Risk Factors & Clinical Patterns of Cerebral Palsy in Children Welfare Teaching Hospital in Baghdad

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ABSTRACT:

BACKGROUND:

Cerebral palsy (CP) is a disorder of posture , movement & tone due to a static encephalopathy acquired during brain growth in fetal life, infancy or early childhood.

OBJECTIVE:

To identify the risk factors of CP & its clinical patterns.

PATIENTS AND METHODS:

This case control study was done from the 1st of January 2009 to the end of September 2009, on 100 patients with CP who attended the neurology clinic or have been admitted to the neurology ward in Children Welfare Teaching Hospital in Medical City complex, Baghdad. For comparative purposes,100 control individuals matched for sex & age were selected. Some of those patients were referred to pediatric clinic & registered with a diagnosis of CP & some of them were brought by the parents or caregivers without referral for various complaints, then we reviewed their full history & examination (mainly neurological) to confirm the diagnosis of CP. A specially designed questionnaire form was used .

RESULTS:

Out of 100 patients with cerebral palsy, male:female ratio was (1.3:1), 89% of the patients were born at term whereas 11% were preterm. Those patients were found to have history of normal vaginal delivery in 70%, with one patient only delivered by assisted delivery, while 29% of them delivered by caesarean section mode of delivery. History of intrauterine growth retardation found in 21% patients, 4% were twin. The mothers of those patients had history of pre-eclampsia in 8% of the cases, regular antenatal care in 65%, history of antipartum haemorrhage in 4%, premature rupture of membrane in 13%. Abnormal presentation was found in 8%, cord prolapse in 4%, neonatal jaundice in 62%, neonatal seizure in 8%, history of head trauma in 4% & history of central nervous system infection in 20%. Spastic CP was the commonest type (67%), while mixed and atonic CP were the least type (1% for each). Quadriplegic CP was the commonest topographical subtype (56%). Delayed social milestone was found in 46% , speech difficulty in 94% , deafness in 2% , ocular problem in 29% , seizure in 58% & all of them had delayed milestone & weakness.

CONCLUSION:

Neonatal convulsion, neonatal jaundice, neonatal infection, antepartum hemorrhage & head trauma are significant risk factors for cerebral palsy while precipitate labour, caesarean section, twins, toxemia, breech delivery, low birth weight & cord prolapse were not found to be significantly associated with cerebral palsy. The most common clinical pattern of CP was spastic quadriplegic CP.

KEY WORDS: cerebral palsy, risk factors , clinical types

INTRODUCTION:

Cerebral palsy (CP) is a non progressive disorder of developing brain. It is a disorder of posture, movement & tone due to a static encephalopathy acquired during brain growth in fetal life, infancy or early childhood [1] . The new recognition that the neurologic features of CP often change or progress over time [2]. The Prevalence of Cerebral Palsy is between 1.0 and 2.4 per 1000 live births, has not diminished in recent decades despite advances in obstetric and neonatal care [3]. The initiating event can take place anytime between prenatal development and age 3 years [4]. Cerebral palsy has traditionally been classified on the basis of the type of motor

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disorder(First classification) [5] in to spastic, dyskinetic, ataxic, dystonic, atonic & mixed types. Spastic CP represents 70-80% of cerebral palsy. Second Classification [6] is called topographic predominance which classifies CP into Quadriplegia, Diplegia, Hemiplegia, Monoplegia, Double hemiplegia [7] & Triplegia. Third classification is (Functional classification systems) [8] that divides patients in to mild, moderate and severe types. Fourth Classification is (Etiologic Classification & Risk Factor) [9]. In this classification the majority of children with cerebral palsy are born with it , although it may not be detected until months or years later. This is called congenital CP , while a small number of children have acquired cerebral palsy. Maternal and prenatal risk factors statistically correlate with CP [8] include Maternal mental retardation, maternal thyroid disorder, especially iodine deficiency, maternal seizure disorder, intrauterine infection [4], blood type incompatibility [9], teen ager mother [10], incompetent cervix[10], polyhydramnios [8], multiple gestation[8], exposure to high levels of lead during pregnancy contributes to disability [11], maternal antibiotics [12]. Perinatal factors include prematurity[8], chorioamnionitis , birth weight less than 2500 g [9], growth retardation [9], non-vertex and face presentation of the fetus [8], birth asphyxia (10%) [8]. Postnatal factors that may contribute to CP include Infections (eg, meningitis, encephalitis), intracranial haemorrhage, periventricular leukomalacia, hypoxia-ischemia (eg from meconium aspiration), kernicterus, seizure, neonatal pneumothorax, sepsis, transfusion[13], brain injuries **[14]** and coagulopathy [9]. About 80% of CP cases are of unknown etiology [15]. Problems associated with CP include: [15] Musculoskeletal , (intellectual, speech, visual & hearing) impairment, feeding and nutrition, urogenital impairment, spinal deformities, teeth problems &epilepsy. Children with cerebral palsy exhibit a wide variety of symptoms including lack of muscle coordination when performing voluntary movements (ataxia), stiff muscles and exaggerated reflexes, walking with one foot or leg dragging , waling on the toe, excessive drooling or difficulties in swallowing and shaking or random involuntary movements [9]. There are no definitive lab studies for diagnosing cerebral palsy [4], only studies to rule out other symptoms causes like thyroid studies , lactate & pyruvate levels , organic and amino acids and chromosomes [4]. Neuroimaging methods help to identify patients who are likely to be at risk. These include ultrasound [16], CT Scan & MRI Brain[17] to identify causes like congenital malformations. Diffusion Tensor Magnetic imaging (DTI) and Fiber Tactography (FT) are new methods that can demonstrate the orientation and integrity of white matter fibres in vivo, but their clinical application are still under investigation [18]. There is no standard therapy that works for every individual with CP [9]. A multidisciplinary team (physician, orthopedist, ophthalmologist, psychotherapist, social worker, speech & language specialist) will work with a child and his/her parents to identify specific impairments and needs [9,19]. Drugs can be used to control seizures, relax muscles (botulinum toxin [20], phenol [4,21], Baclofen [1] and others) and alleviate pain. Treatment with stem cell transplantation is not yet available in the UK but a hospital in China has made a breakthrough in treating cerebral palsy[22,23]. Some studies have suggested that cell therapy is an effective, safe, and immunologically justified method of therapy for patients with cerebral palsy [24].

PATIENTS & METHODS:

A hospital – based prospective case control study was done from1st of January 2009 to end of September 2009 on a 100 patients with CP who attended the neurology clinic or have been admitted to the neurology ward in children Welfare Teaching Hospital in medical city complex, Baghdad. In the study, CP was defined as a non progressive, but changeable disorder that affect motor function with various presentations & clinical findings on examination. Some of those patients were referred to pediatric clinic & registered with a diagnosis of CP & some of them were brought by the parents or caregivers without referral for various complaints, then we reviewed their full history & examination (mainly neurological) to confirm the diagnosis of CP. For comparative purposes, 100 control individuals matched for sex & age were selected from children presented to the general pediatric clinics that did not have symptoms of CP & were not taking any medications. A specially designed questionnaire form was used to aid the investigators in performing the personal interview. Name, age, sex & residence were recorded. Informations about prenatal period were inquired such as prematurity, low birth weight [as long as most of the patients lack a medical card (discharging card) & there is no way to get an access to their hospital medical records, so body weight were obtained from the caregivers (especially parents) who may give us

exact or rough figures] , signs of infection during pregnancy , maternal medical problems, severe toxemia, bleeding in the 3rd trimester, multiple pregnancy & congenital malformations. Informations about perinatal period like prolonged or difficult labour, premature rupture of membrane, malpresentation ,cord prolapse and vaginal bleeding were recorded. Postnatal factors like CNS infection, hypoxia, seizure, coagulopathies, neonatal hyperbilirubinaemia & head trauma were inquired for. Also the questionnaire involved questions about mode of presentation at the age of onset. They were sent to the orthopedist, ophthalmologist, audiologist, speech therapist, dentist…. etc in specialist centers in the medical city complex to look for associated problems such as (ocular, ear, orthopaedic, speech, dental problems & feeding difficulty and others). The patients were classified on the basis of the type of motor disorder into spastic, dyskinetic, ataxic, mixed & atonic types of CP. All patients were sent to laboratory tests such as CBC, RFT, neuroimaging studies as CT-brain or MRI (if available). Neuroimaging studies were not done if the patients had already done them before presentation & if they were useful to diagnose the definitive cause. If the history & examination were suggestive , laboratory tests such as TORCH and urine & serum chromatography (if available) were done. EEG was sent for if there is history suggestive of seizure. Statistical analysis was done by the use of Chi-square test and a *P*-value ≤ 0.05 was considered statistically significant.

RESULTS:

Of the 100 patient with CP 57(57%) were male & 43(43%) were female with the male:female 1.3:1. The distribution of the study sample regarding types of CP were 56% quadriplegic CP, 16% atonic CP, 14% spastic diplegic CP, 10% hemiplegic CP, 2% dyskinetic CP, 1% ataxic and 1% mixed as shown in Table(1). Patients with CP who were born at term were 89(89%) comparing to 97(97%) children in the control group, while those who were born at preterm were 11(11%) compared to 3(3%) children in the control group as shown in Figure (1). The patients who were born to mothers aged < 20 years were 6 patients in comparison to the control group who were 7%. 75% of the patients were born to mothers aged between 20-35 years in comparison to the control group who were 78(78%). Those who were born to mothers aged > 35 years were 19 patients (19%) in comparison to the control group who were 15(15%). Those patients whose mothers were illiterate represent 32% of the sample in comparison to those in the control group who were 14%. While those who were born to primary school educated mothers were 32(32%) in comparison to those in the control group who were 47(47%). Those who were born to secondary school educated mothers were 27(27%) in comparison to those in the control group who were 32(32%). 9% of patients with cerebral palsy had university educated mothers in comparison to 7% in the control group. Regarding paternal education , 26% had illiterate fathers in comparison to 18% in the control group , 38% had primary school educated fathers compared to 29% in the control group , 20% had secondary school educated fathers in comparison to 43% in the control group and 16% had university educated fathers compared to 10% in the control group. Table(2) shows that history of IUGR was found in 21% of patients in comparison to 7% in the control group with significant *P* value of 0.004. History of antepartum hemorrhage was found in 4% of the patients with CP compared to no patients in the control group with significant *P* value of 0.043. Mothers with regular antenatal care was found in 65% in the CP patients group compared to 90% in the control group. Other prenatal factors like multiple pregnancy , maternal epilepsy, pre-eclampsia, maternal hyperthyroidism and maternal diabetes mellitus were found to have insignificant relationship to the development of cerebral palsy. This study found that mothers of 13(13%) patients with cerebral palsy had history of premature rupture of membrane compared to only 1% in the control group with significant *P* value of 0.001 as shown in Table (3). history of abnormal presentation was found in 8(8%) patients in comparison to one in the control group with significant P value (0.017), while no significant relationship was found between cord prolapse and development of CP. History of head trauma was found in 4(4%) patients with CP but none in the control group with significant P value (0.043) as shown in Table (4). Neonatal seizure found in 8 patients and in 1 patient in the CP group and control group respectively with significant P value of 0.017. History of central nervous system infection was found in 20 CP patients and non in the control group with significant P value of 0 . This study showed no significant relationship between Kernicterus and development of CP. 70 patients were the product of normal vaginal delivery , in which one only had assisted delivery

(forceps) , the other 29 patients were products of cesarean section (13% of them were elective procedure and 16% were emergency ones). Dysmorphology was detected in 20 patients, speech disorders in 94, microcephaly in 58, delayed social milestone in 46, growth retardation in 26, squint in 23, nystagmus in 6 and deafness in 2 patients as shown in Table (5). Fit developed in 58(58%) patients with CP, 22(38%) had EEG study which were normal in 3(5%) and abnormal in 19(36%) patients. Antiepileptic drugs were received in 44(75.9%) CP patients with seizure. Physiotherapy was performed in 45% of patients with CP while muscle relaxants were used in 19% of them.

Table 1:Types of CP (functional &topographic).

Types	Observed No.
Spastic quadriplegia	56
Atonic	16
mixed	1
Spastic diplegia	14
Spastic hemiplegia	10
dyskinetic	2
Ataxic	1
Total	100

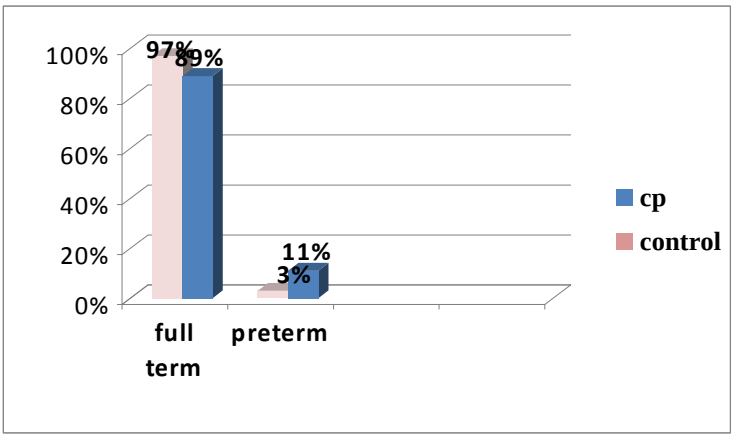

Figure 1: Gestational age of patients with cerebral palsy.

Table 2: Prenatal Risk Factors of CP.

Character	CP	Control	P Value
Antenatal care	65	90	0.001
Intrauterine growth retardation	21	7	0.004
Multiple pregnancy	4	2	0.407
Maternal epilepsy	2	0	0.155
Pre-eclampsia	8	9	0.8
Antepartum hemorrhage	4	0	0.043
Maternal hyperthyroidism	0	0	
Maternal diabetes mellitus	0	0	

Table 3: Perinatal Risk Factors of CP.

Character	CP	Control	P value
Premature rupture of membrane	13	1	0.001
Abnormal Presentation	8	1	0.017
Cord Prolapse	4	1	0.174

Table 4: Postnatal Risk Factors of CP.

Character	CP	Control	P Value
Head Trauma	4	0	0.043
kernicterus	62	12	0
Neonatal Seizure	8	1	0.017
Central nervous systme Infection	20	0	0

Table 5 : Associated problems in patients with Cp

Character	Yes
Speech disorders	94
microcephaly	58
Delayed social milestone	46
Growth retardation	26
squint	23
Dysmorphic feature	20
nystagmus	6
deafness	2
Big head	0

DISCUSSION:

In this study 57% of CP patients were male & 43% were female with male:female ratio of (1.3:1). This is in agree to the previous study of Lukman[25] 2007 & is nearly similar to that found by Erkin G. et al.[26] 2008 which showed 59.2% male & 40.8% female with a ratio (1.4:1). It is obvious that according to functional classification , the majority of patients (67%) had spastic type of CP with different distribution according to topographic classification. This is similar to the findings of Sahu Suvanand et al.[27] 1997& Erkin G. et al.[26] 2008 , who found that the majority(88%,88.3%) of respectively were spastic in nature.

Regarding topographic distribution , this study's findings agree with Sahu Suvanand et al.[27]1997 which showed that 86.4% of patients had spastic quadriplegic CP, but not with Erkin G. et al.[26] 2008 who found that 47.8% of the cases had spastic diplegic CP & 12.8% spastic hemiplegic CP. This finding may be related to smaller sample size & shorter duration of study which limit the ability to detect the differences in this study. This study showed that the majority (89%) of patients presented with cerebral palsy born at term. This result is similar to a study done by Oztürk A. et al.[28] 2007 in which 78% of patients were term & 22% were born at gestational age from (30-36) weeks. History of regular ANC recorded in 65% of mothers of patients with CP, this disagrees with Lukman's study [25] 2007 which found 35% of mothers of the patients with CP had regular antenatal care. Also we found that 21% of patients with CP had a history of intrauterine growth retardation, which is nearly similar to Lukman's study [25] 2007 which showed that 16 (20%) patients had history of intrauterine growth retardation. This percentage was higher in Oztürk .et al.[28] 2007 which showed 38.8% of patients with CP were born with low birth weight. This may be justified by lack of medical records which confirm presence or absence of intrauterine growth retardation , because in this study we obtained the history of birth weight from mothers & some of them did not give us specific figure but a rough assessment. This study showed that 4 patients with CP were twin with insignificant *P* value. This agrees with Sahu Suvanand et al.[27] 1997 which found that twin pregnancy was not a significant risk factor. Regarding maternal disorders during pregnancy, this study showed that mothers of 8 patients with CP had history of pre-eclampsia with insignificant *P* value, which agrees with Sahu Suvanand et al.[27] 1997 who found that toxaemia is not significantly associated with CP. Antepartum hemorrhage was found to be a significant risk factor which agrees with Sahu Suvanand et al.[27]1997. Gestational maternal diabetes mellitus was found to be a non significant risk factor for the development of CP in the siblings which agrees with Oztürk et al.[28] 2007. In this study we could not assess the association between intrauterine congenital infection & development of CP in the children because of lack of reliable serologic investigations in hospital's laboratories or private ones. Premature rupture of membrane was found have significant statistical association with the development of CP in the sibling which agrees with Oztürk et al.[28] 2007 who found that premature rupture of membrane were more common in mothers of children with cerebral palsy. History of abnormal presentation has a significant statistical association with development of CP and this disagrees with Sahu Suvanand et al.[27]1997 who couldn't find significant association between breech presentation & cerebral palsy. This study couldn't find an association between cord prolapse and development of CP which disagrees with Milsom I et al.[29] 2002 who found significant association between cord prolapse & the development of CP. This may be justified by lack of proper medical records & registration about birth process & its complications. In this study we could not assess the presence of birth asphyxia as a risk factor for CP because of lack of medical records & registration of birth process & its complications & we could not depend only on the history of the mother to determine it as a risk factor. kernicterus was found to be statistically significant risk factor for development of CP which is agreeable to Sahu Suvanand et al.[27] 1997. Neonatal seizure was found to be a significant risk factor & this is similar to studies done by Sahu Suvanand .et al.[27] 1997 & Oztürk .et al.[28] 2007. We found a significant association between central nervours system infection & the development of CP. This study showed that 4(4%) patients with CP had history of head trauma with a significant p value(0.04). This disagreed with Sahu Suvanand et al.[27]1997 who found that head trauma was not significantly associated with cerebral palsy. This may be justified by accuracy of obtaining medical history regarding head trauma in each study & severity of head injury. This study showed that 46% of the patients had social problems but we could not assess the percentage & the degree of severity of mental retardation because of unavailability of psychiatrist among the team that was receiving & managing patients with CP who help in the diagnosis & assessment of intellectual impairment & behavioural disorders. Also we found that 94% patients with CP had speech difficulty which disagrees with Andersen GL et al.[30] 2008 who found that children with no or severely impaired speech represented 28% of patients with CP. This difference could be related to the neglect of this disorder specifically& those patients generally by their family & the lack of rehabilitation centers including speech therapy rehabilitation. This study found that 2% of patients

with CP had deafness & this is similar to the percentage found in Andersen GL et al.[30] 2008 who found that 4% of those patients had deafness. We found that 29% of patients with CP involved in this study had ocular problem. This finding was higher than that found by Andersen GL et al.[30]2008 which was only 5% . seizures of different types and severity were recorded in 58% of the CP patients. This percentage was higher than the results found by Andersen GL et al.[30] 2008 which was 28% .

CONCLUSION:

Neonatal convulsion, neonatal jaundice, neonatal infection, antepartum hemorrhage & head trauma are significant risk factors for cerebral palsy while precipitate labour, caesarean section, twins, toxemia, breech delivery, low birth weight & cord prolapse were not found to be significantly associated with cerebral palsy. The most common clinical pattern of CP was spastic quadriplegic CP.

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