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ORIGINAL ARTICLE

CEREBRAL PALSY: ANTENATAL RISK FACTORS

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ABSTRACT: INTRODUCTION: Cerebral palsy (CP) is a group of permanent movement disorders that appear in early childhood. Cerebral palsy is caused by abnormal development or damage to the parts of the brain that control movement, balance, and posture. Most often the problems occur during pregnancy; however, they may also occur during childbirth, or shortly after birth. Often the cause is unknown. **AIM:** To study the different antenatal maternal risk factors associated with cerebral palsy in the study group. **MATERIALS AND METHODS:** Retrospective study was done to assess possible associated antenatal risk factors for cerebral palsy. Mothers of 100 cerebral palsy children were selected who are treated in Rani Chandramani Devi Hospital, a Government hospital in Visakhapatnam, Andhra Pradesh State, India, from 2012 to 2014 and 100 controls, mothers of normal children were studied. Detailed antenatal history was obtained from the mothers of the children in both affected and control group. **RESULTS:** From the data, we conclude that the association of maternal anaemia with cerebral palsy is 7.3 times higher; association of maternal hypertension with cerebral palsy is 6.6 time higher, association with Pre-eclampsia is 6 times higher; association with Eclampsia is 8.6 times higher; with antepartum haemorrhage, the association is 8.6 times higher and association of multiple pregnancy with cerebral palsy is 4.8 times higher than with controls. **CONCLUSION:** From this study of the role of antenatal risk factors, in the occurrence of cerebral palsy in children it is concluded that the most common risk factor associated with cerebral palsy is the maternal anaemia and the other important risk factors associated being hypertension, pre eclampsia, eclampsia, antepartum haemorrhage and multiple births.

KEYWORDS: Cerebral palsy, Antenatal maternal risk factors, Anaemia, Hypertension, Preeclampsia, Eclampsia, Antepartum haemorrhage, Multiple births, Identical twins, Dizygotic twins.

INTRODUCTION: Cerebral palsy is an important cause of crippling in children, the aetiology being not clear. 2 per every 1000 live born children develop cerebral palsy (CP). Cerebral palsy (CP) is a group of permanent movement disorders that appear in early childhood. Cerebral palsy is caused by abnormal development or damage to the parts of the brain that control movement, balance, and posture. Most often the problems occur during pregnancy; however, they may also occur during childbirth, or shortly after birth. Often the cause is unknown.

AIM: To study the different antenatal maternal risk factors associated with cerebral palsy in the study group.

MATERIALS AND METHODS: The study is a retrospective cohort study done by obtaining detailed antenatal history from the mothers of cerebral palsy children who were treated in Rani Chandramani Devi Hospital, a Government hospital in Visakhapatnam, Andhra Pradesh state, India. Patients who were affected by cerebral palsy and Post-polio residual paralysis were admitted in this hospital for

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corrective surgeries/Physiotherapy/Speech therapy. Retrospective study was done to assess possible associated antenatal risk factors for cerebral palsy. Detailed antenatal history was elicited from mothers of 100 cerebral palsy children (Case group) who were treated in this hospital from 2012 to 2014 and from mothers of 100 normal children (Control group) and analysed.

STATISTICS: In our study, the commonest maternal risk factor observed was anaemia. Other important risk factors observed were, hypertension, pre eclampsia, eclampsia, antepartum haemorrhage, multiple pregnancy. History of anaemia was elicited in 39 mothers of the 100 cerebral palsy children (Cases) but in only 8 mothers of the normal children (Controls) with an odds ratio of 7.352 with confidence intervals between 3.216 (Lower) and 16. 806 (Upper). History of hypertension was present in 12 cases and 2 controls with an estimated odds ratio of 6.681 with confidence intervals between 1.455 (Lower) and 30.685 (Upper). History of pre-eclampsia was present in 11 cases and 2 controls with an odds ratio estimate of 6.056 with confidence intervals between 1.306 (Lower) and 28.073 (Upper). History of eclampsia was present in 8 cases and in 1 control with odds ratio estimate of 8.608 with confidence intervals between 1.056 (Lower) and 70.172 (Upper). History of ante partum haemorrhage was present in 8 cases and 1 control with odds ratio estimate of 8.608 with confidence intervals between 1.056 (Lower) and 70.172 (Upper). History of multiple pregnancy was elicited in 9 cases and 2 controls with an estimated odds ratio of 4. 846 with confidence intervals between 1.019 (Lower) and 23.028 (Upper)

RESULTS: From the data, we conclude that the association of maternal anaemia with cerebral palsy is 7.3 times higher; association of maternal hypertension with cerebral palsy is 6.6 times higher, association with Pre-eclampsia is 6 times higher; association with Eclampsia is 8.6 times higher; with antepartum haemorrhage, the association is 8.6 times higher and association of multiple pregnancy with cerebral palsy is 4.8 times higher than with controls.

DISCUSSION: Cerebral palsy is an important cause of crippling in children, the aetiology being not clear. Evidence suggests that 70-80% of CP cases are due to prenatal factors. In maternal anemia,[1] the maternal oxygen uptake is low and oxygen delivery to the fetus is grossly affected, thereby increases the adverse pregnancy outcomes. Maternal hematological disorders directly affects oxygen transfer.

Iron deficiency anemia (IDA) is common in pregnancy and often related to malnutrition. IDA is associated with increased risk for IUGR and prematurity. Oxygen carrying capacity is also altered in hemoglobinopathies. Most severe form is sickle cell anemia which can cause vaso-occlusive crisis and hemolysis. This problem is caused by the abnormal sickle shape of the red blood cells with low oxygen tension. Patients with sickle cell disease are at higher risk for maternal and fetal complications. In a cross sectional analytic study conducted on fifty hospitalized pregnant women and their neonates over a year by Akhter S et al,[2] in Bangladesh, the authors concluded that Iron deficiency anemia (IDA) during pregnancy had significant adverse effect on the foetal outcome. In a study on 600 subjects, Baig SA et al,[3] concluded that low maternal weight, multiple previous pre term deliveries, periodontal diseases, maternal anaemia, physical and emotional stress are among the factors associated with the risk of preterm birth.

A woman is considered to have hypertension if her blood pressure is above 140/90. Chronic hypertension is the hypertension which develops before the woman becomes pregnant. The effects of

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chronic hypertension are intrauterine growth retardation in which nutrients and oxygen supply to the fetus through the placenta is reduced. Other adverse effects of hypertension on the fetus are preterm birth, and abruption of placenta, both of which are associated risk factors for cerebral palsy.

Pre-eclampsia is gestational hypertension with onset at >20 weeks' gestational age, proteinuria (>300 mg of protein in a 24-hour urine sample), systolic blood pressure >140 mmHg or diastolic blood pressure ≥90 mmHg, and disappearance of all these abnormalities before the end of the 6th week postpartum. When tonic clonic seizures appear in a pregnant woman with high blood pressure and proteinuria it is known as Eclampsia.

Pathophysiology of pre-eclampsia is complex.[4] In normal pregnancy, villous cytotrophoblast invades the myometrium, which involves a unique differentiation pathway. The spiral arteries lose their endothelium, muscle fibers and these changes makes the spiral arteries low resistance vessels. Defective invasion of the spiral arteries by cytotrophoblast cells is seen. The abnormalities are related to the nitric oxide pathway,[5] which controls vascular tone. Proper embryo implantation is affected by inhibition of maternal synthesis of nitric oxide. These defects cumulatively leads to chronic placental ischaemia and oxidative stress, in turn leading to intra uterine growth restriction. Oxidative stress leads to endothelial dysfunction, increased vascular hyperpermeability, and hypertension.

In the study by Kristin Melheim Strand et al,[6] on 849 children with cerebral palsy, concluded that exposure to pre-eclampsia was associated with an increased risk of cerebral palsy, and this association was mediated through the children being born preterm or small for gestational age, or both. Among children born at term, pre-eclampsia was a risk factor for cerebral palsy only when the children were small for gestational age. In the study by M. D. Jane E. Brazy et al,[7] comparison of data from 28 preterm infants born to hypertensive mothers with data from 28 gestational age-matched controls was done. All hypertensive mothers were treated intravenously with magnesium sulfate, and 79% received other antihypertensive agents. When compared to control infants, the infants of hypertensive mothers had a significantly higher incidence of somatic growth retardation, microcephaly, thrombocytopenia, leukopenia, neutropenia, low Apgar scores, delayed adaptation, patent ductus arteriosus, hypotonia, and gastrointestinal hypomotility. Magnesium sulfate, is used in the treatment in pre eclampsia for prevention of seizures. It has been shown to have a neuroprotective effect on the fetus. In the study by Lex W Doyle et al,[8] the authors concluded that antenatal magnesium sulphate therapy in women at risk of preterm delivery has a role as a neuroprotective agent and prevents cerebral palsy in their babies.

Antepartum haemorrhage (APH) is genital bleeding during pregnancy from the 24th week (Sometimes defined as from the 20th week) gestational age to term. Causes of antepartum haemorrhage include obstetric and non-obstetric. Obstetric causes can be further divided into maternal and fetal. Under maternal causes-placental and uterine causes are important. Under placental causes bloody show is the most common benign cause of APH and abruption of the placenta is the most common pathological cause of APH. Placenta praevia is the second most common pathological cause of APH.

In the study by M. Lam et al,[9] more infants in the bleeding group had a low Apgar score at the first minute, respiratory distress syndrome, and admission to special baby care and neonatal intensive care units. In the book titled: Cerebral Palsies: Epidemiology and Causal Pathways, by Fiona

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Stanley et al,[10] the authors opined that the placental abruption with its dramatic effects on placental blood flow is more likely associated with cerebral palsy than placenta praevia.

A multiple birth occurs when more than one fetus result from a single pregnancy. Common multiples are two and three, known as twins and triplets, respectively. Multiple birth siblings are either monozygotic or polyzygotic. Monozygotic result from a single fertilized egg or zygote splitting into two or more embryos (Identical), each carrying the same genetic material (genes). They are always of the same sex. Polyzygotic (or fraternal) multiples result from multiple ova of the same menstrual cycle, which are then fertilized to grow into multiples no more genetically alike than ordinary full siblings. Multiples are called "dizygotic" and represent multiples from two eggs specifically. P.O. Pharoah et al,[11,12] compared the prevalence of cerebral palsy in singleton and multiple births. They found that multiple birth babies are at increased risk of cerebral palsy. There is also an increased risk of cerebral palsy within a twin pregnancy if the co-twin has died in utero. The increased risk associated with monochorionic placentation could be due to transfer of thrombo-plastin or thromboemboli from the dead to the surviving fetus, exsanguination of the surviving fetus into the low pressure reservoir of the dead fetus, or hemodynamic instability with bidirectional shunting of blood between the two fetuses.

At root level of the primary health care system, knowledge of these risk factors and their grave impact on the fetus in the causation of cerebral palsy must be imparted to the basic health providers. A record of those pregnant woman who have known risk factors should be maintained and well addressed in the monthly review meetings. The field staff of the primary health care system should encourage the pregnant woman to attend Primary health centre, for regular antenatal checkups. High risk cases are to be screened and referred to higher centres for expert supervision and timely intervention if needed. These steps when scrupulously followed helps in protecting the fetus from development of cerebral palsy due to grave effects of associated maternal risk factors apart from reducing the overall maternal and fetal morbidity and mortality.

CONCLUSION: From this study of the role of antenatal risk factors, in the occurrence of cerebral palsy in children it is concluded that the most common risk factor associated with cerebral palsy is the maternal anaemia and the other important risk factors associated being hypertension, pre eclampsia, eclampsia, antepartum haemorrhage and multiple births.

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