EVALUATION AND ASSESSMENT OF SENSORY AND MOTOR ABNORMALITIES IN HIGH RISK NEONATES WITH <32 WEEKS AT HIGH RISK CLINIC

Abstract:-

Introduction:-The incidence of pre term delivery and the survival rate of preterm babies is rising due to new medical technologies. In developing countries, very low birth weight (BW) babies less than 32 weeks of gestational age (GA) have a high risk for neuro-developmental retardation. They need to be followed up at regular intervals so as to assess various morbidities they develop during hospital stay as also post discharge and neurodevelopment outcome for early stimulation.

Method:- Follow up schedule of <32 weeks neonates is every 15 days till 3 months than every monthly for one year than 3 monthly till 2 years of age. The evaluation consisted of neurological assessments, cranial ultrasounds and developmental assessments.

Result and Discussion:- The study was completed with 69 babies. Male & female ratio was 1.3:1. In our study 62.3% were SGA babies. Convulsion was most common morbitiy 75.3%. Many of the tone abnormalities detected in the first six months in high risk infants start normalizing by 9 months and disappear by 12 months. In this study tone abnormalities improve in 39(85%) of neonates. only 3(5.6%) neonates had sensory-neural hearing loss. 61% had ROP stage 1 and 24.4% neonates had ROP stage 2.

Conclusion:- Delay in individual domains of motor and sensory development can be diagnosed at an early age by us and thus domain specific early intervention therapy can be planned. This will help in decreasing the overall neuro-developmental delays and thus morbidity and overall outlook of preterm.

Keywords:- High risk clinic, Hypoxic ischemic encephalopathy

Introduction:-

The incidence of pre term delivery and the survival rate of preterm babies is rising due to new medical technologies. Advances in perinatal care have increased the survival of high-risk newborns such as those with very low birth weights or suffering from neonatal encephalopathy. Prenatal care, the wide spread use of prenatal steroids and surfactant therapy and the standardization of resuscitation, noninvasive mechanical ventilation supports and intensive care techniques have resulted in a significant reduction of neonatal mortality worldwide.[1,2] In recent years, the survival rate of preterm babies has increased[3]. In developing countries, the impact on survival has been less pronounced, mostly due to the lack of access of part of the population to adequate pediatric care.

High risk neonates are babies who were exposed to high risk factors before birth or during birth or during their new born period. In developing countries, very low birth weight (BW) babies less than 32 weeks of gestational age (GA) have a high risk for neuro-developmental retardation. In preterm babies, prenatal, perinatal and postnatal determinants can give rise to adverse neurological outcomes through complex and causal pathways via hypoxic or ischemic inflammation. Early birth has an influence on brain development and timing of neurobiological process. These processes include neuronal migration, axon and dendrite sprouting, synapse formation, persistence of transient structures involved in anatomical

segregation of thalamic axons from lateral geniculate nucleus in visual cortex. There has been a shift in the distribution of births away from term and post-term towards preterm. Apart from their fight for survival, these preterm babies suffer from various postnatal complications including environmental and metabolic complications which further are responsible for the developmental delay. Today, it is accepted that the criteria of success of newborn intensive care units (NICU) are neuro-developmental outcomes of babies [4]. Despite the increase in survival rates in developing countries, a similar rate of decrease in the long-term neuro-developmental retardation rate was not accompanied. The American Academy of Pediatrics published a guide for the monitoring of preterm babies in 2004.[5] At-risk neonates may develop severe neurological sequelae, such as cerebral palsy, intellectual disability, epilepsy and neuro-sensory disorders, as well as less severe complications like impaired motor coordination, attention defificit hyperactivity disorder and impairments in learning, language, attention, and spatial processing, among others.[6] Severe sequale manifest in early childhood, while those that are less severe appear later in life.[7-10] These sequale may have a negative impact on the academic performance and the cognitive and social skills of the child. One of the chief concerns of the teams involved in the follow up of these children is the early identification of those that may develop sequale for the purposes of implementing early interventions to improve outcomes.[8][10-11] Numerous studies have assessed different tools for predicting neurological outcomes. Brain lesions detected in the neonatal period by cranial ultrasound can predict various impairments of neuromotor and cognitive development.[12] Neurological examinations such as the Amiel-Tisson are associated with neurological outcomes in at-risk newborns. The improvement in perinatal care has led to increase in survival rate of high risk new born but a relatively increased of children with disabilities. They need to be followed up at regular intervals so as to assess various morbidities they develop during hospital stay as also post discharge and neurodevelopment outcome for early stimulation. We have assed sensory -motor follow up of 69 neonates <32 weeks.

Method: 1 year longitudinal follow up study from April 2012 to June 2013 was done in high risk clinic in tertiary care hospital. The high risk factors included low birth weight , pre term birth, convulsion, apnea; hypoxic ischemic encephalopathy, Sarnat stage II or III; intra-ventricular hemorrhage >grade I; hyper-bilirubinemia needing treatment; and respiratory distress with a Silverman Anderson score of $\geq$3. Infants with congenital anomalies were exclude. Follow up schedule of <32 weeks neonates is every 15 days till 3 months than every monthly for one year than 3 monthly till 2 years of age. The evaluation consisted of neurological assessments, cranial ultrasounds and developmental assessment.

Tone assessment done by Amiel Tison[13] method at 3, 6, 9, 12 months. Corrected age was used in preterms. Evaluation of muscle tone is the fundamental part of this method. The evaluation of muscle tone is based on the study of spontaneous posture, passive tone and active tone. Passive tone is measured by popliteal, adductor and dorsiflexor angles in the lower extremity and scarf sign in the upper extremity. Active tone comprises of spontaneous movements and movements provoked by maneuvers such as pull to sit and pull to stand. Based on this examination, the infants were categorized in three groups – (*i*) hypertonia, (*ii*) hypotonia, and (*iii*) minor tone abnormalities like mild hypertonia or hypotonia in one extremity, mild adductor or abductor spasm at the hip joint, and mild hypertonia of the neck extensors. All infants found to have tone abnormalities were refered to occupational therapy.

If there were no tone abnormalities at 6 and 12 months, the group was called normal high risk (HR) group. If tone abnormalities were present at 6 months, but disappeared at 12 months, they were called transient tone abnormalities (TTA) group. Those infants who persisted to have tone abnormalities at 6 and 12 months, were diagnosed as cerebral palsy, and referred to rehabilitation centre.

All infants were screened for retinopathy of prematurity during their hospital stay and follow-up if required. If ROP screening +ve then LASER photocoagulation an OPD procedure done. Hearing screening was also done in all patients. Ultrasonography of head was done at 1 month in all patients and neuro-imaging (MRI) were done when indicated.

Results and Discussion:

During the study, there were 69 babies in our high risk clinic with a gestational age of 32 weeks. Preterm infants with a major anomaly or metabolic disease were excluded. The study was completed with 69 babies.

Table:1 Gestational Age

Gestational Age	SGA	AGA
<28 weeks	**3**	**4**
28 to 30 weeks	**2**	**19**
30 to 32 weeks	**38**	**3**

In our study 62.3% were SGA babies.

Table :2 Birth Weight

BIRTH WEIGHT	NO. of patient	percentage
<1kg	**7**	**10%**
1 TO 1.5 KG	**53**	**76.8%**
1.5 TO 1.8kg	**9**	**13%**

Out of 69 neonates, 76.8% were between 1 to 1.5 kg of birth weight. 13% neonates with 1.5 to 1.8 kg birth weight and 10% neonates with less than 1 kg birth weight.

Table : 3 Associated Morbidities

Associated Morbidities	No of patient	percentage
HMD	**20**	**28.9%**
HYPERBILIRUBINEMIA	**22**	**31.8%**
CONVULSION	**52**	**75.3%**
SEPTICEMIA	**9**	**13%**

In our study observed that convulsion was most common morbitiy 75.3%, followed by hyperbilirubinemia 31.8%, HMD 28.9% and septicemia 13%.

Table: 4 Gender distribution

Sex	No. of patients	percentages
Male	**38**	**56%**
Female	**31**	**44%**

As such there is no sex preference, but in our study 56% were male while 44% were female. Male & female ratio was 1.3:1.

Table: 5 Tone Abnormality

Total Patients	Tone abnormalities detected at 6 months	Tone abnormality disappeared at 12 months
69	**46**	**39 (85%)**

After 3 months of follow up, 14(20.2%) neonates detected tone abnormalities in form of hypertonia or hypotonia. After 6 months of follow up in 46 (66.7%) neonates abnormal tone was detected. Majority of neonates with abnormal tone were SGA and associated with morbidities like, perinatal asphyxia, septicemia, convulsions.

Many of the tone abnormalities detected in the first six months in high risk infants start normalizing by 9 months and disappear by 12 months. In this study tone abnormalities improve in 39(85%) of neonates. Rest of neonates were diagnosed as hypoxic ischemic encephalopathy grade 3.

In a large follow up study of high risk infants, Matile, *et al*.[18] reported that hypertonia found at 6 months disappeared in 81.2% cases. The tone abnormalities in disappeared in 85% of cases in our study. Half of the infants with Transient tone abnormalities (TTA) had minor tone abnormalities and all these normalized at one year.

Transient tone abnormalities have been reported in several follow up studies of preterm infants.[15-18] Amiel Tison reported these abnormalities in a small study of full term infants[13]. Bradt *et al*. have stated that more transient tone abnormalities occur in preterms compared to full terms[17]. In all these studies[15-18] had many more VLBW infants compared to ours. We found no significant difference in the incidence of TTA between our small number of VLBW infants and those weighing ≥1500 g.

Table: 6 Hearing Assessment

No of patients	**sensory-neural hearing loss**	**percentage**
53	**3**	**5.6%**

During duration of this assessment, 53 neonates were assessed for hearing loss by BERA method and out of them only 3(5.6%) neonates had sensory-neural hearing loss. Comorbidities associated with these neonates were septicemia, HMD, perinatal asphyxia, Convulsions and hyperbillirubinemia.

Table: 7 Incidence of ROP according to Birth weight

Birth Weight	**TOTAL numbers of patient screened** (n=64)	**Total number of patient with ROP** (n=41)	**Total number of patient without ROP** (n=23)
<1 KG	7	7(100%)	0
1 TO 1.5KG	49	32(65%)	17
1.5 TO 1.8 KG	8	2(25%)	6

For babies with weight < 1 kg the incidence of ROP was 100%, babies with weight between 1 to 1.5 kg incidence of was ROP 65%,and with weight 1.5 to 1.8 kg was 25%. As the birth weight decreased, incidence of ROP increased.(SGA)

Out of 41 neonates, 29(70.7%) neonates required prolonged oxygen therapy more than 1 week. And these neonates also had more comorbidities like SGA, Very low birth weight, hyaline membrane disease, convulsions, hypoglycemia, hypocalcemia, birth asphyxia and fetal distress. So in this study, Incidence of ROP also increased with those neonates who required prolonged oxygen therapy and had more comorbidities.

Table: 8 Distribution of ROP according to stage

Stage of ROP	No of patients (n=41)	percentages
Stage 1	25	61%
Stage 2	10	24.4%
Stage 3	4	9.8%
Stage 4	1	2.4%
Stage 5	1	2.4%

ROP screening was done in 64 patients, out of which 25 (61%) had shown stage 1 ROP, 10 (24.4%) patients with stage 2, 4 (9.8%) neonates with stage 3, 1(2.4%) patient with stage 4 and 1(2.4%) patient with stage 5 ROP. Maximum number of patient had stage 1.
Neonates with stage 3, 4 and 5 ROP had prolonged oxygen exposure, all were very low birth weight and preterm.

Table: 9 Treatment of patient of ROP

Treatment modality	No of babies
Laser photocoagulation	18
Anti VEGF	2

Out of 41 babies 18 patients were given Laser photocoagulation and 2 patient received anti VEGF. All the patients showed regression following treatment. Patients with stage 4 and stage 5 advised surgery.
USG brain and MRI study was abnormal in 3 patients.

Conclusion:-
In today's era nothing comes without a price. Survival of high risk new born had led to a question about quality of life beyond survival. In our study consisting of preterm infants with a high number of SGA infants shows that many of the tone abnormalities detected at 6 months are transient and resolve by twelve months. Hence, a hasty diagnosis of cerebral palsy should not be made till the latter part of the first year. These abnormalities of tone are not predictive of poor outcome. Our study had shown that delay in individual domains of motor and sensory development can be diagnosed at an early age by us and thus domain specific early intervention therapy can be planned. This will help in decreasing the overall neuro-developmental delays and thus morbidity and overall outlook of preterm. Good follow up programme for early detection of sensory and motor abnormalities with intervention in form of early stimulation (occupational therapy and rehabilitation) in referral centers should be instituted to improve the quality of life of these infants.

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