic snake bite 2 (3.7%). Most common cause of AFP in this study among the **age group of 36-55 years (N=57)** was **Hypokalemic paralysis** (29) which was singly responsible for 50.87% followed by neuroparalytic snake bite (15) which is responsible for 26.32 %. GB syndrome 6 (10.5%),Myasthenia gravis 4(7.01%) Inflammatory myopathy 3 (5.26 %). Most common cause found among the patients who **are above 55 years of age (N=39)** was **Hypokalemic paralysis 36**(92.3%) followed by Myasthenia gravis 2((5.13%) and snake bite 1(2.56 %).

Considering the season of Presentation, we found that the maximum number of cases of acute flaccid paralysis were encountered during the summer season (60%), followed by rainy season 28 % and winter 12 %.

Out of the total number of 150 patients, 126 (84%) presented with Quadriparesis and 15 (10%) presented

with Paraparesis, 6 cases (4%) had hemiparetic presentation and Three cases (2%) presented with isolated neck muscle weakness without any limb weakness.

Most common cause of AFP found in our study is Hypokalemic paralysis (HOPP), which is most commonly found during summer (54 cases - 66.67%), followed by rainy season (16 cases -19.75%) ,then winter (11 cases -13.58%) – Total 81 patients. Out of HOPP patients, most of them were primary HOPP. A total of twenty four (24) patients in this study had secondary potentially reversible causes of HOPP. Out of 24 patients 12 cases Renal tubular Acidosis, 6 cases Primary Hyperaldosteronism, 3 cases of Thyrotoxic Periodic Paralysis and 3 cases of Gitleman Syndrome. Among patients having Hypokalemic paralysis, 18 patients had history of similar episode in past.

42 patients (28%) were diagnosed as GB syndrome on the basis of clinical features and Electrodiagnostic criteria. Among them, 30 (71.43%) were demyelinating and 12(28.57%) were axonal GB syndrome.

16 % of the patients presented with sensory symptoms in the form of tingling, numbness, paresthesias (all these were diagnosed as having GB syndrome) and 84% patients had no sensory symptoms. 13.33 % of the patient(20) presented with AFP had bulbar symptoms and 86.67 % (130) had no bulbar symptoms. Respiratory involvement was found in 14% of patients (21) out of 150 patients.

Death occured in 6(4%) patients who were having severe respiratory paralysis and 144 (96%) patients have been discharged in a stable condition. A significant association was found between hypokalemia with CPK level**.** 67.9% of patients with hypokalemia have elevated CPK level as compared to 4.3% elevated CPK in patients with normal potassium, $p<0.001$ as computed by chi-square test.

DISCUSSION

Acute Lower motor neuron (LMN) weakness or acute flaccid paralysis (AFP) is clinically characterized by rapid onset of weakness of lower motor neuron type, including weakness of the respiratory and pharyngeal muscles, which may progress to maximum severity within several days to weeks.

Since the elimination of poliovirus from large parts of the world, Guillain-Barré syndrome (GBS) has become the most important clinical cause of AFP [1]. The various studies around the world have shown prevalence of GBS among acute flaccid paralysis patients to be 42- 47%.[2]Higher than average prevalence has been reported from Honduras (72%).[3] Studies around the world have identified hypokalemia, envenomation, porphyria, early acute transverse myelitis, rhabdomyolysis, botulism, and myasthenia gravis as other causes of acute flaccid paralysis. In a study conducted by Ashoke K Kayal et al in 2012, 56 cases of Hypokalemic paralysis were found within a short span of 2 years from North-East India.[4]

Our study shows a male preponderance due to higher proportion of males in Hypokalemic paralysis, snake envenomation and GB Syndrome groups. In our study area, which is a very well known rural belt of West Bengal, most of the people (mainly males) are farmers by occupation. So often they are exposed to heavy work load in humid weather. That is why they frequently suffer from hypokalaemic attack. Males are at a higher risk for snake envenomation because of occupational and recreational outdoor activities that predispose them to encounters with venomous snakes. Male preponderance in GBS cases has been reported to be 1.36-2: 1 in some studies and our study reflects similar results (GB syndrome cases, male 27 and female 15).[5],[6] The reasons for such a predilection are not clear.

The most common etiology of acute flaccid paralysis in this entire population was Hypokalemic paralysis, which was responsible for 54% of the cases. This is because people working in a hot humid weather frequently developed hypokalemia due to excessive sweating leading to dehydration. Also, rice is the staple food of the region, which is high in carbohydrate content and thus can be a precipitating factor for hypokalemia. In one of the largest study on HPP from Taiwan by Lin et al., [7] a total of 97 cases of Hypokalemic paralysis were reported over a period of 10 years. Various series of HPP cases has been reported from different parts of India also.

A recent prospective study from North India by [10] Maurya and colleagues reported 30 patients of HPP over a period of 3 years .In an earlier series reported by Arya et al., [8] a total of 22 cases of Hypokalemic paralysis were reported over 30 years. In retrospective study from South India by Rao et al. [9] 31 patients were detected over a period of 6 years. In our Study, Hypokalemic paralysis was found as the most common aetiology of AFP in patients with age > 36 years whereas a preponderance of younger individuals was observed in GB syndrome patients. This finding in our study is supported by a study done by Rupesh Kaushik et al., from North-West India.[11]

There was a seasonal variation in the incidence of Hypokalemic attacks; highest numbers of cases (66.67 %) were detected during the summer season in the month from March to June, when the average temperature in this region ranges from 26-42°C and an average humidity of 75%.These findings in our study are consistent with an earlier Indian study.[12]

Most of the patients presented with quadriparesis (84%) and 10% had Paraparesis ,4% had hemiparetic presentation and (2%) presented with isolated neck muscle weakness without any limb weakness.This finding is also similar with the findings that found in the above mentioned study.[11] Only 16% of the patients presented with sensory symptoms as most of the aetiologies of AFP found in this study are (Hypokalemic paralysis, neuroparalytic snake bite,

MG) pure motor disease and all of them were Acute GBS. 20 patients presented with AFP had bulbar symptoms in our study. Of them 6 patients had GB syndrome, 11 had snake bite, 2 had MG and 1 had Inflammatory Myopathy. So out of total 42 GBS patients 6 patients (14.28%) had bulbar involvement which is lower than that reported in previous studies [13],[14] and out of 18 snake-bite patients, 11 patients (61.11%) had bulbar involvement which comes in range of other reported study.[15]

Respiratory involvement was found in 14% of patients out of 150 patients. Among them 12 patients out of 18 snake bite patients (66.67 %) and 6 patients out of 42 GBS patients (14.28%) had respiratory paralysis and needed mechanical ventilation, this later value is lower than previous study [6]

The ratio of demyelinating(30) and axonal(12) GB syndrome were compatible with the study done by Hadden RD et al., [16] previously. In the present study, there is no death among Hypokalemic paralysis patients, quite similar to Previous studies.[4] There are 6 deaths out of 150 AFP patients (4% in-Hospital mortality) in the present study of which 4 patients had severe respiratory failure due to neuroparalytic snake bite and 2 patient had respiratory paralysis due to GBS.

Except the above mentioned 4 patients, all other snake bite patients (14 out of 18) were managed successfully (77.78%). Other studies also showed similar results.[15],[17] A significant association was found between hypokalemia with CPK level in this present study. 67.9% of patients with hypokalemia have elevated CPK level as compared to 4.3% elevated CPK in patients with normal potassium – indirectly due to damage to muscle membrane .This has also been infrequently reported in earlier Indian studies[4],[12]

CONCLUSIONS

This is one of the few studies on Acute Lower motor Neuron weakness or Acute Flaccid Paralysis in adults from eastern India. Many studies are available in the paediatric population regarding AFP prevalence and differential diagnoses, mainly done as an offshoot of the global polio eradication initiative.

This study was done to find out the etiologies of AFP in adult population and to know their clinical profile and also to find out the outcome with in-Hospital mortality of those patients.

In our study, we found Hypokalemic paralysis as the most common etiology of AFP in adult population contributing up to 54 % of cases. Next common aetiology is GB syndrome .The study shows male preponderance with significant seasonal variation of AFP cases. It also shows that GBS is predominant in young patients whereas Hypokalemic paralysis is predominant after 3rd decade.

There was 4% in-Hospital mortality during the entire period of this study, thereby suggesting that a timely intervention can be life-saving in this treatable but potentially fatal disease.

There was no much difference in the clinical profile of the patients of AFP in our study as compared to most of the previous studies

LIMITATIONS

The parameters assessed were mostly subjective and reporting of which is influenced by many confounding factors including the age, educational status and co-morbidities.

Being a single-centre study in Eastern India, our observations may not be representative of the entire country. Larger sample size and longer duration of follow-up is necessary to identify other conditions causing acute flaccid paralysis and their long-term outcomes.

In spite of all these limitations, we can conclude that the data obtained from our study will be useful for the physicians who work in resource-limited settings.

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DECLARATIONS

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None

CONFLICT OF INTEREST

None declared

ETHICAL APPROVAL

Not required

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