

Comparative study of growth and neuro development of babies born to mothers with pregnancy induced hypertension to non hypertensive mothers

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Abstract

Aims: To study the growth and neurodevelopment of babies born to mothers with hypertensive mothers compared to babies of non hypertensive mothers up to 1 year of age. **Methods:** This was a prospective cohort study conducted in 420 babies in the Inborn NICU and Newborn Follow up clinic of Department of Pediatrics in a tertiary Government Medical College Hospital. 210 live born babies born to hypertensive mothers and 210 babies born to non hypertensive mothers were included and followed up to 1 year of age using TDSC, DDST scales and WHO growth curves. **Results:** Percentage of developmental delay in babies of hypertensive mothers is 3.3% vs .8% for babies of non hypertensive mothers. There was statistically significant difference between both male and female cases and controls regarding weight, length and head circumference at birth. But on follow up, this difference was not maintained due to the catch up growth attained by the cases. There was 7% incidence of developmental delay among low birth weight babies born to hypertensive mothers. **Conclusion:** Neurological handicaps were seen among babies of mothers with severe hypertension who had multiple neonatal complications. Low birth weight babies born to hypertensive mothers had more developmental delay. Hence early anticipation of problems, improved antenatal and neonatal services will help to reduce the neurological morbidity. **Keywords:** growth, neuro development, pregnancy induced hypertension.

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Received Date: 09/05/2015 Revised Date: 18/05/2015 Accepted Date: 20/05/2015

Access this article online

Quick Response Code:



Website:

www.statperson.com

DOI: 23 May 2015

INTRODUCTION

Pregnancy associated hypertensive disorder is an important medical disorder in the antenatal period. It causes a state of chronic placental insufficiency with reduced blood flow to the various organs in the foetus which adversely affects the growth and development of

the foetus¹. Hypertension complicates up to 15% of the pregnancies and is a leading cause of prematurity and low birth weight (LBW). Babies born to mothers with pregnancy associated hypertension belong to a high risk group who require special care and follow up, not only during the newborn period but also subsequently. Many of them are premature or term small for gestational age². There has been a dramatic increase in survival rates of this population due to advancement in perinatal and neonatal treatment expertise. With increasing survival of these infants, the incidence of chronic morbidity and long term sequelae would also increase. This will affect the resources of the family and society. There is paucity of data on long term outcome of such babies from developing countries including India. The data from developed countries^{3,4} cannot be extrapolated to the population in the developing countries as we have more small for gestational age infants and their genetic

makeup, environment in which they are reared, the level of care and infrastructure are different. Hence there is a need to study the postnatal problems, pattern of growth and neurological development of these babies. This will help us to have a better insight into their problems and enable us to anticipate such problems in future. Early identification of these problems will assist us in timely intervention and better outcome⁵. The present study seeks to evaluate the outcome of these babies in terms of growth and neuro development in the first year of their life.

AIMS

To study the growth and neurodevelopment of babies born to hypertensive mothers compared to babies of non hypertensive mothers up to 1 year of age.

MATERIALS AND METHODS

This prospective cohort study was conducted in the Inborn NICU and Newborn Follow up clinic of Department of Pediatrics in a tertiary Government Medical College Hospital

CASES

Inclusion Criteria

Consecutive sample of babies born to mothers with pregnancy induced hypertension during the study period in Government Medical College Hospital, who have given consent for the study were enrolled in the study and were followed up for a maximum period of 1 year.

Exclusion criteria

1. Babies with major congenital anomalies
2. Babies with chromosomal anomalies
3. Babies sustaining infectious, hypoxic, traumatic or ischemic insults to the brain beyond the newborn period.

CONTROLS

Consecutive sample of babies born to non hypertensive mothers in the same study period who have consented for the study.

DATA COLLECTION

Clearance from ethical committee of the hospital was obtained before the study. All live babies born to hypertensive mothers in the study period who have given consent for the study were enrolled in the study. Babies were examined immediately after birth. Anthropometric parameters, systemic examination, development and maturity were assessed. Gestational age was assessed using modified New Ballard score. Address and phone number was collected from parents. Control group was selected on a random basis and includes live born babies

born to mothers with normal antenatal period delivered in the same time frame. Clinical details were collected from the control group also. After discharge from hospital, these babies were put under regular follow up at term, 1and1/2, 3and1/2, 9 months and 1 year coinciding with their immunisation dates at the newborn follow up clinic. Corrected gestational age was taken for preterm babies. During each visit, weight, height, head circumference are assessed and plotted in the WHO growth chart and compared with standard curves.^{6,7,8} Neurodevelopment was assessed using Trivandrum Development screening chart.⁹ Whenever a delay in development was noted, the baby was fully assessed using DDST 2 and interventions like early stimulation and physiotherapy are started. Those who failed to turn up for the follow up visits were contacted over telephone or through personal letters. Those who could not be contacted were declared lost on follow up.

Statistical testing: Continuous variables were expressed as mean and S.D. Significance testing was done using chi square test .P values greater than .05 were considered non significant.

Definitions: Low birth weight (LBW) babies: Babies with a birth weight less than 2500grams irrespective of the period of gestation. Very low birth weight babies: Babies with birth weight less than 1500grams Extremely low birth weight babies: Babies with birth weight less than 1000grams

Preterm: Preterm is defined as gestational age less than 37 completed weeks (up to 36 weeks or up to 259 days)

Term: Term is defined as gestational age between 37-41 weeks (259-293 days) Post term is defined as gestational age of 42 weeks or more (294 days or more) Small for age (SGA) babies (small for gestational age, light for dates, intra uterine growth retardation): Babies with birth weight less than 10th centile for their gestational age are designated as SGA babies.^{10,11,12}

OBSERVATION AND RESULTS

A prospective cohort study of babies born to hypertensive mothers out of singleton gestation was conducted in Government Medical College. Consecutive sample of babies born to hypertensive mothers were included in the study after applying the inclusion and exclusion criteria along with equal number of control babies. 210 cases and 210 controls were studied. 3.3% babies had developmental delay. All the developmental delay cases were among those with severe hypertension. None of the cases of mild hypertension had developmental delay.

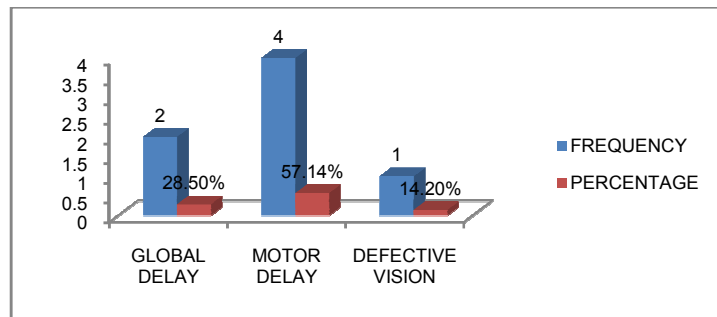


Figure 1: Figure showing the types of developmental delay

4 cases had motor delay (57.14%) vs 2 cases (28.5%) with global delay.

Table 1: Distribution of babies with anthropometry below 3rd centile at birth

Parameter	No of female cases	No of male cases	No of female controls	No of male controls
Weight<3rd centile	44/98(44.8%)	52/112(46.4%)	14/98(14.2%)	20/112(17.8%)
Length <3rd centile	42/98(42.8%)	47/112(41.7%)	12/98(12.24%)	15/112(13.39%)
Head circumference< 3rd centile	38/98(38.77%)	38/112(33.9%)	7/98(7.1%)	10/112(8.9%)

There is no statistically significant difference between males and female cases regarding anthropometric parameters. 46.4% male cases had weight below 3rd centile vs 17.8% male controls. 41.7% male cases had length below 3rd centile vs 13.4% male controls. 33.9% male cases had head circumference below 3rd centile vs 8.9% of controls. There is a statistically significant difference regarding weight and length between male cases and controls at birth. (p value=.011 and .001 respectively) 44.8% female cases had weight below 3rd

centile vs 14.2% among controls. 42.8% females had length below 3rd centile vs 12.24% among controls. 38.77% females had head circumference below 3rd centile vs 8.9% among controls. There is a statistically significant difference in number of babies with weight and length below 3rd centile among female cases and controls. (p value=.001 and .01 respectively). There is statistically significant difference between both male and female cases and controls regarding HC below 3rd centile at birth

Table 2: Table showing distribution of babies with anthropometry below 3rd centile at 1 year of age

Parameter	No of female cases	No of male cases	No of Female controls	No of male controls
Weight<3rd centile	33/98(33.67%)	34/112(29.5%)	26/98(24.07%)	24/112(23.5%)
Length <3rd centile	30/98(29.4%)	35/112(31.5%)	25/98(22.24%)	21/112(21.4%)
Head circumference< 3rd centile	6/98(6.25%)	8/112(7.1%)	5/98(4.6%)	6/112(5.88%)

There is no statistically significant difference between males and female cases regarding anthropometric parameters. 29.5% male cases had weight below 3rd centile vs 23.5% male controls. 31.5% male cases had length below 3rd centile vs 21.4% male controls. 7.1% male cases had head circumference below 3rd centile vs 5.88% of controls. There is no statistically significant difference regarding weight and length between male cases and controls at birth. 33.67% female cases had weight below 3rd centile vs 24.07% controls. 29.4% female cases had length below 3rd centile vs 22.24% controls. 6.25% female controls had head circumference below 3rd centile. 44.8% female cases had weight below 3rd centile vs 4.6% among controls. There is no statistically significant difference in number of babies with weight and length below 3rd centile among female cases and control. There is no statistically significant difference between both male and female cases and

controls regarding HC below 3rd centile at 1 year of age. Catch up growth between males and females was comparable.

DISCUSSION

Outcome of babies in the study

Survival rate of babies in this study was 82.07%. Most deaths occurred between 26 weeks up to 1 week after birth. Survival rate is higher than in other studies due to difference in patient population, antenatal care and NICU facilities. Percentage of developmental delay was 3.3%. This is lower than what was obtained in the study by Pradeep kumar¹³ *et al* which studied only very low birth weight babies and had more VLBW babies (55 babies). The present study is comparable to the one done by Choudhri¹⁴ *et al* from Pune which showed 4% incidence of cerebral palsy. The rate of developmental delay in this study is greater than developmental delay in general

population found by M.K.C. Nair *et al* in 2009 which is 2.5%.¹⁵. All the developmental delay cases were among those with severe hypertension. None of the cases of mild hypertension had developmental delay. There was 7% incidence of developmental delay among low birth weight babies born to hypertensive mothers. Median birth weight of babies of mothers with hypertension is 2.44 kg. Median birth length of hypertensive babies is 46.57cm. Median birth head circumference of hypertensive babies is 31.98 cm. Median birth weight of control babies is 3.3 kg. Median birth length of control babies is 49.5cm. Median birth head circumference of control babies is 34.3cm. There was twice the incidence of term SGA and preterm SGA among cases compared to controls. There was statistically significant difference between both male and female cases and controls regarding weight and length at birth. But on follow up, this difference was not maintained due to the catch up growth attained by the cases. Follow up growth WHO MGRS curves were used for studying the follow up growth of these babies^{16,17}. At 1 year of postnatal age and corrected gestational age, males had a better growth than females though not statistically significant. This may be due to the peculiarity of our social setup where boys are given greater care than females. This catch up growth should be watched with caution since there is altered metabolic programming in growth retarded infants which can predispose to adult metabolic disorders. The weight gain in term and preterm babies was comparable. The results of the study are comparable to the study by Akhila *et al* which showed 29% overall malnutrition in children under 3 years in Kerala. According to the National Family Health Survey, the number of the State's underweight children had increased from 27 per cent in 1998-99 to 29 per cent in 2005-2006. The number of anaemic children showed a 12 per cent increase from 1998-99 to 2005-2006 in the State. 33.67% female babies of hypertensive mothers were still below 3rd centile for weight and 29.4% were below 3rd centile for length. Catch up growth was 11.13% for weight and 13.4% for length among female babies. There was no statistically significant difference regarding growth parameters between female cases and controls at 1 year. 29.1% male babies of hypertensive mothers were still below 3rd centile at 1 year for weight, 31.5% were below the 3rd centile for length. Though there was growth faltering, catch up growth was 17.3% for weight and 10.2% for length. There was no statistically significant difference between male cases and controls regarding growth parameters at 1 year. This result is similar to the one obtained by Sridhar^[18] *et al* which showed that the growth pattern for weight and length showed good catch up growth in babies >1.25 kg birth weight and >30 weeks

gestation, reaching almost the same level as controls by 1 year of age

CONCLUSION

Survival rate of babies in this study was 82.06%. At birth, there was statistically significant difference between cases and controls regarding weight, length and head circumference. At 1 year of corrected gestational age, though growth faltering was persisting, there was no statistically significant difference regarding cases and controls regarding growth parameters. Incidence of neurological problems was 3.3% which is higher than that in normal population. Neurological handicaps identified at 1 year were cerebral palsy, global developmental delay and vision defect. Neurological handicaps were seen among babies of mothers with severe hypertension who had multiple neonatal complications. Low birth weight babies born to hypertensive mothers had more developmental delay.

RECOMMENDATIONS

Incidence of neurological abnormalities is high, so follow up is required. In general population, catch down growth is seen, especially in the latter half of infancy. Hence public awareness regarding complementary feeding and health education strategies are required. Facilities for neuro developmental assessment, vision and hearing testing should be available at affordable rates at all tertiary centres so that early detection of problems and appropriate corrective measures can be taken. Training for doing initial screening tests for early detection of neurological problems should be imparted to health workers as many such babies may not be brought to the tertiary centres due to financial constraints. Timely introduction of nutritional supplements and early stimulation are essential for optimum growth of these babies.

LIMITATIONS

Exact matching of cases and controls based on gestational age and birth weight could not be done as controls were taken from consecutive sample of babies who were willing to come for follow up.

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Source of Support: None Declared
Conflict of Interest: None Declared