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Research Article

**ONE-YEAR RESEARCH EXPERIENCE ON THE NEUROLOGICAL
ILLNESSES BURDEN DIAGNOSED THROUGH NEUROLOGICAL &
NEUROSURGICAL DIAGNOSIS IN A TERTIARY PEDIATRIC
INTENSIVE CARE UNIT (PICU) IN THE BACKDROP OF PAKISTAN
(SERVICES HOSPITAL, LAHORE)**¹Dr. Asad Munir, ²Dr. Muhammad Junaid Munir, ³Dr. Muhammad Adnan Akbar¹THQ Hospital Lalian District Chiniot²DHQ Jhang³THQ & Trauma Centre Fatehpur**Abstract:**

Objective: The assessment of the spectrum and burden of neurological illness in the setting of an intensive pediatric unit and associated motility review was the primary objective of our research.

Methods: We consulted the retrospective medical records review about the children between the age of one month to sixteen years who were hospitalized in the Services Hospital, Lahore (Acute Neurological Department) in the period of April, 2015 to March, 2016. The basic diagnosis, demographic and neuro diagnostic procedures were also carried out, outcomes and therapies were also carried out on a data sheet which was well structured.

Results: We studied a total of 231 cases which were admitted because of an acute neurological illness in the PICU, the mean age of the children was observed as (67 ± 50) months, 125 children were under the age of five years (54%) and 138 children were male (59.7%). Among these children a total of 144 children had neurological illness (62.3%) and 87 children were diagnosed with neurosurgical illnesses (37.7%). In acute patients of neurological illness, 119 cases were of non-traumatic-coma (51.5%) and 25 cases were of neuromuscular illness (10.8%). Above 500 neuro diagnostic procedures/ tests were carried out in our research on the children having neurological disorders. Our rate of mortality was eighteen percent which was also compared with the total mortality rate observed as twelve percent.

Conclusion: In PICU the repeated and common disorders were the of acute neurological nature; which were related to the increased rate of the mortality. CNS infections, severe traumatic brain injuries and status epilepticus were mostly repeated causes of the illness of acute neurological nature in this particular cohort.

Key Words: Burden, PICU, Acute Neurological illnesses and Mortality.

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INTRODUCTION:

Children face the neurological illnesses burden in abundance. One third of the emergency cases are of neurological illnesses and hospitalization was carried out in twenty-five percent cases [1]. These both the complications and illnesses are faced in the PICU [2, 3]. Higher mortality rate is expected in the patients of neurological injuries with prolonged stay at the hospital.

It is also observed that in fifty percent dead cases were diagnosed with brain acute injuries [4]. Critical is prevention along with illness treatment. It has been demonstrated by numerous research studies that hypotension and hypoxia are the main reasons behind the secondary injuries of the patients. Neuro-resuscitation implementation and neuroprotective approaches with the involvement of the therapeutic and diagnosis armamentariums has improved the outcomes in a significant way about the numerous neurological illnesses [5, 6].

METHODS:

We consulted the retrospective medical records review about the children between the age of one month to sixteen years who were hospitalized in the Services Hospital, Lahore (Acute Neurological Department) in the period of February, 2016 to January, 2017. The basic diagnosis, demographic and neuro diagnostic procedures were also carried out, outcomes and therapies were also carried out on a data sheet which was well structured. The ethical review committee approved the research protocols and informed consent was also secured.

The annual rate of the hospital admissions in our research was observed as 450 admissions. Any nervous system illness during hospital admission was treated as neurological illness. Two main categories were made for the diagnosis of the disease which were Neurological & Neurosurgical diagnosis. Further subdivision of the neurological category was made as NTC (Non-traumatic Coma) & NMD (Neuromuscular disorders). The division of the NTC was also made as intrinsic/ structural (CNS infections, space occupying and vascular lesion) & toxic / metabolic (encephalopathy because of hypoxia, status epilepticus, hypertension, poisoning & metabolic like inborn metabolism error, fulminant hepatic failure and diabetic coma). The disorders of the neuromuscular diagnoses were primarily GBS

(Guillain-Barre syndrome), botulism & Myasthenia Gravis etc. Postoperative care at the end of neurosurgical procedures and Traumatic brain injury were included in the category of Neurosurgical cases. Meningitis, cerebral malaria and encephalitis were included in the CNS infections which was diagnosed through the clinical assessment the assessment was also made through brain imaging and lumbar puncture (MRI brain and CT scan). Encephalopathy was further divided into various groups such as ischemic / hypoxic, toxic, metabolic or status epilepticus. Diagnosis of the patients was dependent on the grounds of history, physical assessment, neuro diagnostic tests such as imaging MRI / CT, EEG / NCV / EMG, laboratory tests and therapeutic interventions including plasma exchange and therapeutic hypothermia keeping in view the state of the patients. To analyses the research outcomes analytic and statistical assessments were applied.

RESULTS:

We studied a total of 231 cases which were admitted because of an acute neurological illness in the PICU, the mean age of the children was observed as (67 ± 50) months, 125 children were under the age of five years (54%) and 138 children were male (59.7%). Among these children a total of 144 children had neurological illness (62.3%) and 87 children were diagnosed with neurosurgical illnesses (37.7%). In acute patients of neurological illness, 119 cases were of non-traumatic-coma (51.5%) and 25 cases were of neuromuscular illness (10.8%). A total of 60 cases were observed with CNS infection (26%) which was structural cause and 23 cases were of status epilepticus (10%); these were also the most repeated causes of the metabolic and structural NTC type respectively. We also noticed 49 cases of severe traumatic brain injury (21.2%) and 38 cases of postoperative neurosurgical illness (16.5%); these were also common cohort in our research study. Mechanical ventilation was a mechanical resource applied to 180 cases (78%), 67 cases were extended inotropic support (29.4%) and 76 cases were of therapeutic hypothermia (33%). PICU care was required for 50 children (21.6%) for monitoring purpose. Above 500 neuro diagnostic procedures/ tests were carried out in our research on the children having neurological disorders. Our rate of mortality was eighteen percent which was also compared with the total mortality rate observed as twelve percent.

Table-I: Demographic, Outcome variables and Resource Utilizations of hospitalized critically ill children having Neurological diagnosis in PICU (N – 231).

Variables		N= 231 (100%)	
Age (mo) (mean ± SD)		67 ± 50	
Male		138 (59.7%)	
Details		Number	Percentage
ICU Interventions	MV	181	78.4
	Inotropes	68	29.4
	Therapeutic Hypothermia	77	33.3
	Plasmapheresis	13	5.6
	Neuro diagnostic Procedures	162	70
CT scan Brain	MRI	97	42
	LP	76	33
	EEG	150	65
	cEEG	23	10
	SSEP	8	3.5
	Nuclear Perfusion Scan	8	3.5
Outcome Variables	Length of ICU stay (days) (mean ± SD)	5.68 ± 6.47	
	Glasgow Coma outcome scale > 3	41	17.7
	Expired	42	18.6

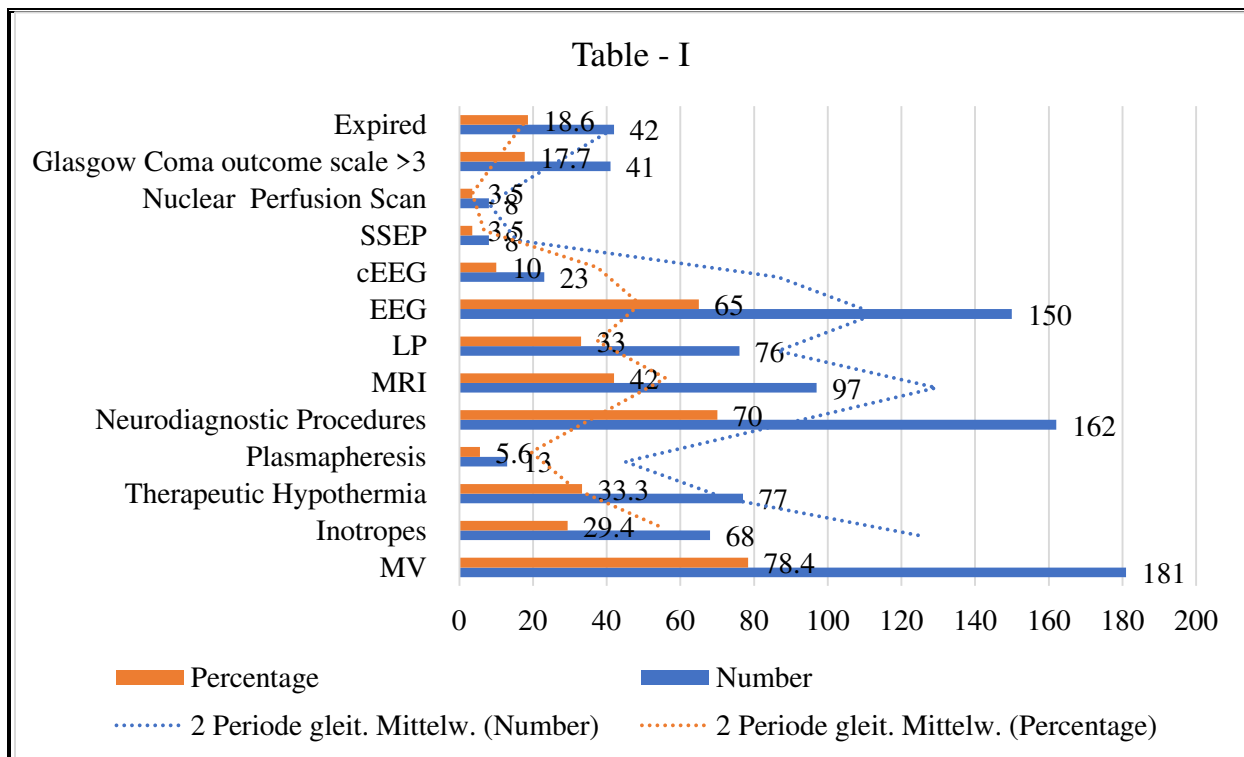
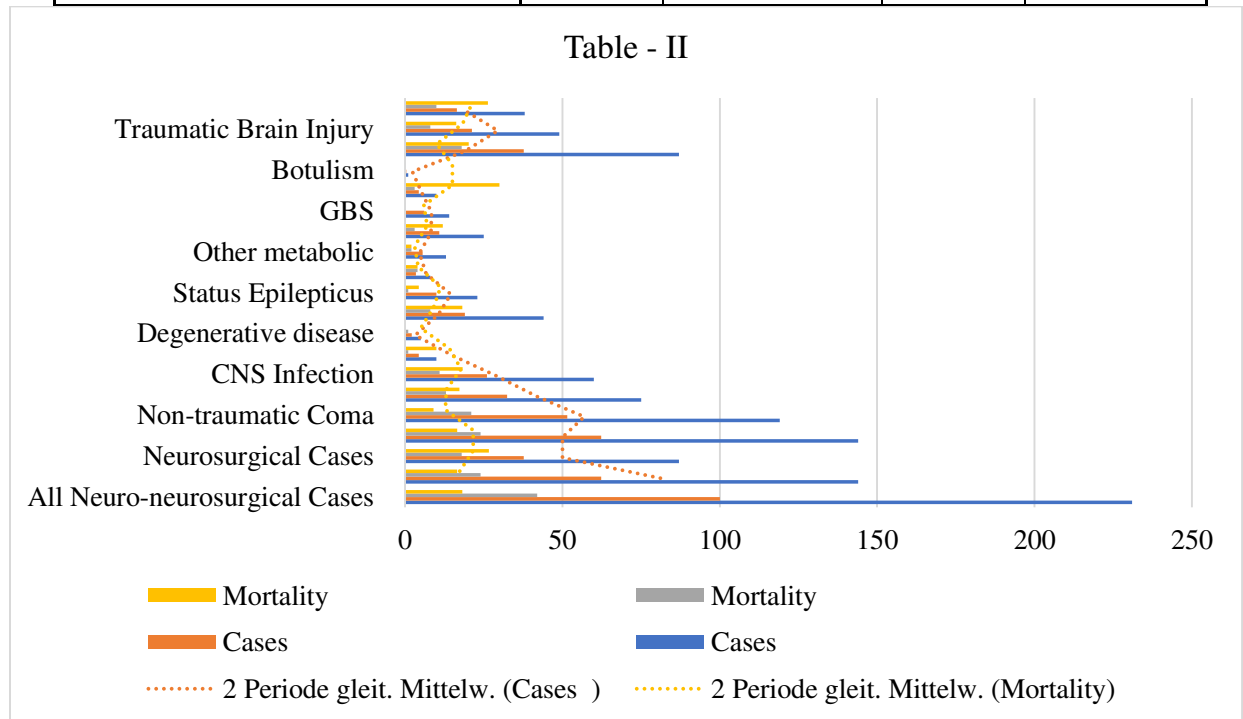


Table – II: Frequency of acute neurological and neurosurgical disorders and mortalities.

Variables	Cases		Mortality	
	Number	Percentage	Number	Percentage
All Neuro-neurosurgical Cases	231	100	42	18.18
Neurological Cases	144	62.33766234	24	16.6
Neurosurgical Cases	87	37.66233766	18	26.6
Neurological Cases	144	62.33766234	24	16.6
Non-traumatic Coma	119	51.51515152	21	9
Structural	75	32.46753247	13	17.3
CNS Infection	60	25.97402597	11	18.33
Stroke	10	4.329004329	1	10
Degenerative disease	5	2.164502165	1	0
Metabolic / Toxic	44	19.04761905	8	18.18
Status Epilepticus	23	9.956709957	1	4.34
Hypoxic-Ischemic	8	3.463203463	4	4
Other metabolic	13	5.627705628	2	2
Neuromuscular Disease	25	10.82251082	3	12
GBS	14	6.060606061	0	0
MG	10	4.329004329	3	30
Botulism	1	0.432900433	0	0
Neurosurgical Cases	87	37.66233766	18	20.2
Traumatic Brain Injury	49	21.21212121	8	16.3
Post-operative NS:	38	16.45021645	10	26.31



For observation a total of 181 patients (78.3%) were kept in the PICU with a total of 50 acute neurological disorders cases (21.6%). There was a need of the mechanical ventilation for 78% of the children, 67 cases (29.4%) were treated with the support of inotropic support and 76 cases 33.3% were managed through neuroprotection therapeutic hypothermia. Thirteen patients were carried out with therapeutic plasma exchange in the illness of neuromuscular. 162 cases were treated with the brain CT scan (70%), 97 cases of MRI (42%), 76 cases with LP (33%), 8 cases with radionuclide cerebral perfusion scan (3.5%), 150 cases with EEG (65%), 23 cases with continuous EEG (10%) and 8 cases of somatosensory evoke potential (SSEP) for coma prognosis (3.5), which have been reflected in Table – II.

PICU mean stay was observed (5.68 ± 6.47) days. Forty-one cases (17.7%) were observed with Glasgow coma results as below 3; whereas, 43 cases of acute brain injury (18.6%) against the overall rate of mortality which was 143 cases (12%). Higher chances of death were reported in the mechanical ventilation management with a p-value as (< 0.001).

DISCUSSION:

As I know this is first of its kind research which covers every aspect of the severe neurosurgical and neurological illness in children of Pakistani setting in the tertiary care PICU. It was observed that 19.3% cases of PICU (231 / 1192) were categorized as the acute neurological abuses. There is scarce literature available on the topics of acute illness of CNS such as Status Epilepticus, Stroke, CNS-infections, Traumatic Brain Injuries and Nontraumatic coma in Pakistani children [7 – 9]. There is a wide range of the neurological disease spectrum. In the under developed countries the disease burden is very high such as in Pakistan. It has been observed in few of the research studies that the association of the PICU deaths were linked with the neurologic failure [4].

We observed that 1/5 cases were hospitalized for the acute neurological illnesses which was linked with the increased rate of mortality. Bell is of the view (26.2%) children were hospitalized for the diagnosis of the neurological disease [2]. Same reports have been produced by various other authors such as LaRovere *et al.* etc. [3]. Longer hospital stay and costly treatment were also associated with the acute children neurological diseases [1]. In the recent research studies, Elbeledy is of the view that neurological disorders during the period of PICU are observed as thirty percent of the total admitted cases [10].

It has been reported in most of the research studies held in the under-developed countries that CNS

infections cause the illness of the neurological nature and NTC in children which includes meningitis, cerebral malaria and encephalitis [8, 11]. Contrarily, PICU CNS infections rates in the under-developed countries was observed low [2]. CNS infections cohort was observed in 60 cases (26%). In various other research studies, the infections related to CNS were observed as fifty percent in the acute neurological disorders. Acute seizure, traumatic brain injuries and status epilepticus were repeated causes of the USA hospitalized cases [1 – 3].

Various factors are linked with the rate of mortality such as delayed hospital visit, neurological illness severity and inadequacy of the resources that were required for ICU. The cure such children is very difficult and sensitive which demands priorities and cerebral balancing. In the developed nations the healthcare for the adults facing neurocritical care is in better state [15 – 17]. An early diagnosis can be helpful for the better management of the disease and assists in the selection of an appropriate intervention for the improvement of the overall outcomes [18 – 20]. Majority of the children acute neurological disorders had higher recovery ability with the timely management of the interventions [22]. Educational and awareness programs like ENLS (Emergency Neurological Life Support) and PNELS (Pediatric Neurologic Emergency Life Support) were helpful in the timely diagnosis of the disease [23]. A number of trained pediatric intensivist and pediatric neurologist participated in the awareness program.

CONCLUSION:

In PICU the repeated and common disorders were the of acute neurological nature; which were related to the increased rate of the mortality. CNS infections, severe traumatic brain injuries and status epilepticus were mostly repeated causes of the illness of acute neurological nature in this particular cohort.

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