

Original Article

Determinants of cerebral palsy among under-5 children

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Abstract

Cerebral palsy (CP) is one of the leading causes of childhood disability worldwide, with the greatest burden found in the developing countries of the world. This hospital based case-control study was conducted from January 2010 to June 2010 to find out the determinants of cerebral palsy among under-5 children. The study was conducted among 76 diagnosed cerebral palsy cases with 76 children considered as control group from the same institute. Study suggested that, children with male sex were four times more likely to have cerebral palsy than the female child. There were more than 2.5 times more chance of developing cerebral palsy among the parents who had consanguineous marriage. In case of home delivery there were 2.25 times more chance of developing cerebral palsy than those had the hospital delivery. Among the mothers of the cases who were suffering from problem during delivery, 47.5% had prolong labour during delivery, 25.0% had premature rupture of membrane and 20.0% had breech presentation. There were 33 times more risk of developing cerebral palsy among the premature baby than the term birth. There were 12.5 times more chance of developing cerebral palsy among the low birth weight child than the of normal weight child. This study concluded that, greater knowledge and understanding on cerebral palsy is required to enhance decision-making processes about the affected children.

Key words: Cerebral palsy, low birth weight, post natal infection

Introduction

Cerebral palsy (CP) is the most common and costly form of chronic motor disability that begins in the early childhood.^{1,2} 'Cerebral' refers to the brain and 'palsy' means weakness or lack of muscle control.³ In the 1860s, an English surgeon William Little first noticed this puzzling disorder that struck children in the first years of life causing stiff, spastic muscles in their legs and, to a lesser degree, in their arms & the disease was known as Little's disease for many years.

Cerebral Palsy (CP), used to describe a group of disorders affecting body movement and muscle co-ordination, is a "non-progressive" but not unchanging disorder of movement and/or posture, due to an insult to or anomaly of the developing brain. Development of the brain starts in early pregnancy and continues until about age three. Damage to the brain during this time may result in cerebral palsy.⁴

The exact causes of most cases of CP are unknown, but many are the result of problems during pregnancy in which the brain is either damaged or doesn't develop normally. This can be due to infections, maternal health problems, or something else that interferes with normal brain development. Problems during labor and delivery can cause CP in some cases.⁵

Certain risk factors make it more likely that a baby will develop cerebral palsy. However, most babies with one of these risk factors do not develop cerebral palsy. Premature babies may suffer from bleeding in the brain, which can damage delicate brain tissue, or develop periventricular leukomalacia, destruction of nerves around the fluid-filled cavities (ventricles) in the brain.⁶ Infections during pregnancy e.g. rubella, cytomegalovirus, herpes and toxoplasmosis can cause brain damage and result in cerebral palsy. Maternal infections involving the placental membranes (chorioamnionitis) may contribute to cerebral palsy in full-term as well as premature babies. Insufficient oxygen reaching the fetus may occur when the placenta is not functioning properly or it tears away from the wall of the uterus before delivery. Until recently, it was widely believed that asphyxia during a difficult delivery was the cause of most cases of cerebral palsy. Studies now show that birth complications, including asphyxia, contribute to only 5 to 10 percent of cases of cerebral palsy.

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Severe Jaundice can pose a risk of permanent brain damage, resulting in athetoid cerebral palsy. Certain blood diseases, such as rhesus incompatibility, can cause severe jaundice and brain damage, resulting in cerebral palsy.⁶

This study was conducted to find out the determinants of cerebral palsy among under-5 children by associating birth weight, preterm delivery, antenatal checkup, perinatal & postnatal illness and socioeconomic condition with cerebral palsy.

Methods

This study was conducted at the outpatient department of the neurology unit, Dhaka Shishu Hospital, Dhaka from January 2010 to June 2010. Consecutive 76 children of 7 months to 5 years old with cerebral palsy diagnosed by the consultant neurologist were enrolled for the study. Controls were matched by age and sex of same age group not having cerebral palsy or other developmental disorder. Birth weight, history of preterm delivery, records of antenatal checkup, history of perinatal & postnatal illness and socioeconomic condition were noted and analysed. Data was collected purposively by face to face interview through a pre-tested semi structured questionnaire. Written informed consent was obtained from each of the child’s parent/guardian and the study protocol was approved by the institutional ethical committee.

Results

There was no significant differences between cases and controls ($t=1.320$; $p=0.189$). On an average both cases (27.93 ± 17.502) and controls (24.33 ± 16.136) were of similar ages. In both cases and controls, mothers were within 21-30 age groups. Significant numbers belonged to younger age groups in cases and there was no significant age difference between cases and controls ($t=.636$; $p=.526$). Most of the cases lived in semi pacca (43.4%) house, where greatest numbers of controls lived in pacca house (44.7%). There was a statistically significant association between the housing condition and developing cerebral palsy ($\chi^2= 31.386$, $df=4$, $p<.000$).

Children with male sex were four times more likely to have cerebral palsy than the female child. (OR=3.986; 95% CI : 1.913-8.306). In three fourth of the cases, mothers were married below 18 years of age, that is, there was three times more risk of developing cerebral palsy among the mothers whose age at marriage was below 18 years(OR=3.162; 95% CI : 1.591-6.285). There was more than two and half times more chance of developing cerebral palsy among the parents who had consanguineous marriage (OR=2.634; 95% CI: .954-7.274). A strong relationship was observed between antenatal checkup and developing cerebral palsy ($\chi^2=13.982$, $df=1$, $p<.000$). (Table-I)

Table 1: Pregnancy related factors of cerebral palsy

Factor	CP	Control	ODDs Ratio	P*
Consanguinity	14	6	2.634	ns
Twin pregnancy	3	1	3.082	ns
Ante natal checkup	29	52	0.285	sig
Problem at gestational period	8	12	0.627	ns

Three fourth (75.0%) of the cases had home delivery in respect to three fifth (59.2%) of the control had the same. In case of home delivery there was 2.25 (OR=2.220; 95% CI:1.103-4.467) more chance of developing cerebral palsy than those who had the hospital delivery. There was a statistically significant relationship between the delivery problem and cerebral palsy ($\chi^2= 15.072$, $df=1$, $p<.000$). Half of them had prolong labour during delivery (47.5%), 25.0% of them had premature rupture of membrane & 20% had breech presentation. There was a strong relation between the gestational age and developing cerebral palsy which was statistically highly significant ($\chi^2= 68.100$, $df=1$, $p<.000$). It also showed that there was 33 times more risk of developing cerebral palsy among the premature baby than the term birth. (Figure-1&Table II)

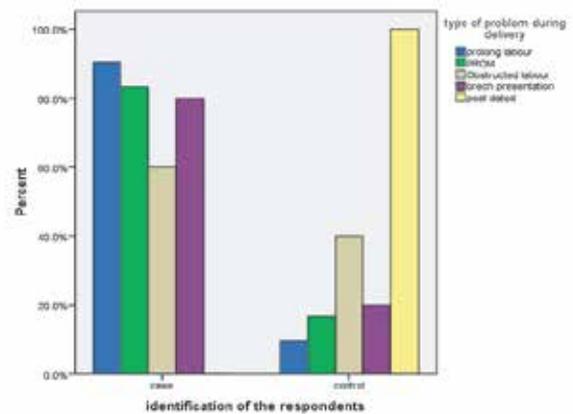


Figure-1: Distribution of the respondents by the type of problem during delivery

Table II: Delivery related factors of cerebral palsy

Factor	CP	Control	ODDs Ratio	P*
Place of delivery				
Home	57	45		
Hospital	19	11	.220	Sig.
Problem during delivery	39	16	3.953	sig
Delivery before 37 weeks of pregnancy	56	6	32.667	Sig.

Distribution of the birth weight was categorized in to two groups. Those who were below 2.5 kg were categorized as low birth weight and more than 2.5 kg babies were termed as normal weight baby. It showed statistically significant relationship between the birth weight and developing cerebral palsy. ($X^2 = 43.195$, $df=1$, $p<.000$). Odds ratio shows that there was twelve and half times more chance of developing cerebral palsy among the low birth weight child than that of normal weight child ($OR=12.222$; 95% CI [5.447-27.226]). Majority of the child had delayed crying (80.3%) & it was almost fourth fifth of the total cases. Delayed crying had relationship with developing cerebral palsy ($X^2 = 68.745$, $df=1$, $p<.000$).

There were thirty four times more chance of developing cerebral palsy among those had the perinatal problem than who had not the problem during that period ($OR=34.279$; 95% CI [13.279-88.133]). There was a statistically significant relationship between the postnatal problem of the child and cerebral palsy ($X^2 = 76.917$, $df=1$, $p<.000$). It showed fifty four times more chance of developing cerebral palsy among those who had the postnatal problem than who had not the problem during that period ($OR=54.000$; 95% CI [17.395-167.638]). (Table-III)

Table III: Delivery related factors of cerebral palsy

Factor	CP	Control	OR	P*
Low birth weight	54	21	12.222	Sig.
Delayed crying	15	66	.037	Sig.
Problems during postnatal period	57	4	54.001	Sig.

Discussion

In this study both cases and controls were homogenous. Males were four times more likely to have cerebral palsy

than the female child, $OR=3.986$; 95% CI : 1.913-8.306.

Cerebral palsy (CP) is more common in males than in females, but the reasons for this disparity are uncertain.⁷ A study conducted by N Sathiakumar and A M Yakubu shows that CP was more common in boys.⁸

In a view to find the socio economic association with cerebral palsy, different socio-economic indicators were analyzed in this study. In terms of residence, a statistically significant association was found with the residential status and cerebral palsy ($X^2 = 33.576$, $df=3$, $p<.000$). It also showed an association between the housing condition and developing cerebral palsy ($X^2 = 31.386$, $df=4$, $p<.000$). Chi square tests suggests a statistically significant association between the monthly income and developing cerebral palsy ($X^2 = 19.120$, $df=2$, $p<.000$).

CP is found across all socioeconomic classes. There was a clear association between CP and socioeconomic status. There was a linear association between the incidence of CP, major perinatal indicators and the socio-economic status of the household of the mother ($p < 0.001$). But there is a controversy regarding the existence of a socio-economic gradient for cerebral palsy according to literature.⁹

There were more than two and half times more chance of developing cerebral palsy among the parents who had consanguineous marriage ($OR=2.634$; 95% CI : .954-7.274). Consanguineous marriage was top-ranked risk factors that were determined in Turkish children with CP as compared with other countries.¹⁰ Other authors studied 103 Saudi children with CP and compared their antecedent factors with those of a control group. The major risk factors identified were a history of CP in a sibling and consanguinity of the parents.¹¹

There is increasing evidence that cerebral palsy (CP) in

developed countries results mainly from antenatal factors. A strong relationship was found between antenatal checkup and developing cerebral palsy ($\chi^2 = 13.482$, $df=1$, $p<.000$). There is an association between quality of intrapartum care and death. The contribution of adverse antenatal factors in the origin of cerebral palsy needs further study.¹² Results suggest that antenatal factors play a major role in the pathogenesis of CP in Saudi Arabia.¹¹ Antenatal infections marginally increased the risk of CP.¹³ The risk of cerebral palsy among term breech presentation infants does not seem to be related to mode of delivery, but is more likely linked to a higher rate of being small for gestational age in breech infants.¹⁴

There was a strong relation between the gestational age and developing cerebral palsy. ($\chi^2 = 68.110$, $df=1$, $p<.000$). It also showed that there thirty three times more risk of developing cerebral palsy among the premature baby than the term birth (OR=32.667; 95% CI : 12.289-88.834). The main factors associated with CP, identified by multivariate analysis, being small for gestational age (SGA).¹⁵ Preterm infants are at 8 times higher risk than term infants for pre- and perinatal brain damage, resulting in cerebral palsy. The influence of prenatal and birth-related risk factors on cerebral palsy in preterm infants is investigated in a register-based study & statistically significant higher rates in cases were found.¹⁶ To investigate risk factors for cerebral palsy in relation to gestational age three case-control studies within a geographically defined cohort was done by the former Oxfordshire health authority. The apparent reduced risk of cerebral palsy associated with very preterm infants is driven by the characteristics of the gestation matched control group.¹⁷

In this study, there was a relationship between the birth weight and developing cerebral palsy. ($\chi^2 = 43.195$, $df=1$, $p<.000$). Odds ratio shows that there were twelve and half times more chance of developing cerebral palsy among the low birth weight child than the of normal weight child (OR=12.222; 95% CI 5.447-27.226). Birth weight is an extremely powerful predictor of an individual baby's survival. In general, the lower the weight, the higher a baby's risk of infant mortality.¹⁸ A population-based cross-sectional study of cerebral palsy was carried out and found that the rate of CP was more than 70 times higher compared with those weighing 2500g or more at birth.¹⁹ The commonest risk factor amongst cases was low birth weight (28.8%).

In this study it was found that there were thirty four times more chance of developing cerebral palsy among those had the perinatal problem than who had not the problem

during that period (OR = 34.279; 95% CI 13.279 - 88.133). A longitudinal study was carried out in Nigeria found that leading causes of CP were birth asphyxia (39.0%), bilirubin encephalopathy (24.4%) and post infectious brain damage (18.3%). By the end of 1 year, 61 (74.4%) had defaulted from follow up, 11 (13.4%) had died and only 21 (25.6%) were still receiving rehabilitative care.²⁰

Until recently, many publications have supported the hypothesis that asphyxia at birth was the major cause of cerebral palsy. In 1993 and 1994, several publications showed that there is a significant relationship between asphyxia and cerebral palsy, but that the role of asphyxia was overestimated in the past.²¹ The incidence of cerebral palsy is 1 per 1,000, whereas the proportion caused by perinatal asphyxia is only 8% to 10%.²²

Delayed crying had relationship with developing cerebral palsy. It was statistically proved in this study by the chi square test ($\chi^2 = 68.745$, $df=1$, $p<.000$). Evidence suggests that 70-80% of CP cases are due to prenatal factors and that birth asphyxia plays a relatively minor role (<10%).²³ Evidence available in early 2006 indicates that asphyxial birth is a minor cause of CP and not a substantial contributor to other neurologic disability in children without CP.²⁴

There was a significant relationship between the postnatal problem of the child and cerebral palsy ($\chi^2 = 76.917$, $df=1$, $p<.000$). Also there were fifty four times more chance of developing cerebral palsy among those had the postnatal problem than who had not the problem during that period (OR=54.001; 95% CI 17.395-167.638). Severe infections, especially meningitis or encephalitis, can also lead to brain damage in this age group. Either of these infections can cause disabilities ranging from hearing loss to CP and severe retardation.²⁶

Further investigations are needed to confirm our findings in more number of study populations and to identify the mechanisms that explain the considerable residual socio-economic variation. There is an association between quality of intrapartum care and death. Recent evidence, which suggests that cerebral palsy has predominantly prenatal etiology. The findings also suggest an association between suboptimal care and cerebral palsy, but this seems to have a role in only a small proportion of all cases of cerebral palsy. The contribution of adverse antenatal factors in the origin of cerebral palsy needs further study. Several studies concluded that children with CP need greater knowledge and understanding to enhance decision-making processes about their health.

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