

# Elementary school enrolment and its determinants among children with cerebral palsy in Thiruvananthapuram district, Kerala, India

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## ABSTRACT

**Context:** There is enough documented evidence to prove the benefits of early and appropriate initiation of education among children with cerebral palsy (CP). **Aim:** To find out the proportion of children with CP who are enrolled for some kind of formal education and to study the determinants of the same. **Setting and Design:** This cross sectional study was done among children, attending the special clinics at government medical college, Thiruvananthapuram. **Materials and Methods:** Children between 3 and 12 years of age diagnosed with CP were subjects for the study. **Statistical Analysis Used:** Enrollment for any form of formal education was the major outcome variable. The factors associated with initiation of formal education were tested using Chi-square test or Fischer's exact test. Independent association of each factor was evaluated through binary logistic Regression analysis. **Results and Conclusions:** The mean (SD) age of the children ( $n = 86$ ) was 5.7 (2.3) years with forty-six (53.5%) of them being girls. Diplegia was the commonest limb abnormality found. Fifty-two (60.5%) children were undergoing some kind of schooling. Those children who were less dependent physically and those who had achieved better language development were regular school goers. After binary logistic regression the ability of a child to speak in sentences ( $P = 0.008$ ) and ambulatory level of the child ( $P = 0.019$ ) were factors which favored, whereas delay in attaining the adaptive developmental milestone of transferring objects from one hand to another ( $P = 0.014$ ) was found to be detrimental for school enrollment.

**Key words:** Cerebral Palsy, cerebral palsy and school enrollment, education and disability

## Introduction

Cerebral palsy (CP) refers to a group of permanent disorders of the development of movement and posture, causing activity limitations that are attributed to non progressive disturbances that occurred in the developing fetal or infant brain.<sup>[1]</sup> CP has got an estimated prevalence of 2/1000 in the general population.<sup>[2]</sup> The motor disorders in CP are often accompanied by disturbances of sensation, perception, cognition, communication, and behavior.<sup>[3]</sup> It may often be complicated with epilepsy and secondary musculoskeletal problems.<sup>[3]</sup> Impaired control

and coordination of voluntary muscles is accompanied by mental retardation or learning disabilities in 50-75% of children and by speech disorders (25%), auditory impairments (25%), seizure disorders (25-35%), or abnormalities of vision (40-50%).<sup>[4]</sup>

Physical, social, and environmental factors, service systems and policies existing in the society may influence a person's attitude to his/her impairment or activity limitations.<sup>[5]</sup> The physical and social problems imparted by CP start from childhood and extent to the adult life of the patient and several childhood characteristics seem to predict long-term social prognosis.<sup>[6]</sup> Youth and adults with this infirmity will require health care support throughout their lives.<sup>[7]</sup> So it is important to provide proper training including formal to this most needy segment of population. But their disability complicated by the socio-economic backwardness often prevents them from availing basic human rights including education. Since CP is an evolving disorder in childhood,

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10.4103/0976-3147.116446

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some limitations may not be evident early in life. But it is usually manifested by the school going age.

Cerebral palsy cannot be cured, but thoughtful interventions including proper education will often improve the child's capabilities.<sup>[8]</sup> Besides special education for cerebral palsy patients, a key factor will always be a supportive element. People with a severe degree of cerebral palsy can still be functional and independent. Handicap is the result of limitations imposed by the environment and society, which limits an individual having a specific disability.<sup>[9]</sup> Studies also documented the importance and benefits of appropriate education for children with CP.<sup>[10]</sup>

There are only few studies which gives an insight into the determinants of formal education among children with CP. This information may be of use, when planning community based strategies for these children. Aim of the study is to find out the proportion of children with cerebral palsy in the age group of 3-12 years who have enrolled for some kind of formal education and to study the determinants of the same among these children.

## Materials and Methods

This hospital based cross sectional study was conducted in the department of physical medicine, medical college hospital, Thiruvananthapuram (Kerala, India). The study participants were children between 3 and 12 years of age diagnosed with cerebral palsy, (diagnosis of CP was made either by a pediatrician or by a neurologist) attending the special clinics conducted at the department of physical medicine and rehabilitation, government medical college, Thiruvananthapuram. Cerebral palsy clinics are routinely conducted at the study setting on 1<sup>st</sup> and 3<sup>rd</sup> Monday of each month. A team headed by a physician specialized in physical medicine runs the clinic. Physiotherapist, nursing staff and counselors are also part of the team. The main services provided through this clinic are physiotherapy for the children and counseling for the parents. Prosthetic and orthotic appliances are being provided from this clinic with the help of other departments of the medical college or external agencies. About 20-40 children with CP from all over the state attend the clinic on each clinic day. This study was carried out during the last quarter of 2008. No exclusion criteria was fixed, hence all 86 patients who attended the clinic during this period were subjects for the current study.

A semi structured questionnaire was used for the data collection which included variables to assess formal

education status of the child, clinical features of the morbidity and socio-economic status of the parents. Primary respondents were parents/guardians who accompanied the children during the hospital visit. Written informed consent was obtained from them before administration of the questionnaire. Those children whose parents/guardians did not give consent were excluded from the study.

## Statistical analysis

Enrollment for any form of formal education was the major outcome variable. The co-variables included educational status of the parents, socio-economic factors, clinical features and clinical history of the disability. The study variables were expressed either in terms of mean (SD) or frequency (%). The factors associated with initiation of formal education were tested using Chi-square test or Fischer's exact test. Independent association of each factor was evaluated through binary logistic regression analysis. A significance level of 95% and a power of 80% were assumed in all these analyses.

## Results

The study population included children between the age of 3 years to 12 years with a mean (SD) age of 5.7 (2.3) years. Forty-six (53.5%) of them were girls. Diplegia was the commonest limb abnormality found (52, 60%) followed by hemiplegia (24, 28.2%), quadriplegia (6, 7.1%) and triplegia (4, 4.7%). Eighty-one children (94.2%) were opting physiotherapy to get relieved from symptoms. Fifty-two (60.5%) children were undergoing some kind of schooling. The mean (SD) at which formal education began was 4.3 (1.4) years. One third of them (27, 31.4%) were using the facilities of Anganwadies (the outreach centers of integrated child development scheme in India, available one per 1000 population) for the initiation of schooling. The educational level of the children is given in Table 1.

Thirty seven (43.0%) children in the study group were able to walk without the help of other people or without

**Table 1: The pattern of schooling among the study subjects**

Type of schooling	Frequency	Percentages
No schooling	34	39.5
Anganwadi*	27	31.4
Special school	3	3.5
Elementary school	22	25.6
Total	86	100

\*The peripheral outreach of Integrated child development scheme (ICDS) in India, where the 'Anganwadi worker', not a specially trained person is giving pre-school education to children of 3-6 year age group

using crutches. Drooling was present in 36 (41.9%), strabismus in 44 (51.2%) and urinary incontinence in 34 (39.5%). Twenty three (23.3%) of them were suffering from any form of mental retardation. The physical and physiological factors associated to the initiation of schooling among children with CP are given in Table 2.

The ability to communicate was assessed in the study population and the following observations were made. Eighty-three (96.5%) of children were able to communicate through vocalization, seventy-two (83.7) of them were able to communicate using words and fifty-five (64.0%) of them were using sentences. The pattern of communication skills of the children associated to schooling is given in Table 3.

Regarding the attainment of developmental milestones, 73 (84.9%) achieved head control before two years. Grasp was attained before two years in case of 64 (74.4%) of children. Sixty (69.8%) children were able to transfer objects from one hand to another by the age of 2.5 years. Sit with balance was achieved by 66 (76.7%) children before 2.5 years. These factors were found associated to the initiation of schooling in children with CP, according to the bi-variate analysis Table 4.

**Table 2: Physical physiological characteristics and schooling among children with cerebral palsy**

Study variable	Yes/No	Schooling present (%)	No schooling (%)	P
Able to walk independently	Yes	31 (83.8)	6 (16.2)	<0.001
	No	21 (42.9)	28 (57.1)	
Presence of drooling	Yes	15 (41.7)	21 (58.3)	0.002
	No	37 (74.0)	13 (26.0)	
Presence of strabismus	Yes	21 (50.0)	21 (50.0)	0.052
	No	31 (70.5)	13 (29.5)	
Presence of urinary incontinence	Yes	13 (38.2)	21 (61.8)	0.001
	No	39 (75.0)	13 (25.0)	
Presence of mental retardation	Yes	8 (36.4)	14 (63.6)	0.007
	No	44 (68.8)	20 (31.2)	

\*Chi-square test was used

**Table 3: Communicating ability and schooling among children with cerebral palsy**

Study variable	Yes/No	Schooling present (%)	No schooling (%)	P
Communicating ability by vocalization	Yes	52 (62.7)	31 (37.3)	0.029
	No	0	3	
Communicating ability using words	Yes	49 (68.1)	23 (31.9)	0.001
	No	3 (21.4)	11 (78.6)	
Communicating ability with sentences	Yes	43 (78.2)	12 (21.8)	<0.001
	No	9 (29.0)	22 (71.0)	
	No	52 (63.4)	30 (36.6)	

\*Chi-square test was used

The higher mental functions of the children under the study were as follows. 87.2% identified objects correctly and 96.5% identified people correctly. Number concept was present in 43 (50.0%), color concept in 38 (76.0%) and function concept in 58 (67.4%). The relationship of higher mental function of the children under this study and the status of initiation of schooling is given in Table 5. Some of the primitive reflexes were persistent in a few children. Sucking reflex and snout reflex were present in 11 (12.8%) children each. Other reflexes maintained were grasp reflex in seven (8.1%), palmomental and glabellar reflexes in four (4.7%) each Table 6.

After bi-variate analysis ability to walk independently, ability of verbal communication, early attainment of almost all developmental milestones and presence of almost all higher mental functions were seen to be significant factors for school enrollment. But factors like presence of drooling, urinary incontinence, mental retardation and persistence primitive reflexes down played school enrollment.

After binary logistic regression three factors, were found to be independently associated with the initiation of

**Table 4: Developmental milestones and schooling among children with cerebral palsy**

Study variable	Yes/No	Schooling present (%)	No schooling (%)	P
Head control before 2 years	Yes	48 (65.8)	25 (34.2)	0.017
	No	4 (30.8)	9 (69.2)	
Grasp attained before 2 years	Yes	45 (70.3)	19 (29.7)	0.001
	No	7 (31.8)	15 (68.2)	
Transfer of object attained before 2.5 years	Yes	44 (73.3)	16 (26.7)	<0.001
	No	8 (30.8)	18 (69.2)	
Sit with balance attained before 2.5 years	Yes	45 (68.2)	21 (31.8)	0.008
	No	7 (35.0)	13 (65.0)	

\*Chi-square test was used

**Table 5: Higher mental function and schooling among children with cerebral palsy**

Study variable	Yes/No	Schooling present (%)	No schooling (%)	P
Identification of objects	Yes	51 (68.0)	24 (32.0)	<0.001
	No	1 (9.1)	10 (90.9)	
Identification of persons	Yes	52 (62.7)	31 (37.3)	0.029
	No	0	3	
Number concept	Yes	35 (81.4)	8 (18.6)	<0.001
	No	17 (39.5)	26 (60.5)	
Color concept	Yes	33 (80.5)	8 (19.5)	<0.001
	No	19 (42.2)	26 (57.8)	
Function concept	Yes	45 (77.6)	13 (22.4)	<0.001
	No	7 (25.0)	21 (75.0)	

\*Chi-square test was used

**Table 6: Persistence of primitive reflexes and schooling among children with cerebral palsy**

Study variable	Yes/No	Schooling present (%)	No schooling (%)	P
Sucking reflex	Yes	1 (9.1)	10 (90.9)	<0.001
	No	51 (68.0)	24 (32.0)	
Snout reflex	Yes	1 (9.1)	10 (90.9)	<0.001
	No	51 (68.0)	24 (32.0)	
Grasp reflex	Yes	1 (14.3)	6 (85.7)	0.009
	No	51 (64.6)	28 (35.4)	
Palmomentary reflex	Yes	0	4	0.011
	No	52 (63.4)	30 (36.6)	
Glabellar tap	Yes	0	4	0.011
	No	52 (63.4)	30 (36.6)	

\*Chi-square test was used

formal education in cerebral palsy. Ability of a child to speak in sentences ( $P = 0.008$ ) and ambulatory level of the child ( $P = 0.019$ ) were factors which favored enrollment for any form of formal education, but delay in attaining the adaptive developmental milestone of transferring objects from one hand to another ( $P = 0.014$ ) was found to be detrimental for school enrollment. These three factors could explain more than one third of the variability in the regression model ( $R^2$  value of 0.34).

## Discussion

The pattern of most of the clinical and epidemiological features CP recognized by the present study is in concordance with the studies reported from elsewhere. There are reports available in literature which state that diplegia is the commonest limb abnormality in CP as found in the current paper.<sup>[11]</sup> Presence of primitive oral reflexes are well documented in CP and one of such studies identified these reflexes among 15 children among a sample size of 60 (25%),<sup>[12]</sup> but the proportion of children with primitive reflexes according to the current study is only half of the above mentioned study. Primitive reflexes are more prominent and persist longer in dyskinetic CP.<sup>[13]</sup> Majority of children in this study have spastic diplegia (60%), this may be the reason for lower proportion of primitive reflexes when compared to the other study. Physical ability of the children in the current study is in par with that of a reported study from Japan.<sup>[14]</sup> Spastic diplegia was the most common type of weakness in CP according to both the papers and more than 40% of the study population could walk without support in both the studies.

A study reported from Shiga, Japan showed that 99% of the children had exposure to schooling,<sup>[15]</sup> even though more than two third of the study population is mentally retarded.<sup>[13]</sup> But in our setting, less than two third of the

children are exposed to some kind of education, even with the proportion of mental retardation (23.3%) is much less than that in Japan. This could be attributed to the social structures and technologies available in a developed country like Japan in comparison to the setting of our study. The social system in resource poor setting is often fail to ensure education to the disadvantaged and marginalized children as that of those suffering from CP. The quality of education delivered to these children was also much different in both the setting. According to the Japanese study 53% of the children entered an elementary school, 41% a special school, and 5% entered a protective institution,<sup>[15]</sup> but most of the children in our setting were using the services of Anganwadies. Anganwadies are the outreach centres of integrated child development scheme (ICDS) where an Anganwadi worker is available to give supplementary feeding and pre-school non formal education to the children.<sup>[16]</sup> The education related services provided in Anganwadies are non-formal pre-school education to the children from the local community of 3-6 year age group. The worker is not specially trained to deliver education and related services to children who need a special attention. This information is particularly important in the context that, there is evidence that elementary schooling can improve the motor functions and learning skills of a child with CP.<sup>[17]</sup> The children in our setting is often denied of such services.

Education is considered one of the most important attribute of one's standard of living and it is an integral component of all indices related to human development. It is absolutely important to provide education to children who are challenged physically and mentally. According to the multivariate model in this study it is evident that the ability to move and communicate is extremely important for a child to start education. It is interesting to see that in the developed world even mental retardation is not a factor which abstain children from achieving minimal educational standards. In our setting only the children who can move and communicate well receive some kind of education and it is also not comparable to the former setting in terms of quality. So we have to focus mainly in two aspects, first is the strategies to improve the motor skills and language skills of the children with CP even from very young age, so that it may enable the child to seek some kind of education. We also have to build a social system that will help these children enable themselves irrespective of their physical disabilities. Both these entities demand special training of care takers in the family, teachers and community workers. Their empowerment will help the children attain. Early improvement in language and motor skills will improve the school going percentage of these differently abled children.



In short, 60.5% children with cerebral palsy in the current study were undergoing formal education and early achievement of physical, cognitive and language milestones was found to be important in determining school enrollment. Persistence of primitive reflexes detains them from the same. Prudent measures should be adopted at family and community levels to aid the development of these children. This helps them to achieve superior educational standards and rehabilitate better and can pave way for a better quality life.

### Limitations

The inclusion of young children (age group of 3-5 years) may be one of the reasons for the perceived lower proportion of schooling. But it should be noted that the network of institutions for informal education (Anganwadi) available in India cater children of 3-6 year age group. In fact the schooling should start early for these children to develop their potentials. The co-morbidities including seizure disorders might have contributed to the failure to schooling which is not included in the analysis.

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**How to cite this article:** Anish TS, Ramachandran R, Sivaram P, Mohandas S, Sasidharan A, Sreelakshmi PR. Elementary school enrolment and its determinants among children with cerebral palsy in Thiruvananthapuram district, Kerala, India. *J Neurosci Rural Pract* 2013, 4(Suppl 1):s40-4.  
**Source of Support:** Nil. **Conflict of Interest:** None declared.