https://doi.org/10.29309/TPMJ/2024.31.07.8180

The Professional Medical Journal
www.theprofesional.com
2024, Volume, 31 Issue, 07

ORIGINAL ARTICLE

Clinical spectrum of acute flaccid paralysis among pediatric patients at the National Institute of Child Health, Karachi, Pakistan.

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Article Citation: Ismail, F, Ashfaq M, Bibi S, Ahmed A. Clinical spectrum of acute flaccid paralysis among pediatric patients at the National Institute of Child Health, Karachi, Pakistan. Professional Med J 2024; 31(07):1023-1029. https://doi.org/10.29309/TPMJ/2024.31.07.8180

ABSTRACT… Objective: To evaluate the clinical spectrum and immediate outcomes of acute flaccid paralysis (AFP) in children presenting at National Institute of Child Health, Karachi, Pakistan. **Study Design:** Cross-sectional study. **Setting:** Department of Pediatrics, NICH, Karachi, Pakistan. **Period:** August 2023 to January 2024. **Methods:** A total of 121 children of either gender, aged 1-15 years, and presenting with AFP were analyzed. AFP was diagnosed by nerve conduction study. Causes of AFP, like Guillian Barre Syndrome (GBS), transverse myelitis, traumatic neuritis were noted. Outcomes were noted in terms of discharged from hospital, left against medical advice, and mortality. **Results:** In a total of 121 children, 75 (62.0%) were boys. The mean age was 6.00±2.88 years, ranging between 1-12 years. There were 74 (61.2%) children who were fully vaccinated as per age. The most common cause of AFP were GBS, transverse myelitis, and hypokalemic paralysis, noted in 49 (40.5%), 19 (15.7%), and 15 (12.4%) children, respectively. Ninety (74.4%) children were discharged after the treatment, 10 (8.3%) left against medical advice, whereas mortality was noted in 21 (17.4%) children. Children leaving against medical advice were left out from the analysis to compared final outcomes with respect to various study variables. Incomplete vaccination status (p=0.0006), and presentation with sensory loss (p=0.0003) were found to have significant association with mortality. **Conclusion:** Guillian Barre Syndrome was found to be the most common cause behind acute flaccid paralysis in children. Incomplete vaccination history, and presenting with sensory loss were associated with poor outcomes.

Key words: Acute Flaccid Paralysis, Guillian Barre Syndrome, Sensory Loss, Transverse Myelitis, Traumatic Neuritis.

INTRODUCTION

Acute flaccid paralysis (AFP) is an infrequent multifarious clinical syndrome identified by rapid onset of weakness, involving, less commonly, respiratory and swallowing muscular weakness, and with a wide range of etiological factors, encompassing both infectious and non-infectious causes, which can cause life-long incapacity or even mortality.[1,2] AFP weakens the body's muscular responses by affecting the neurological system, particularly the gray matter surrounding the spinal cord. There are multiple possible etiologies for AFP, making it a heterogeneous illness. A disease or trauma that affects the nerves that supply the affected muscles can be the cause of AFP.[3] AFP was recently reported as an outbreaks of disease in the US and throughout the world.[4,5] For effective care, the precise cause of AFP and its occurrence are required. Poliomyelitis was the main cause of AFP in the pre-vaccine period. However, other diseases, like lesions of the anterior horn cells, Guillain-Barré syndrome (GBS), diphtheria, myositis, and infections with enterovirus D68, can also develop into AFP.[6]

AFP is one of the major public health priorities because of disease caused by emerging pathogens, and it continues to be the principal method of polio surveillance. The World Health Organization (WHO) issued an international health emergency declaration in May 2014 in response to the continuing polio outbreaks in the Horn of Africa, Afghanistan, Iraq, Pakistan, and Syria, whereas reports of AFP in the US, Europe, and China were concurrently made due to the emergence of non-polio enteroviruses.[7,8]

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Article received on: 17/01/2024
Accepted for publication: 01/04/2024

The majority of the world's surviving wild polio virus reservoirs are found in Southeast Asia (SEAR), including Pakistan.[9-11] According to WHO estimates, in the absence of wild poliovirus transmission, there is a background yearly prevalence of at least 1 case of AFP per 100,000 people in children under the age of 15.[12] Other causes of AFP include myopathies, neuropathies, hypokalemic periodic paralysis, meningitis, encephalitis, CVA, GBS, transverse myelitis, traumatic neuritis, and spinal cord impairment (low back injury, abscesses, or tumors). The primary cause of AFP in both developed and underdeveloped nations continues to be GBS.[13] GBS is a rapid-onset muscular weakness brought on by an autoimmune condition that affects the peripheral nervous system. The acute phase of GBS can be fatal, with 15% of people experiencing respiratory muscle paralysis.[14] Since cases of AFP share symptoms and signs with poliomyelitis, AFP surveillance is used globally to track and assess the polio eradication effort.[15] The spectrum of clinical presentations of AFP and its sequelae have not been well studied. The rate of recurrence of the spectrum of AFP was assessed by Shaila Ali et al. According to them, GBS accounted for 18.9%, traumatic neuritis 12.8%, transverse myelitis 1.7%, and poliomyelitis 1.6%, respectively.[16]

A wide range of potential etiologies for AFP exist, and these etiologies differ noticeably with advancing age. The clinician faces a special challenge when a child with acute quadriparesis or paraparesis arrives at the emergency room. A precise and timely diagnosis of the disease leads to a successful outcome. Numerous studies on the incidence of AFP and its differential diagnosis in pediatric patients are available, primarily as a result of the global drive to eradicate polio. Nevertheless, there haven't been many of these studies done yet, especially at the local level. Therefore, we planned this study with the objective of evaluating the clinical causes and the immediate outcome of AFP presenting at NICH. The findings of this study are anticipated to give pediatricians the fundamental information required for the adoption of preventative measures in the form of parent counseling regarding routinely advisable proper vaccination for children, avoiding poor sanitary conditions, overcrowding, and emphasizing robust provision of health care to alleviate the burden associated with this.

METHODS

This descriptive cross-sectional study was conducted on patients admitted at the Department of Pediatric Medicine, "National Institute of Child Health (NICH)", Karachi, Pakistan, from August 2023 to January 2024. The study obtained prior approval from the "Institutional Ethical Review Board" (letter IERB-38/2021). A sample size of 121 was calculated using the WHO software for sample size calculation, considering the expected frequency of GBS, the most common reported cause of AFP in children, at 18.9%[16], with 95% confidence level and at 7% margin of error. A non-probability consecutive sampling technique was used for sample selection. The inclusion criteria were children of either gender, aged 1-15 years, presenting with AFP. The exclusion criteria were children presenting with pseudoparalysis or with viral myositis. Children with primary neurological deficits at birth, congenital anomalies, or syndromic children were also excluded from the study. AFP was defined as the sudden onset of paralysis/weakness detected by power in any part of the body of a child less than 15 years of age. GBS was defined as ascending paralysis (weakness that starts in the legs and spreads to the arms).[17] AFP was diagnosed by nerve conduction study.

Parents or caregivers of the children were briefed about the study objectives, safety, and secrecy of the collected data. Informed and written consents for the study were obtained from the parents or caregivers of children. The demographic data of the patients, including their age, weight, duration of illness, history of vaccinations, and any prior illnesses, were recorded. A Camry analog weighing scale was used to measure the length and a stadiometer for height. The workup of all patients with lower limb weakness was assessed. Two separate stool specimens (8-10 g) were collected ≥24 hours apart, both within 14 days of paralysis onset, and were shipped on ice or

frozen packs to the virology laboratory at the "National Institute of Health, Islamabad, Pakistan" for the isolation of the polio virus. The presence or detection of polio virus in stool was a polymerase chain reaction (PCR) diagnostic. The researchers initially detected poliomyelitis based on clinical assessment. Poliomyelitis was defined as a biphasic form of illness with a prodromal stage (characterized by a non-throbbing headache, sudden onset of high-grade fever, sore throat, nausea, vomiting, and muscle aches), followed by a symptom-free phase of 7-10 days, and then the appearance of asymmetrical paralysis (not affecting both sides equally) of limbs (detected by a power score examination). In cases of GBS and transverse myelitis, additional testing was done on serum electrolytes, cerebrospinal fluid (CSF), magnetic resonance imaging (MRI) of the brain or spine, and electrophysiological investigations. Transverse myelitis was defined as the sudden onset of muscle weakness (detected by a power score examination), bladder dysfunction (leaking of urine that cannot be controlled), and severe pain. Severe pain was evaluated by visual analog scale scores. Scores≥8 were considered for severe pain. Transverse myelitis was detected by an MRI spine central T2 hyperintense spinal cord lesion on a long segment (3-4 spinal segments or more). Traumatic neuritis was defined as an iatrogenic condition caused by unsafe intramuscular (gluteal) injection practice that leads to mild paresthesia (burning or prickling sensation at the site of injection) and paralysis (detected by a power score examination) of the foot and permanent sequelae. A specifically designed proforma was used to collect the necessary information.

A database was developed on "IBM SPSS Statistics" version 26.0 for data analysis. The quantitative variables like age, length, height, and the mean duration of illness were expressed in the form of a mean and a standard deviation (SD). For the qualitative variables, such as parental residence status, GBS, transverse myelitis, traumatic neuritis, poliomyelitis, immunization status, and socioeconomic status, frequencies and percentages were calculated. Using the chi-square test, associations between categorical variables like age, gender, place of residence, immunization status, socioeconomic status, and outcome variables were assessed. Quantitative data was compared using independent sample t-test. The significance of the statistical results was measured on the basis of a p-value≤0.05.

RESULTS

In a total of 121 children, 75 (62.0%) were boys. The mean age was 6.00±2.88 years, ranging between 1-12 years. The mean body weight was 17.25±6.12 kg, ranging between 6-38 kg. The mean duration of illness was 25.81±26.86 days, ranging between 4-210 days. There were 74 (61.2%) children who were fully vaccinated as per age. Table-I is showing frequency distribution of demographic and clinical characteristics of children with AFP.

Characteristics		Frequency (%)
Gender	Boys	75 (62.0%)
	Girls	46 (38.0%)
Age	1-5	57 (47.1%)
	>5	64 (52.9%)
Residence	Urban	75 (62.0%)
	Rural	46 (38.0%)
Socio-economic status	Lower	103 (85.1%)
	Middle	18 (14.9%)
Vaccination status	Fully vaccinated	74 (61.2%)
	Partially vaccinated	31 (25.6%)
	Not vaccinated	16 (13.2%)
Fever		70 (57.9%)
Sensory loss		43 (35.5%)
Paralysis symmetry	Asymmetrical	21 (17.4%)
	Symmetrical	100 (82.6%)
Site involved	All 4 limbs	26 (21.5%)
	Both lower limbs	54 (44.6%)
	Other combinations	41 (33.9%)

Table-I. Demographic and clinical characteristics (n=121)

The most common cause of AFP were GBS, transverse myelitis, and hypokalemic paralysis, noted in 49 (40.5%), 19 (15.7%), and 15 (12.4%) children, respectively. Figure-1 is showing details about different causes of AFP.

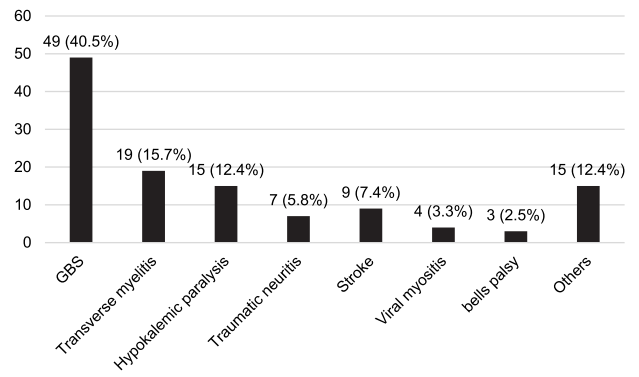

Figure-1. Causes of acute flaccid paralysis (n=121)

Ninety (74.4%) children were discharged after the treatment, 10 (8.3%) left against medical advice, whereas mortality was noted in 21 (17.4%) children. Children leaving against medical advice were left out from the analysis to compared final outcomes with respect to various study variables. Vaccination status (p=0.0006), and presentation with sensory loss (p=0.0003) were found to have significant association with outcomes and the complete details are shown in Table-II.

DISCUSSION

In this study, it was found that 62.0% children with AFP were male. These findings are consistent with the recently published local findings where Khalid AQ et al reported 63.3% of children with AFP to be male.[18] Another study by Abid et al noted 63.2% children with AFP to be male and these findings are also very similar to what we found.[19] The mean age of children with AFP in this study was 6.00±2.88 years. Agarwal et al from India in a recent study reported the mean age of children with AFP to be 6.4±3.7 years.[20]

This study showed that GBS, transverse myelitis, and hypokalemic paralysis were the most frequent causes of AFP, noted in 49 (40.5%), 19 (15.7%), and 15 (12.4%) children, respectively. A study by Agarwal et al revealed GBS, transverse myelitis, and traumatic neuritis to be the most common causes behind AFP, observed in 75.0%, 13.3%, and 11.7% children, respectively.[20] GBS stands out as the primary cause of AFP in pediatric patients.[21] GBS is a significant contributor to chronic neurological disorders among children.[22] Previous data indicated that AFP in children is predominantly linked to comorbid GBS, with subsequent occurrences including myelitis, neuritis, hypotonia associated with the central nervous system, and infections.[23] In another study, GBS was reported as the leading cause, accounting for 94% of cases, followed by additional factors such as dysphagia (13%), sensory symptoms (23%), and respiratory failure (16%).[24] These findings underscore the prominence of GBS in the landscape of pediatric AFP and its associated complications.

Variables		Discharged (n=90)	Mortality (n=21)	P-Value
Gender	Boys	56 (62.2%)	12 (57.1%)	0.6670
	Girls	34 (37.8%)	9 (42.9%)	
Age (years)	1-5	42 (46.7%)	12 (57.1%)	0.3871
	>5	48 (53.3%)	9 (42.9%)	
Duration of symptoms (days)		28.54±30.32	16.52±7.20	0.0748
Socio-economic status	Lower	75 (83.3%)	20 (95.2%)	0.1619
	Middle	15 (16.7%)	1 (4.8%)	
Vaccination status	Fully vaccinated	65 (72.2%)	6 (28.6%)	0.0006
	Partially vaccinated	14 (15.6%)	10 (47.6%)	
	Not vaccinated	11 (12.2%)	5 (23.8%)	
Presentation	Fever	52 (57.8%)	13 (61.9%)	0.7296
	Sensory loss	26 (28.9%)	15 (71.4%)	0.0003
Paralysis symmetry	Asymmetrical	13 (14.4%)	5 (23.8%)	0.2944
	Symmetrical	77 (85.6%)	16 (76.2%)	
Causes of AFP	GBS	38 (42.2%)	6 (28.6%)	0.2495
	Transverse myelitis	13 (14.4%)	6 (28.6%)	0.1217
	Traumatic neuritis	5 (5.6%)	-	0.2690

Table-II. Stratification of study variables with respect to outcomes (N=111)

And this study further endorse what has been laid in the literature previously. Hypokalemic paralysis was another important cause of AFP in this study and this condition typically exhibits swift improvement with correction by potassium supplementation.[25]

Not much local work is seen describing outcomes of children with AFP while many others have presented baseline clinical and demographic characteristics of children with AFP.[18,19] In this study, relatively higher mortality rates among children with AFP were reported (17.4%). These figures are higher than what what has been reported by a study from India (7.7%).[26] A recently conducted local study described mortality of rates of 2.0% in children with AFP.[18]

Monitoring AFP through surveillance plays a crucial role in the ongoing efforts towards polio eradication. It serves as a sensitive and essential indicator for identifying potential cases of poliomyelitis and poliovirus infections. These indicators are integral in assessing and verifying the ongoing effectiveness of AFP surveillance, ensuring its accuracy and efficiency in the timely detection of potential polio cases and related infections. This surveillance mechanism is pivotal in maintaining a vigilant and proactive approach to eradicate polio. Understand the varied manifestations and characteristics of AFP in children, contribute valuable insights for improved diagnosis, treatment, and preventive strategies. Enhance our knowledge of the etiology, and outcomes of AFP in children ultimately aids in the development of more effective healthcare interventions for pediatric patients with AFP. Being a single center study, conducted on a relatively modest sample size were some of the limitations of this study. We only noted short-term outcomes in the present set of children with AFP so further studies should be planned to record long-terms outcomes including neurological disabilities.

CONCLUSION

Guillian Barre Syndrome was found to be the most common cause behind acute flaccid paralysis in children. Incomplete vaccination history, and presenting with sensory loss were associated with poor outcomes.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SOURCE OF FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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2	Muhammad Ashfaq	Concept and design, Critical revisions, Final approval.	
3	Saneeda Bibi	Interpretation of data, Critical revisions, Final approval.	
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