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NEURO DEVELOPMENTAL DISORDERS (NDD) PROFILE OF CHILDREN AND ADOLESCENTS ATTENDING PAEDIATRIC NEUROLOGY OP AT A GOVT.HEAD QUARTERS HOSPITAL

Dr. M. Birla Pavalam	MD Paed DM Neuro Asst.Prof. of Paediatric Neurology, MMC, Madurai & GHQH, Virudhunagar(VNR).
Dr. U. Jayalekshmi*	DNB(Paed) 1st Year Post Graduate, GHQH, VNR. *Corresponding Author
Dr. N. Aravind Babu	MD Paed, NICU Nodal Officer, GHQH, VNR.
Dr. S. Sathya Prakash	DCH DEIC- Paediatrician, GHQH, VNR
Mr. M. Chithiravel	DEIC Psychologist, GHQH, VNR

ABSTRACT

Objective: To study the NDD profile in domain wise and in spectrum and continuum pattern across various age groups and to analyse the seizure patterns among them. Design: Cross sectional study.

Setting: Paediatric Neurology op based study in GHQH, Virudhunagar, Tamilnadu between January to June 2018.

Participants: A total of 283 Children from neonatal age to 18 Years of age referred to Paediatric Neurology op from general Paediatrics OP, NICU and District Early Intervention Centre (DEIC), GHQH, VNR.

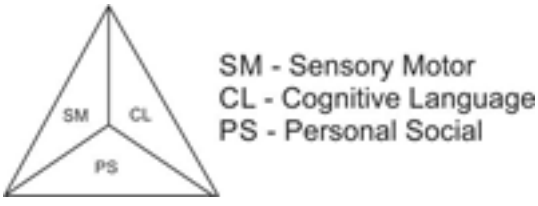
Results: NDD children constituted 22.5 percent of paediatric neuorology OP with significant increase among male sex, 72 percent . Neonatal surveillance from birth to 8 months age constituted 16 percent of NDD children whereas Global Developmental Delay(GDD) constituted 17 percent and 10 percent of NDDs of 8 months to 2 years age and 3 years to 5 years age group respectively. 21 percent of NDD children fell in 8 months to 2 years age where as 18 percent fell in 3 years to 5 years age group. 35 percent of NDD children fell in 6 years to 12 years age group where as 10 percent fell 12 years to 18 years age group. Excluding the children under neonatal surveillance, 37 percent of NDD children had more than one developmental diagnosis. Seizures occurred in 18 percent of NDD Children among which spastic quadriplegia took the lead with 14 percent followed by GDD and moderate MR each constituting 12 percent.

KEYWORDS :

INTRODUCTION

The term Neuro Developmental Disorder is used in two ways [1]. The first refers to conditions with a known genetic or acquired etiology such as fragile x syndrome or fetal alcohol syndrome. The second use refers to selective impairment of certain aspects of neurodevelopment such as ADHD, ASD or dyslexia.

But the Academy of Nuerodevelopmental sciences [2] considers NDD as a unitary way. It defines neurodevelopment as the study of qualitative changes across various domains of one's entire life on neural basis. The various domains are conceptualised as a tritriangular model (see below).



The orders as well as disorders of these domains form a spectrum and continum and the NDDs can further be viewed as major and minor as follows.

Domain	major disability	minor disorder
SM	deaf, blind, CP	HI, VI, clumsiness
CL	MR, DLD	LDs, ESD
PS	ASD, ADHD	Problem behaviors

The major disabilities of one domain overlap with the disorder of other domain of similar severity. For example spastic quadriplegic CP with moderate to severe MR and seizures is a usual combination like spastic diplegic CP with mild MR or borderline intelligence. The disabilities can also present as dynamic over time. Spastic diplegia with borderline intelligence in early childhood resolves in later childhood as LD.

The minor disorders also well overlap as borderline effect of tritriangular model. For example LDs are often accompanied by clumsiness and problem behaviors.

Even though this sort of approach is recommended by ANS, the specific syndrome can also finds its place but as a second line specification. That is fragile-X syndrome will be included in ANS-NDD profile only after its specification of manifestation which can be either mild ASD or moderate ASD with ID.

The results of studies of NDD prevalence vary according to settings where it occur. For example in school settings, ADHD or LD predominate where as in CDC they gravitate as per therapy services available. Paediatric Neurology OP is an unique place where most of the major and minor NDD can be well addressed which can also be influenced by effectiveness of referral points. When the problem behavior or scholastic performance aren't given priorities in primary OPs, they willnot reach Paediatric Neurology OP. On the other hand when RBSK's mobile team search for NDD in focussed way they can reach Paediatric Neurology OP. With the improvisation of NICU care with current NHM policies, there is an increase in number of neonates recruited for NN surveillence. With these background, the NDD profile of Paediatric Neurology OP of GHQH, VNR during first half of year 2018 had been analysed by following methodology.

METHODOLOGY

Whatever the souce of referral, the paediatric neurologist of GHQH, VNR will make a neurodevelopmental diognosis based on history and clinical examination which may be supplemented by appropriate blood investigation and neuroimaging in needed cases. Bayley III infant and toddler asscessment was then carried out by him for young children and those under NN surveillence. The older children were referred for speech and language evaluation, IQ ascessment (from psychiatry dept), NIMHANS index of LD, vanderbilt or ISAA (tamil) by DEIC psychologist with which neurodevelopmental diagnosis are confirmed and goals are set for interventions.

The interventions were carried out by physiotherapist, speech therapist, special educator, psychologist as per individual child, the activities being co-ordinated by DEIC paediatrician as well as paediatric neurologist. The interventions and medications for seizures and multivitamins are available to all children at free of cost only. The paediatrician and paediatric neurologist co-ordinate and monitor the progress as per the consensus statement of IAP on evaluation and management of ASD, ADHD and LD (3).

The NDD profile of children in first half of 2018 were analysed with chi-square 'P' value in SPSS 16 software after ethical committee sanctioning, results of which are as follows.

RESULTS:

Total paed neuro cases 1260 & NDD cases 283 (22.5%). Monthwise NDD status: Jan-59 (25%), Feb-42 (19%), Mar-36 (19.1%), Apr-39 (18.5%), May-57 (31.5%), Jun-50 (32.02%).

TABLE – I Sex ratio comparision between Neuro OP total versus Neuro OP NDD cases

Neuro OP	Male	Female	P value *
total (1260)	762 (60.5%)	492 (39%)	< 0.001
NDD (283)	234 (72%)	79 (28%)	< 0.001

*** < 0.05 significant**

TABLE - 2 Age wise NDD status (total NDD = 283)

S.No.	Age interval	NDD	Percentage
1.	0-8 months	46	16.25
2.	8 mo - 2 years	59	20.84
3.	3 year - 5 year	51	18.02
4.	6 year - 12 year	98	34.62
5.	> 12 year	29	10.2

P < 0.001 significant

Among the 0-8 months, NDD children, all of which constituted the Neonatal surveillence, 74 percent fell into male and 26 percent into female sex category.

Among the 59 NDD children between 8 months to 2 years, Global Developmental Delay constituted 10 (17%) disorders of SM domain 44 (73%), disorders of CL domain 4 (6.7%) and PS domain 1 (1.7%). Table - 3, summarises the SM domain specific NDD status of all age intervals.

TABLE 3 - SM domain specific NDD status

S. No.	SM domain	8mo-2yr N=44	3yr-5yr N=22	6yr-12yr N=39	>12 yr N=4	p value*
1.	Motor delay	8	0	0	0	0.013
2.	Evolving Cp	3	0	0	0	0.234
3.	Spastic diplegia	10	5	2	0	0.173
4.	Infantile hemiplegia	9	3	18	3	0.083
5.	Infantile hemiplegia with LD	0	0	5	0	0.01
6.	Spastic quadriplegia with MR	0	12	4	1	<0.001
7.	Spastic CP with CVI	4	1	0	0	0.289
8.	Extrapyramidal CP	0	0	4	0	0.08
9.	HI	0	1	5	0	0.059
10.	Motor delay with DSL	10	0	0	0	0.004

*** < 0.05 significant**

Among the 4 cases of NDD between 8 months and 2 years, pertaining to CL domain, ESD constituted 1, DSL, expressive > receptive 2 and DSL expressive and receptive 1. The one case of NDD pertaining to PS domain was syndromic ASD.

Among the 51 NDD children between 3 year and 5 year, GDD constituted 5 (10%), disorders of SM, CL and PS domain 22 (44%), 17 (34%) and 7 (14%) respectively.

See table 3 for SM domain specific NDD status. Of the 17 children of CL domain between 3 years to 5 years, DSL exp > receptive constituted 9, DSL exp and receptive and DSL at risk for LD 2 each, ESD, DSL with imparied socialisation, DSL with temper difficulty and DSL with clumsiness, one each. Of the 7 children of PS doamin between 3 years to 5 years ASD, ADHD and ASD with MR constituted 4,2 and 1 respectively.

Of 283 total NDD children, 98 fell between 6 years to 12 years, among whih 39, 49 and 10 children constituted SM, CL and PS domain disorders respectively. See table 3 for SM domain specific NDD status. In CL domain, DSL exp > receptive, DSL at risk for LD, Development articulation disorders and stuttering constituted 3,2,2 and 1 respectively where as slow learner, LD, LD with clumsiness and ADHD with LD constituted 7,8,8 and 3 respectively. Mild and moderate MR constituted 4 and 11 respectively in CL domain. In PS domain ADHD, ADHD with MR and ADHD at risk for LD constituted 2 , 5 and 1 respectively where as ASD and ASD with MR constituted 1 each.

Of 283 total NDD children only 29 fell more than 12 years age. SM domain specific status were given in table 3 where as CL domain specific status were, slow learner - 8, LD with ADHD - 4, LD with clumsiness - 6, LD - 6 and moderate MR – 1.

Of the total 57 LD - slow learner profile 50 were male and 7 were female. Excluding NN surveillence, that is among 237 NDD children 149 (62.87%) had single diagnosis whereas 88 (37.13%) had more than one developmental diagnosis. Among these 237 NDD children seizures occur as the comorbidity in 43 (18.14%) and their individual NDD association is given in Table 4.

TABLE 4 - Seizure Association with specific NDD

S. No.	NDD	Seizure Number n = 43	%
1.	GDD	5	11.62
2.	Spastic diplegia	4	9.3
3.	Spastic quadriplegia with MR	6	14
4.	MR, moderate	5	11.6
5.	ASD with MR	3	7
6.	Spastic CP with DSL	2	5
7.	ADHD with MR	3	7
8.	Infantile hemiparesis	2	4.6
9.	Slow Learner	4	9.3
10.	Mild MR	3	6.9
11.	DSL	3	6.9
12.	LD	1	2.325
13.	HI	2	4.65

DISCUSSION

In western literature, there is a well difined increase in publications related to NDD, percentage publications with genetic and animal model content and estimated and affected children. A partial list of prevalance estimation of NDD per 100 computed from Rutter et al, Udwin and Dennis (4) were, lesh nyhan syndrome 0.0005, criduchat 0.002, PKU, DMD and TSC 0.01 each - FXS 0.06, Klinefelter 0.08, fetal alcohol syndrome 0.1, CP - 0.15, Down's Syndrome - 0.16, ASD 0.6, ADHD - 5, ID - 5.5 and dyslexia - 6. As already discussed in introductory section ANS-NDD profile is based on domain wise spectrum and continum pattern which is reflected in this paper.

When this ANS-NDD tritriangular model is applied to various settings, an uniform pattern of NDD profile may be obtained in future. The male sex preponderance and SM domain preponderance in early years of life are well understand whereas the comorbidities need specific notifications.

The NDD profile analysis in this paper has a restriction of detailing interventional protocols. But it clearly indicate the direction of interventions as per continum and spectrum model. For example, motor delay with DSL that has significant association in this paper warrants combined physio and speech interventions at eariler years.

On the otherside of NDD profile analysis, we can strengthen the primary rehabilitation measures, that is NICU care and emergency paediatrics. The NDD profile analysis and the scuccess of interventions also reflect the literacy and SE status of our society. To conclude a proper NDD profile analysis will reflect and forecast various dimensions of neurodevelopmental health.

Abbreviations

HI-Hearing Impaired
CVI - Cortical Visual Impairment
VI-Visual Impaired
DLD-Developmental Language Disorder
LD-Learning Disability
ESD-Expressive Speech Delay
ANS-Academy of Neurodevelopmental Sciences
ID-Intellectual Disability
CDC-Child Development Centre
RBSK-Rastriya Bal Swasthya Karyakram
NHM-National Health Mission
ISAA-Indian Scale of Autism Assessment
DSL-Delayed Speech and Language
ADHD-Attention Deficit Hyperactive Disorder
ASD-Autism Spectrum Disorder
MR-Mental Retardation
PKV-Phenyl Ketonuria
DMD-Duchenne Muscular Dystrophy
TSC-Tuberous Sclerosis Complex
SE-Socio Economic

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