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Nutritional Status of Children with Cerebral Palsy Attending to Tertiary Care Centre .

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ABSTRACT

Introduction- Cerebral palsy (CP) is a group of permanent disorders of movement and posture, causing limitation in an activity that is attributed to non-progressive disturbances in the developing fetal or infant brain. Poor nutritional status is common in this group, and children across all severities of gross motor functional impairment are at risk. **Methodology** -A total of 80 cases were included in the study, chosen as per inclusion criteria guided by –The Definition and classification of cerebral palsy, April 2006 International consensus.Thorough clinical history regarding presenting complaints, birth history encompassing antenatal, intra-natal and postnatal history, detail developmental history of all 4 domains, nutritional history was noted. After obtaining informed consent, clinical examination, particularly central nervous system examination and anthropometric measurements were done. Anthropometric parameters were plotted against age and gender specific WHO growth charts & interpreted. CBC, iron and ferritin values were compared with age reference standards and categorized as anemic & non anaemic. **Results**- 75% of the study subjects were <5 years of age. Majority of cerebral palsy children had growth flattering: more than half 53(53.8%) subjects had underweight, 30 (37.6%) were stunted & 6 (7.5%) were over-weighed. 28 (35%) were anemic out of which 46% were diagnosed with iron deficiency anemia. Overall iron & ferritin deficiency was noted in 13 (16.3%) subject of them . **Conclusions**- In this study, children with cerebral palsy have impaired anthropometric parameters with considerate percentage of anaemia. Early identification and treatment of these patients is very crucial for their optimal growth and development.

Keywords-Cerebral Palsy, Nutritional Status , Iron Deficiency Anaemia , Anthropometry.

INTRODUCTION

The incidence of CP is 3.6/1000 live births and male to female ratio is 1.4:1 according to recent data from the Centres for Disease control and prevention. [1]The optimization of nutritional status is integral to the overall health and clinical management of children with cerebral palsy (CP).[2] Poor status of nutrition is a common problem in this cluster, and children of all grades of gross motor functional impairment are at risk.[3] The approach to nutritional assessment is multi-dimensional . [4]The European Society of Gastroenterology, Hepatology and Nutrition recommended that the nutrition assessment of children with CP should include various anthropometric components and difficulties in feeding, dietary energy intake ,gastrointestinal factors and micronutrient status[5,6].

Objective-To assess the nutritional status of the children with cerebral palsy visiting tertiary care centre by anthropometry & to estimate Iron deficiency anaemia in cerebral palsy children.

Methodology

This was an observational study done at tertiary care centre where all the children admitted with clinical features suggestive of or previously diagnosed cases of cerebral palsy between the age group of 1-14 years were studied over a period of one and half years. Patients with cerebral palsy on any hematinic medication, previous blood transfusion, hemolytic anemia, Motor impairment due to malfunction of spinal cord or muscles, progressive neurological disorder and Those who did not give consent for blood sampling were excluded. A total

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of 80 cases were included in the study, chosen as per inclusion criteria guided by –The Definition and classification of cerebral palsy, April 2006 International consensus.[16] Selected subjects were evaluated by relevant history and detailed clinical examination. Appropriate investigations were done & all required information was documented in a pre-designed proforma of the study. Thorough clinical history regarding presenting complaints, birth history encompassing antenatal, intra-natal and postnatal history, detail developmental history of all 4 domains, nutritional history was noted. After obtaining informed consent, clinical examination, particularly central nervous system examination and anthropometric measurements were done. In the child with CP or similar neurodevelopmental disability, interpreting anthropometric data has significant caveats. Although growth charts specific to children with CP have been published, the use of these charts to evaluate the growth of a specific child with CP is not necessarily the optimal solution and the use of such population-derived growth charts is not recommended by the US Centers for Disease Control (and Prevention). Hence WHO charts were used. All study subjects underwent venipuncture (5 ml venous blood sample), after obtaining written informed consent, for analysis of complete blood count that included hemoglobin, White Blood Cell count, platelets, mean corpuscular hemoglobin MCH, mean corpuscular volume MCV, mean corpuscular hemoglobin concentration MCHC, red cell distribution width RDW, peripheral smear, serum iron and serum ferritin. Fasting serum sample for ferritin analysis was taken. Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean SD (Min-Max) and results on categorical measurements are presented in number (%). Significance is assessed at 5 % level of significance.

RESULTS

Among the study subjects, 70 % of cases were between 1-5 years . 25 % of cases were between 6-10years , 5 % of cases were between 11-15 years . The participants in the present study were children between 1 to 14 years of age .57.5 % were male .21. % were of preterm birth and 66.3 % were delivered by vaginal route and 83.8% were of Adequate for Gestational Age .67.5% had not cried immediately after birth (Among them 10 % had cried after first ten mins of birth and 36.5 % between 1 to 5 mins).Among study population , 63.8% had undergone NICU admission and 21.3% had Neonatal Hyperbilirubinemia .Only 25% had undergone exchange transfusion.96.3 % had Gross Motor Delay and 95% had fine motor delay . 71.3 % had caregivers to feed them .46.3 % were of normal weight , 28.8% had moderate underweight and 25% had severe underweight .Among the height parameters , 61.3 % were normal ,rest had stunting .25.5 % had microcephaly , 55.5 % had normal BMI and 37.5 % had wasting .Among study subjects , 35 %were anaemic , 36.3 % had Microcytic hypochromic anaemia and 63.8 % had Normocytic Normochromic Anaemia .Serum Iron levels were < 40 mg /dl in 16.3 % and < 12 ng / ml in 16.3%.Iron Deficiency Anaemia was present in 22.5% .A significant statistical correlation was seen between the observed parameter(weight, height ,calorie and head circumference) and their BMI categories .

DISCUSSION

Normal growth parameters is usually accepted as a surrogate marker of health, however deviation from normal growth is a pointer towards disruption of child's health. Children with CP have poor growth. Among the study subjects,56 CP cases were between 1-5 years (70%), 20 CP cases were between 6-10years (25%), 04 CP cases were between 11-15 years (5%).A study conducted by T O Adekoje et al on –Anthropometry of children with cerebral palsy at the Lagos University Teaching Hospital[7] on 102 CP children in 2005-2006 showed 77 (75%) to be less than 5years of age & 16 (25%) were above 5 years of age, similar to our study. A recent study done by A R Almuneef [8] reported that 65 % out of 74 CP cases studied, aged less than 5 years similar to our study.46 CP cases were males (57.5%) & 34 were females (42.5%) which is similar to the study conducted by Toopchizadeh et.al[9] . In our study , % of subjects with underweight were 53% compared to 38.1% ,69.35% , 34.9 % and 20 % in studies done by Karagiozoglou LT et al[10] , Dr.Kiran Gaikwad et al[11] , Mustafa et al[12] and Dahlseng et al [13]. In our study % of children with anaemia was 35 % compared to study done by PG Hariprasad et al[14]it was 83% . The mean hemoglobin of the study population was found to be 9.19 g/dl with a minimum of 3.7 g/dl and a maximum of 13.0 g/dl. Anemia in various age groups among participants were categorized with respect to the WHO guidelines.In our study in Anaemic patients , mean values of Haemoglobin , Serum Iron , Serum Ferritin were 9.8 , 63.78,35.93 compared to a study done by Athanasionx Papadopoulos et alwas 9.6 , 42.1 and 13.7[15] .The most common primary motor type was spasticity-73 (90%), followed by dystonic-4 (5%), mixed & choreoathetoid CP being the least of 2(2.5%) & 1(1.3%) respectively.Among the spastic cerebral palsy quadriplegia > diplegic > hemiplegic >paraplegic > monoplegic. Similar results were seen in a study done by Swarupa et al as well with spastic quadriplegic CP being the most common type.[16]

Average iron and ferritin in our study was 63.5 & 38.2 ng/ml overall in all children, with low serum iron & ferritin seen in 13 CP patients accounting for 16.25%.Similar results were seen in a study conducted in Shiraz,Iran by Firoozeh Fazlalizadeh et al on Growth and minerals status in children with cerebral palsy during April 2012-April 2013[17]. From a total of 90 participants, 89 (98.9%) had normal ferritin levels & only 1 (1.1%) had low ferritin levels.

Similar results was also seen in the study on Micronutrient status in children with cerebral palsy by Elisabet

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Hillesund. This study had 36 children with CP, aged 1.5–17 years and among them 5 (13.8%) had depleted iron stores (serum ferritin < 12 ngm/L), of whom 4 (11.1%) had a low iron intake.
Serum ferritin levels were normal in 33 patients (47.8%) and below the normal range in 36 (52.2%) while in our study low serum ferritin levels was noted in 13 (16.3 %) subjects & normal serum ferritin levels was noted in 66 (82%) subjects of study subjects.[18]
A study was conducted by Esen İspiroğlu et al on ‒Anemia, vitamin B12, folic acid and iron deficiency in children who cannot feed themselves due to neurological disease‖ in Turkey[19] enrolled 50 children. 28 patients (56%) had anemia out of which 4 (8%) had only iron deficiency (ID) & 9 (18%) were iron deficiency anemia (IDA) but in contrast our study reported that 23/80 (29%) had anemia & 13/23 (56.7%) had iron deficiency anemia[20] .In a study, done by Bashir et al , the incidence of anaemia was 56 % compared to our study in which it was 35 % [21].A poor correlation between ferritin and hemoglobin in cerebral palsy children was seen in our study which was similar to a study done by Rahul Mohan et.al [22]

CONCLUSION

Abnormalities in anthropometry in children with cerebral palsy are secondary to various etiologies, few of them might get affected to promote growth.The conventional approaches to tackle malnutrition may not be appropriate for this special cluster of children because of their physical challenges and physiological inabilities. Most of these children come from weak economical backgrounds and are more vulnerable to malnutrition. Though anemia is a significant risk factor for poor neurocognitive outcome, it is irrational to give prophylactic iron supplementation. Pending the costlier investigations like serum ferritin & iron, RBC indices, RDW & peripheral smear examination correlates well with the diagnosis.
To strengthen the nutritional status of these cluster of children, nutritional rehabilitation centers similar to severe malnutrition are to be encouraged. Further preference to be given for the preparation of locally available therapeutic food for nutritional rehabilitation.Also nutritional anemia is to be looked for during regular rehabilitation follow up & timely intervention with supplements reduces its ill effect on neuro-cognitive domain.

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Table 1: Age distribution of patients studied

Age in years	**No. of patients**	**%**
1-5	56	70.0
6-10	20	25.0
11-15	4	5.0
Total	80	100.0

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Table 2 -Anthropometric and Laboratory Parameters Details-

Z score Interpretation	No. of patients	%
Normal	37	46.3
Moderate underweight	23	28.8
Severe underweight	20	25
Total	80	100
Z score Height Interpretation	No. of patients	%
Normal	49	61.3
Moderate stunting	15	18.8
Severe stunting	15	18.8
Tall stature	1	1.3
Total	80	100
Z score Interpretation	No. of patients	%
Normal	36	45
Microcephaly	20	25
Null	24	30
Total	80	100
BMI Interpretation	No. of patients	%
Normal	44	55
Obesity	4	5
Over weight	2	2.5
Wasted	30	37.5
Total	80	100
Hemoglobin interpretation	No. of patients	%
Non-Anemic	52	65
Anemic	28	35
Total	80	100
Peripheral smear	No. of patients	%
Microcytic hypochromic blood picture	29	36.3
Normocytic normochromic blood		
	51	63.8
picture		
Total	80	100
Red cell distribution%	No. of patients	%
<11.5	0	0
11.5-14.5	39	48.8
>14.5	41	51.3
Total	80	100
Serum Iron (mcg/dL)	No. of patients	%
<40	13	16.3
40-100	65	81.3
>100	2	2.5
Total	80	100
Serum Ferratin (ng/ml)	No. of patients	%
<12	13	16.3
>12	66	82.5
NA	1	1.3
Total	80	100

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Low serum iron & serum ferritin was noted in 13 subjects accounting for 16.3 %.

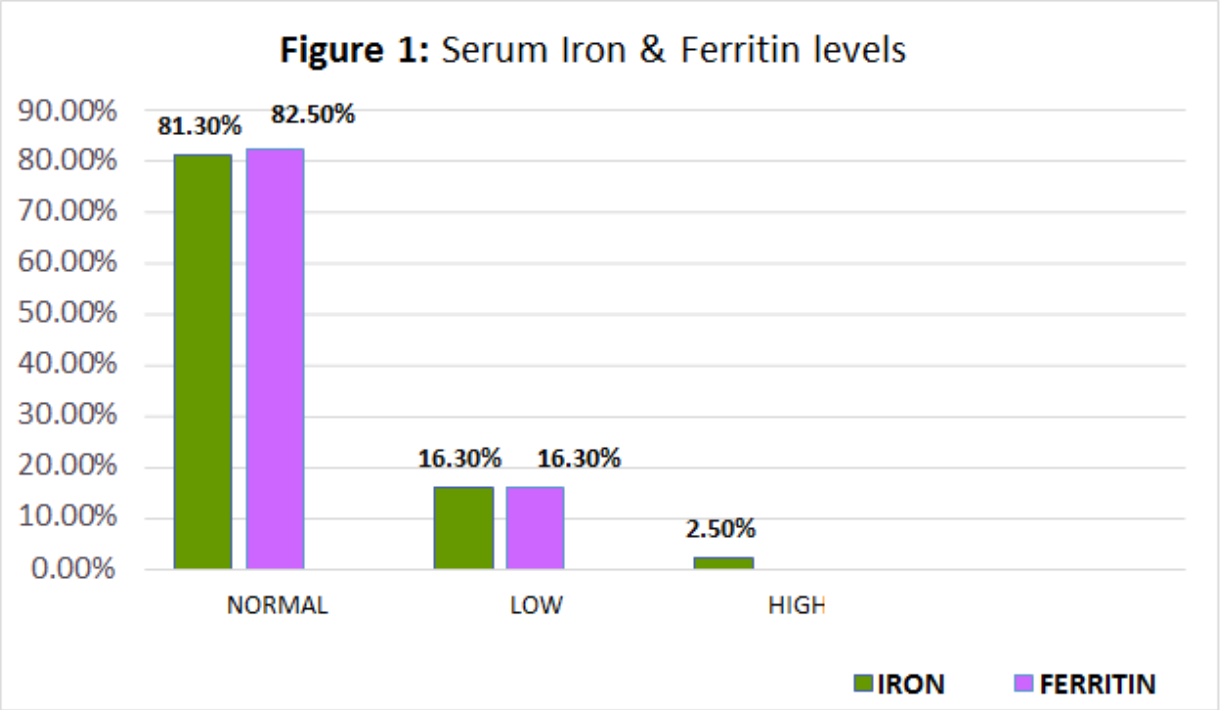

Figure 1: Serum Iron & Ferritin levels