Original Paper

Rickets in cerebral palsy children

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Abstract

A cross sectional prospective study was conducted to find the presence of rickets in 60 children with cerebral palsy (CP). The diagnosis of rickets was made on the basis of clinical profile, biochemical studies and radiological studies. Statistical analysis was done using chi-square test.

Rickets was found in 15 % (n= 9) of cerebral palsy patients included in the study. Maximum cases of CP were between the age group of 1-2 years with male to female ratio of 1.3:1. Spastic quadriparesis (43.33%) cases dominated the study. Maximum cases of rickets, 33.33% (3 out of 9) were in the age group of 1-2 years. Male to female ratio in rickets cases was 1.25:1. Of all children having rickets, 44.5 % (4 out of 9) had spastic hemiparesis followed by 33.33% (3 out of 9) having spastic quadriparesis; 66.66% (6 out of 9) cases diagnosed with rickets were found in children who had achieved walking (of them 5 were of healed rickets and 1 case was of active rickets). Rest of the cases were found in children who had not achieved ambulation. Of 9 cases diagnosed as rickets, 2 were on anti-epileptic drugs.

Many studies suggest that insufficient energy and nutrient intake occurs in children with CP due to oral and neuromotor problems. According to our study, ricket is not as common as expected in children with CP (15.0%). Since prescription of high doses of vitamin D in absence of a deficiency can result in toxicity, every child with CP should be completely investigated for rickets before prescribing calcium and vitamin D supplements.

key words **: Cerebral palsy, rickets.**

Cerebral palsy (CP) describes a group of developmental disorders of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances occurring in the developing foetal or infant brain. The motor disorders of CP are often accompanied by disturbances of sensation, cognition, communication, perception, and/or behaviour, and/or by a seizure disorder.[1] It is one of the leading causes of neuromotor disability in children.[3]

Many studies suggest that insufficient energy and nutrient intake is common in such children which may have adverse health effects and lead to deficiency disorders like rickets.[2]

Materials and Methods

Sixty consecutive children diagnosed as CP of either sex fulfilling the inclusion criteria and agreeing to participate in study were taken from those attending as outpatients in the department of Physical Medicine and Rehabilitation, VMMC and Safdarjang Hospital, New Delhi. The inclusion criteria were: (1) age group: 0 – 15 year. (2) sex: both males and females (3) willingness to participate.

They were investigated for presence of rickets on the

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basis of clinical profile, biochemical studies (serum calcium, phosphorus and alkaline phosphatase) (Table 1) and radiological studies (x- rays of bilateral wrist joints and knee joints). Radiological diagnosis was taken as definitive one; clinical and biochemical findings were used to corroborate the diagnosis.

Statistical analysis was done using chi-square test.

Results

Mean age of 60 patients was 3 years 9 months (range 9 months to 11 years). Maximum cases of CP were between the age group of 1-2 years (Table 2). There were 34 males (56.66%) and 26 females (43.33%) in the study (M:F ratio1.30:1) (Table 3).

Of the 60 patients diagnosed as CP, 26 (43.33%) were of spastic quadriparesis, 19 (31.66%) of spastic diplegia, 12 (20%) of spastic hemiparesis and 3 (5%) of mixed type.

Rickets was found in 9 (15%) out of 60 cerebral palsy patients included in the study. Maximum cases of rickets, 3 (33.33%) out of 9, were in the age group of 1-2 years. Of these 9 patients, 5 were males and 4 females (M:F 1.25:1). Four (44.5%) out of the nine patients had spastic hemiparesis, 3 (33.33%) had spastic quadriparesisand 2 (22.22%) had spastic diplegia.

Six out of 9 (66.66%) cases diagnosed with rickets were found in children who had achieved walking. Rest of the cases were found in children who had not achieved ambulation.

Out of 9 cases diagnosed as rickets, 2 were on anti-epileptic drugs but none of them had any difficulty in feeding.

Discussion

In our study, male to female ratio was found to be 1.3:1. Erkin *et al*[4] found the male to female ratio 1.45:1. In a similar study conducted by Pharaoh *et al*[5] the male to female ratio was 1.4:1. Studies have reported higher incidence of several developmental brain disabilities including mental retardation, autism, attention deficit, hyperactivity disorder and cerebral palsy as well as structural differences in brain of male children born prematurely.[6] Evidence is accumulating to suggest cellular pathways leading to neuronal death after an infant brain injury are different in males and females, and that this is influenced by sex chromosomes, not sex hormones as its effect may occur later in life.[6]

Table 1 — *Reference values of alkaline phosphatase (in SI units)*[3]

Age group (in years)	Male	Female
1 - 9	145 - 420	145 - 420
10 - 11	130 - 560	130 - 560
12 - 13	200 - 495	105 - 420
14 - 15	130 - 525	70 - 230
16 - 19	65 - 260	50 - 130

Out of 60 patients included in our study, spastic quadriparesis dominated the study constituting 43.33% followed by 31.66% of spastic diplegia, 20% of spastic hemiparesis and 5% of mixed type. In a retrospective study of 544 CP cases by Srivastava *et al*,[7] spastic quadriparesis comprised maximum number of cases (34.9%) followed by hemiplegia (28.7%) and diplegia (21.9%). Sharma *et al*[8] in their study of 480 cases found 54% diplegia, 15% quadriplegia, 11.8% double hemiplegia, 8.6% hemiplegia and 3.9% of mixed type.

Henderson[9] in his study observed reduced levels (<10 ng/ml) of calcidiol in 19% non-institutionalised children with CP which was significant but found to vary greatly with seasons. Low levels of calcitriol (<20 pg/ml) in 2% of their patients were comparable to normal paediatric subjects despite anticonvulsants and poor nutrition.

Maximum cases (3 out of 9) of rickets in our study

Table 2 — *Type of CP and rickets*

Type of CP	Rickets	No rickets	Total No of cases (%)
Spastic quadriparesis	03	23	26 (43.33%)
Spastic diplegia	02	17	19 (31.66%)
Spastic hemiparesis	04	08	12 (20%)
Mixed (spastic + dyskinetic)	0	03	03 (5%)

Table 3 — *Age distribution and rickets*

Age groups (in years)	Rickets (n=9)	No rickets (n=51)	Total (n=60)
0 - 1	0	8	8
1 - 2	3	10	13
2 - 3	2	6	8
3 - 4	1	4	5
4 - 5	1	4	5
5 - 6	0	7	7
6 - 7	0	4	4
7 - 8	0	2	2
8 - 9	1	0	1
9 - 10	0	2	2
10 - 11	1	3	4
11 - 12	0	1	1

Table 4 — *Sex distribution and rickets*

Racket/No racket	Male	Female
Rickets	05 (14.7%)	04 (15.4%)
No rickets	29 (85.3%)	22 (84.6%)
Total	34	26

Table 5 — *Milestones achieved and presence of rickets*

Milestone achieved	Rickets	No rickets	Total
No ambulation	03 (10.7%)	25 (89.3%)	28
Ambulation	06 (18.75%)	26 (81.25%)	32

were in 1-2 years age group. Out of 34 male patients, 5 (14.7%) had rickets while 4 females out of 26 (15.38%) had rickets. This difference was statistically insignificant.

Of 9 children with rickets, 6 had achieved walking (5 healed rickets and 1 active rickets).

Prevalence of rickets was 10.7% (3 out of 28) in non-ambulatory group and 18.75% (6 out of 32) in ambulatory group (Table 2), the difference being insignificant. Feeding difficulties were absent in our patients.

Two of these 9 patients were on anti-epileptic drugs. Morijiri and Sato[10] found that anticonvulsant drugs depressed serum 25 - OHD levels, but this was not the major factor in development of rickets. The vitamin D supplementation increased their serum

25- OHD level which could not be maintained unless they were exposed to sunlight.

Bereket[11,12] found varying prevalence of rickets (4-27 %) in different regions of India due to ethnic, socio –cultural and economic diversity. In our study, rickets was not found to be more common in CP children.

Conclusion

Rickets is not common in children with CP. Since prescription of high doses of vitamin D in absence of a deficiency can result in toxicity, every child with CP should be completely investigated for rickets before prescribing calcium and vitamin D supplements. However, insufficient energy and nutrient intake occurring in children with cerebral palsy due to oral and neuromotor problems has been reported to cause rickets.

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