A PROSPECTIVE CLINICAL AND ELECTROPHYSIOLOGICAL SURVEY OF ACUTE FLACCID PARALYSIS IN PEDIATRIC PATIENTS

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ABSTRACT

Objective: Recognition of common causes of acute flaccid paralysis in children.
Study Design: Descriptive study.
Place and Duration of Study: Combined Military Hospital Peshawar, from Aug 2009 to Jun 2012.
Material and Methods: The demographic data including age, gender and clinical data including history of injection, stool results, and final diagnosis (polio, non-polio enterovirus, traumatic injection neuritis, GBS and an unknown group) were expressed in terms of frequencies and percentages. Chi-square test was applied for the association of age-groups with various causes of AFP. A *p*-value of less than 0.05 was taken as statistically significant. SPSS version 20 was used for statistical analyses.
Results: Injection neuritis and post-viral paralysis (polio, non-polio enterovirus) were the common causes of AFP.
Conclusion: As the study identified common causes of AFP which are essentially preventable, it highlighted certain issues during the process. First is the lack of nursing staff training or iatrogenic disability due to quackery, which requires urgent intervention to prevent it. Second is a deficiency in the WHO management protocol for AFP. NCS EMG proved to be a vital diagnostic tool for AFP, which is not included in the WHO AFP protocol at present.It is suggested that this diagnostic modality should be included in the AFP diagnostic protocol for better diagnostic yield.

Keywords: Acute flaccid paralysis, Electrophysiological studies, Injection neuritis, Polio.

INTRODUCTION

Acute flaccid paralysis (AFP) is defined as any case of new onset of hypotonic weakness in a child aged less than 15 years of age[1]. AFP in children may be caused by a variety of infectious and noninfectious etiologies[2-5]. Infectious causes include poliomyelitis and non-polio enterovirus both resulting in disabling disease. Other important causes of AFP include injection neuritis, guillain barre syndrome (GBS) and transverse myelitis[6]. In the recent past, due to the security situation and 'noncompliance' of the vaccination program in certain agencies of Federally Administered Tribal Area (FATA) and Khyber Pakhtunkhwa (KPK), there has been an upsurge of Polio. In Pakistan, AFP surveillance began in 1997 and it is a well-functioning and sensitive system at national, provincial, and district levels.

The best available method to confirm the diagnosis of poliomyelitis is the isolation and identification of poliovirus from the stool[6]. The World Health Organization (WHO) has developed a global network of laboratories to provide this service in collaboration with several other institutions. The virology laboratory at National Institute of Health (NIH) Islamabad is the Regional Reference Laboratory (RRL) for polio eradication. Nerve conduction study (NCS) and electromyography (EMG) is not part of AFP protocol but the WHO surveillance teams refer most cases of AFP for NCS/EMG to support the diagnosis. This was a relatively rare investigation and was not performed in any government hospital of Peshawar at that time. Since the services were available at the rehabilitation medicine department, Combined Military Hospital (CMH) Peshawar, we received quite a

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few of these cases. While performing these procedures there were some interesting observations which we thought could be useful in future health planning and prevention of AFP. With this background, a study was carried out in rehabilitation medicine department of CMH Peshawar to evaluate common causes of AFP in children.

MATERIAL AND METHODS

After taking informed consent from the parents of the children and formal approval from CMH Peshawar hospital ethical committee, the study was carried out from Aug 2009 to June 2012 in the electrodiagnostic section of the rehabilitation medicine department, CMH Peshawar.

The study was a prospective descriptive, following WHO guidelines[6] for AFP cases. A total of 193 cases included through non-probability convenience sampling technique. As AFP is a clinical presentation and not a disease, so sample size calculation was based on all the patients presenting at the department. As AFP in children is a notifiable condition, all cases were reported to local health authorities and WHO surveillance teams. Among the cases included in the study, some cases were referred directly by the local physicians whereas others were brought by the doctors of WHO surveillance teams for NCS/EMG at rehabilitation medicine department of CMH Peshawar where NCS /EMG was performed by a qualified rehabilitation medicine physician. The study included children below the age of 15 years presenting with AFP within 4 weeks of development of weakness. For data collection purpose, children with less than one year age were also included in the same one year group.The subjects excluded from the study were children presenting with bowel and bladder incontinence, bilateral sensory level (spinal cord injury both traumatic and atraumatic), hereditary disorders e.g. muscular dystrophy, hereditary sensory motor neuropathy, nerve injuries following fractures and polytrauma.

NCS/EMG was performed with Medtronic Keypoint Version 5 (USA). NCS was performed for lower limbs only if involvement was unilateral, whereas in the case of bilateral involvement upper limbs were also included. In lower limbs, common peroneal, tibial and in few cases, femoral nerves were also assessed as per clinical requirement. Sensory studies were carried out for sural and superficial peroneal nerves. Upper limbs were assessed for median and ulnar nerves including both motor and sensory studies. For motor studies compound muscle action potential (CMAP), distal motor latency (DML), motor conduction velocity (MCV) and F-response were assessed. In sensory studies, Sensory Latency (SL), Sensory Nerve Conduction Velocity (SNCV) and Sensory Nerve Action Potential (SNAP) were studied. Electromyography (EMG) of clinically affected muscles was carried out. Stool tests were collected by surveillance teams as per WHO guidelines for Polio and tested at NIH Islamabad. The final diagnosis was based upon NCS/EMG results, laboratory tests and opinion of experts committee.

The demographic data including age, gender, and clinical data including history of injection, stool results and final diagnosis (polio, non-polio enterovirus, traumatic injection neuritis, GBS and an unknown group) were expressed in terms of frequencies and percentages. Chi-square test was applied for the association of age-groups with various causes of AFP. A *p*-value of less than 0.05 was taken as statistically significant. SPSS version 20 was used for statistical analysis.

RESULTS

A total number of 193 cases reported during the study period. Among them, 112 (58%) were male and 81 (42%) were female. The age ranged from 1 year to 14 years (mean age 3.7 ± 3 years). The detailed age distribution is shown in table-I. The commonest diagnosis was injection neuritis which was 79 cases (40.9%), followed by non-polio (NP) 42 (21.8%). Various causes of AFP identified are shown in table-II. There was a

strong correlation of age groups with various conditions (p-value<0.001). It was observed that no case of GBS seen in the first year of life and no polio case was identified after 5 years. That commonest cause of AFP in children above 5 years was injection neuritis. The diagnosis versus age groups correlation is shown in table-III.

The involvement was unilateral in all cases except the 25 cases who had GBS. Another important finding was the common issue of injection for all ailments. The total 159 (82%) patients received an injection and out of them, 79 developed injection neuritis. During the collection of data, there was an incidental finding that the majority of these patients (74) had received an injection by an unqualified medical practitioner or a quack (unskilled medical practitioner).

Table-I: Frequency of cases with different age groups.

Age (Years)	Frequency (No. of Cases)	Percentage (%)
1	60	31.1
2	34	17.6
3	20	10.4
4	19	9.8
5	19	9.8
6	9	4.7
7	11	5.7
8	5	2.6
9	2	1.0
10	2	1.0
11	4	2.1
12	3	1.6
13	2	1.0
14	3	1.6
Total	**193**	**100.0**

Table-II: Frequency of disease pattern among the patients.

Final Diagnosis	Frequency (No. of Cases)	Percentage (%)
GBS	25	13.0
Injection Neuritis	79	40.9
Non-Polio	42	21.8
Polio	25	13.0
Unknown	22	11.4
Total	**193**	**100.0**

Table-III: Age association with diagnosis among the study groups.

Final Diagnosis	Age			Total
	Age Group 1-5	Age Group 6-10	Age Group 11-15	
GBS	7	10	8	25
Injection Neuritis	42	30	7	79
Non-Polio	24	13	5	42
Polio	25	0	0	25
Unknown	10	2	10	22
Total	**108**	**55**	**30**	**193**

DISCUSSION

Pakistan is one of those unfortunate countries of the world where poliomyelitis is still prevalent[5]. The poor socioeconomic status and

difficulty in vaccination due to social, political and security reasons are few identified important reasons for the spread of this disease. There were 306 cases of Polio reported in Pakistan till December 2014; followed by Afghanistan, Nigeria and Somalia with only 28, 6 and 5 cases respectively[1]. AFP is a horrifying presentation in a country where polio is still a prevalent disease. With the given security environment in Pakistan leading to enormous difficulties in following the EPI program, media coverage of new cases is already making headlines. Owing to the hype created by media, travel embargo and certain misconceptions at the community level, all AFP cases are considered as polio and this leads to widespread panic in affected family and in society in general.

WHO has developed guidelines for AFP workup[1]. It includes identification of AFP cases, isolation and mapping (identification of the type of strain) of virus from stool test. However, in WHO guidelines, there is neither any method for identification of other causes of AFP nor any role of electrodiagnostic medicine in the clinical workup.

There is a lot of literature gap in various electrophysiological findings of acute polio. Very little western literature is available regarding NCS/EMG findings in acute polio; there are some Indian authors[7] and work done by Kirmani[8] on the subject. Even in the work done by these authors, the main stress is upon NCS than EMG. Kirmani et al stressed upon the fact that motor conduction velocities are not much affected by acute polio which can help differentiate it from demyelinating disorders like GBS.

Pakistan, a country where the general literacy rate is poor, medical education of paramedics and nurses is poorer; injection neuritis/traumatic injection injury is another major cause of AFP[9-11]. Similar to the literature, the bulk of AFP cases as seen in this study consisted of post viral and injection neuritis. Both the conditions are preventable and unfortunately, restricted to the underdeveloped world. The lack of good paramedical training program is causing traumatic and chemical neuritis in a large population of patients, which has devastating consequences both for individual and community[12]. Another reason for high incidence of injection neuritis is a general misconception due to which injection is considered to be the most effective method of treatment[13-15]. Another important factor in patients with AFP is that, clinically, both polio and injection neuritis have a remarkable similarity in history as most of them get a fever, myalgias and an injection[14,15]. Same is the case with GBS, with limited knowledge of local general practitioners; this type of AFP is also mistakenly considered polio in the first place. Another dangerous phenomenon which most healthcare professionals are unaware of, is provocation by intramuscular injection i.e. non-polio entero-viruses do not normally cause paralysis, it may occur when infection is coincident with an intramuscular injection[16].

This study is initial and limited work on a huge problem. However certain recommendations based on the findings include a dire need to educate masses regarding vaccination, hazards of injections, and possibly other causes of AFP in Pakistan. The poor structured medical education program for paramedics also needs urgent attention. Continued medical education of doctors regarding proper disposal and workup for patients with the help of seminars and conferences regarding AFP is the need of the hour. Similarly, there is an urgent need to improve the quality of care. Last but not the least, adding injection neuropathy to the AFP Surveillance polio eradication program is needed to know the exact magnitude of the problem. For proper workup, it is suggested that all AFP cases be assessed by NCS/EMG twice (at the initial visit and after 03 months).

CONCLUSION

In conclusion, we found certain important issues during identification of causes of AFP in this study. Since the most common cause is

injection neuritis, which is due to poor injection technique. The training standard of nursing staff should be improved to prevent it. Community level patient education is needed to avoid handling of AFP cases by quakes. Secondly, NCS/EMG was found to be a useful supportive diagnostic tool for AFP, which is not there in the WHO AFP protocol at present. Therefore, a multicenter study should be conducted on AFP to develop management protocol of AFP and NCS/EMG should be included as a diagnostic tool, in addition to stool test as a supportive test in all cases of AFP.

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CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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