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Research Article

Prospective Observational Follow up Study of High Risk Infants Discharged from SNCU and NICU of a Tertiary Centre in Kolkata

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Abstract:

Neonatal period is a period where the brain and other body systems are still immature and an insult of any type whether it be hypoxic, metabolic or infectious can have long term adverse consequences. Due to an increase in SNCU/NICU facilities and advances in the field of neonatology, neonatal mortality has decreased to some extent whereas morbidity has increased. These infants who faced insults either during the intra-uterine or neonatal period constitute the "high risk" group and many of them go on to have adverse outcomes later in life. Their management can pose a dilemma both for the parents and doctors. Follow up of high risk cases such as those with prematurity, low birth weight, perinatal asphyxia, sepsis, pathological jaundice, neonatal convulsions etc. is very important as it can help to identity infants who would require early intervention to minimize disability. Among the babies completing follow up(n=63), 15 (23.8%) were found to have developmental delay at the end of 1 year. In this study, the incidence of developmental delay among high risk infants completing follow up is quite high (23.8%) and similar to the high incidence found by Chatterjee et al. (31.6%) , Calame et al. (29%) and Shrestha et al. (28.6%).[3,7,35] The demographic characteristic of high risk babies enrolled for follow up consisted of 24 cases of perinatal asphyxia (9 having severe HIE and 15 having moderate HIE by Levene's Scoring[36] at birth) , 21 cases of neonatal convulsion, 7 cases of invasive ventilation, 11 cases of symptomatic hypoglycemia, 31 cases of sepsis/meningitis, 45 cases of pathological jaundice of which 5 cases required double volume exchange transfusion, 15 cases having gestational age less than 34 weeks and 31 cases with a birth weight of less than 1800 grams.

Introduction:

Neonatal period is a period where the brain and other body systems are still immature and an insult of any type whether it be hypoxic, metabolic or infectious can have long term adverse consequences. Due to an increase in SNCU/NICU facilities and advances in the field of neonatology, neonatal mortality has decreased to some extent whereas morbidity has increased[1]. These infants who faced insults either during

the intra-uterine or neonatal period constitute the "high risk" group and many of them go on to have adverse outcomes later in life. Their management can pose a dilemma both for the parents and doctors. Follow up of high risk cases such as those with prematurity, low birth weight, perinatal asphyxia, sepsis, pathological jaundice, neonatal convulsions etc. is very important as it can help to identity infants who would require early intervention to minimize disability. World Health Organization has defined disability as a loss of full functional capacity in domains as mobility, cognition, hearing and vision which may hinder their full and effective participation in society on an equal basis with others.[1] By follow up, timely appropriate counter measures can be taken to mitigate the impact of risk factors on development as well as it would also help us understand the outcomes of various insults during the perinatal period - both long term and short term. Studies have revealed that while some interventions can have immediate positive effect on an illness, it can have long term adverse outcomes like retinopathy of prematurity associated with oxygen therapy in preterm neonates with RDS.[3]

Follow up of high risk infants and understanding of outcomes will help in providing essential feedback to SNCUs/NICUs so that better interventions and protocols can be designed which will be beneficial to the community and humanity as a whole in the long run.

Aims & Objective:

Primary Objective

- To assess the neurological outcome of high risk infants discharged from Sick Neonatal Care Unit and Neonatal Intensive Care Unit.

Secondary Objectives

- To find out the incidence of neurological developmental delay in high risk infants over a follow up period of 1 year.
- To assess the risk of development of other medical morbidities in high risk infants.

Sample Size: 100

Inclusion Criteria

Any Neonate born in NRSMCH and neonates admitted in SNCU or NICU of NRSMCH with:

- Birth asphyxia with hypoxic ischemic encephalopathy
- Pathological jaundice or total bilirubin > 20mg/dl or neonates requiring exchange transfusion
- Symptomatic hypoglycemia
- Neonatal convulsions
- Mechanical ventilation for more than 24 hours
- Neonates weighing <1800 grams
- Neonates <34 weeks gestational age
- Meningitis and/or culture proven sepsis

Exclusion Criteria:

- Neonate with gross congenital malformations
- Healthy neonates with gestational age of 34 weeks or more

Study Design:

Prospective Observational Study

Methodology:

100 high risk infants born at NRSMCH or admitted at neonatal period at NRSMCH falling under the inclusion criteria were enrolled for follow up for a period of 1 year. Parents were explained about the study and well informed consent was taken from them. Relevant data regarding birth, pregnancy and maternal

details, neonatal details and socio-economic details of the family were taken. Communication address and phone number were taken. Follow up was done in high-risk clinic on 8th day, 1, 3, 6 and 12 months of life as per hospital protocol. In case the patient missed follow up, parents were contacted over phone and advised for follow up. Up to 2 missed follow ups other than that of 12th month was considered as acceptable follow up. Socio-economic status was determined using Modified Kuppuswamy Scale. Nutritional assessment was done by anthropometry. Assessment of immunization status was done on each follow up. ROP screening was done for all infants less than 2 kg or less than 35 weeks gestational age at the age of 28 days. In infants less than 28 weeks gestational age or less than 1200 grams, ROP screening was done by 2-3 weeks of age. Visual and hearing assessment was done by VEP and BERA as per unit protocol. Other investigations like USG brain, MRI brain and echocardiography were done for patients if indicated. Neurological assessment was done by Hammersmith Infant Neurological Examination(HINE) at 3, 6 and 12 months of age. Developmental screening was done by Denver Development Screening Test-II at 6 months and 1 year of age. Any infant considered to have developmental delay by DDST-II was assessed in detail by DASII. Scores of less than 67 at 3 months of age, less than 70 at 6 months of age and less than 73 at 12 months of age in Hammersmith Infant Neurological Examination were considered suboptimal. Infants having 2 or more cautions and/ or 1 or more delays in Denver Developmental Screening Test- II (DDST) were considered as suspects and rescreened in 1-2 weeks. Infants found to be suspects in Denver Developmental Screening Test- II (DDST) at 12 months of age further underwent neurodevelopmental assessment by Developmental Assessment Scale for Indian Infants (DASII). An infant was considered to have abnormal neurodevelopment if any one of the following abnormalities were found :-

1.Either DMoQ or DMeQ of less than 70% on DASII.

2.Hearing Loss.

3.Visual Impairment

All subjects of the study population was studied in a methodical manner in a predesigned structural pro forma.

- Detailed Antenatal and Birth History
- Socioeconomic status
- Anthropometry at birth and serial Anthropometry measurements during follow ups
- Immunization status
- ROP screening for all babies <2 kg /< 35 weeks
- Hammersmith infant neurological examination (HINE).
- Denver Developmental Screening Test II (DDST-II).
- Developmental assessment using Developmental Assessment Scale for Indian Infants (DASII)

Study Tools:

- Pediatric length board
- Measuring Tape
- Weighing Machine
- Modified Kuppuswamy Scale
- Hammersmith Infant Neurological Examination chart
- Denver Developmental Screening Test- II chart and kit
- Developmental Assessment Scale for Indian Infants (DASII)

Statistical analysis was done using SPSS 27 software.

Results:

HIGH RISK FACTORS	Total No.
Perinatal Asphyxia	24
Symptomatic Hypoglycemia	11
Mechanical Ventilation	7
Pathological NNJ with DVET	5
Pathological NNJ without DVET	40
Birth Wt.<1800 grams	36
G.A<34 weeks	16
Sepsis	31
Neonatal Convulsion	21

Table: Demographic distribution of high risk factors

	Number	Mean	SD	Minimum	Maximum	Median
Birth WEIGHT (kg)	100	2.1924	0.6968	0.755	3.88	2.315
GA	98	36.1735	2.988	28	41	37
HC (cm)	97	31.8247	2.3849	25.5	37	32
LENGTH (cm)	97	46.067	3.5617	36	61	46
Duration of Hospital Stay	100	16.47	13.5031	2	62	14

Table: Distribution of mean Birth WEIGHT (kg)

	Number	Mean	SD	Minimum	Maximum	Median
Birth WEIGHT (kg)	100	2.1924	.6968	0.7550	3.8800	2.3150

Table: Distribution of mean Duration of Hospital Stay

	Number	Mean	SD	Minimum	Maximum	Median
Duration of Hospital Stay	100	16.4700	13.5031	2.0000	62.0000	14.0000

High Risk Factors

Table: Distribution of Perinatal Asphyxia

Perinatal Asphyxia	Frequency	Percent
NO	76	76.0%
Moderate HIE	15	15.0%
Severe HIE	9	9.0%
Total	100	100.0%

I. SEPSIS

Table: Distribution of Sepsis

VARIABLE	Frequency	Percent
NO sepsis	69	69.0%
Sepsis	25	25.0%
Sepsis+ Meningitis	6	6.0%
Total	100	100.0%

Table: Distribution of mean Ventilation (days)

	Number	Mean	SD	Minimum	Maximum	Median
Ventilation(days)	100	.1200	.5556	0.0000	3.0000	0.0000

Table : Distribution of Hypoglycemia

Hypoglycemia	Frequency	Percent
Asymptomatic	9	9.0%
Symptomatic	11	11.0%
No	80	80.0%
Total	100	100.0%

Table : Distribution of Pathological Jaundice

Pathological Jaundice	Frequency	Percent
NO	55	55.0%
YES	45	45.0%
Total	100	100.0%

Table 15: Distribution of Exchange Transfusion among babies having PathologicalJaundice

Exchange Transfusion	Frequency	Percent
NO	40	88.9%%
YES	5	11.1%
Total	45	100.0%

Table: Distribution of Outcomes In Relation To Different RiskFactors

(Variables)

VARIABLES	Frequency (Study Population)	Frequency (In cases completing follow up)	No. of Delays (percentage of cases having delay among the babies that completed follow up with respect to each individual risk factor)
Perinatal Asphyxia Moderate HIE	**15**	**11**	**1 (9.1%)**
Perinatal Asphyxia Severe HIE	**9**	**5**	**5 (100%)**
Symptomatic Hypoglycemia	**11**	**6**	**0 (0%)**
Mechanical Ventilation	**7**	**5**	**3 (60%)**
Pathological NNJ with DVET	**5**	**4**	**1 (25%)**
Pathological NNJ without DVET	**40**	**19**	**4 (21.05%)**
Birth Wt.<1800 grams	**36**	**19**	**4 (21.05%)**
G.A < 34 weeks	**16**	**9**	**3 (33.3%)**
Sepsis	**25**	**19**	**5 (26.3%)**
Sepsis + Meningitis	**6**	**4**	**1 (25%)**
Neonatal Convulsion	**21**	**13**	**9 (69.2 %)**

Table: Distribution of Associated Risk Factors And Developmental Delay AmongVentilated Babies Who Completed Follow Up (n = 5)

RISK FACTORS	FREQUENCY OF VENTILATION	NO. of cases with developmental delay at the end of one year
Sepsis	1	0 (0 %)
Sepsis+ Prematurity + VLBW	2	1 (20%)
Sepsis + Pathological Jaundice	1	1 (20%)
Birth ASphyxia	1	1 (20%)
Total	5	3 (60%)

Table: Distribution of Associated Risk Factors And Developmental Delay AmongBabies With CONVULSION Who Completed Follow Up

(n = 13)

RISK FACTORS	FREQUENCY	NO. of cases with developmental delay at the end of one year
Perinatal Asphyxia (Moderate HIE)	3	1 (7.7%)
Perinatal Asphyxia (Severe HIE)	5	5 (38.5%)
Sepsis	2	1 (7.7%)
Pathological jaundice requiring DVET	3	2 (15.4%)
Total	13	9 (69.2%)

Table: Distribution of Associated Risk Factors and Developmental Delay Amongbabies with Symptomatic Hypoglycemia Who Completed Follow Up (n = 6)

Risk Factors	FREQUENCY	NO. of cases with developmental delay at the end of one year
Sepsis	2	33.3%
Sepsis + LBW	1	16.7%
Low birth weight	1	16.7%
Sepsis + Prematurity + VLBW	2	33.3%
Total	6	100%

Table: Overview Of Risk Factors Among The Babies Having Delay (N=15) At The End Of One Year Of Follow Up

High Risk Factors	Frequency	Percentage
Severe Birth ASphyxia	5	33.3%
Moderate Birth Asphyxia	1	6.7%
Sepsis+Prematurity+Low Birth Weight	3	20%
Sepsis + Pathological Jaundice	2	13.3%
Sepsis with Meningitis	1	6.7%
Pathological Jaundice	2	13.3%
Pathological Jaundice with DVET	1	6.7%
Total	15	100%

Table: Distribution of ROP in Babies Undergoing ROP Screening

ROP	Frequency	Percent
NO	32	86.5 %
YES	5	13.5 %
Total	37	100.0%

Table: Distribution of Treatment in babies having ROP

ROP TT	Frequency	Percent
Anti-VEGF + Laser	2	40.0 %
Laser	2	40.0 %
NO	1	20.0 %
Total	5	100.0%

Table: Distribution of outcome of babies having ROP at 1 year of follow up

Total No. of ROP cases	No. of cases with normal vision	No. of cases having visual impairment
5	**4(80%)**	**1 (20%)**

Table: Distribution of Hearing (BERA)

Hearing (BERA)	Frequency	Percent
Done	74	74.0%
Not Done	26	26.0%
Total	100	100.0%

Table: Distribution of BERA findings

BERA findings	Frequency	Percent
SNHL	8	10.8 %
NAD	66	89.2 %
Total	74	100.0%

Table: Distribution of Associated High Risk Factors in Babies with SNHL onBERA

High Risk Factors	Frequency	Percentage
Sepsis + Pathological Jaundice + Convulsion	2	25.0 %
Sepsis + Prematurity + VLBW	1	12.5 %
Sepsis + Meningitis + Prematurity + VLBW	1	12.5 %
Birth Asphyxia (Severe HIE) + Convulsion	2	25.0 %
Pathological Jaundice + Convulsion	1	12.5 %
Pathological Jaundice + DVET	1	12.5 %
Total	8	100%

Table: Distribution of MRI Brain findings

MRI Brain findings	Frequency	Percent
Abnormal	18	58.1%
NAD	13	41.9%
Total	31	100.0%

Table: Distribution of outcomes among babies having abnormal USG, MRI andBERA findings who completed follow up

TEST	Total No. Done	No. of abnormal result	No. of abnormal results with delay
USG	45	9 (20%)	4 (8.9%)
MRI	29	15 (51.7%)	11 (37.3%)
BERA	63	7 (11.1%)	7 (11.1%)

Table: Distribution Of Mean Hammersmith Infant Neurological Examination (Hine) Score During Follow Up At 3 Months, 6 Months And 1 Year Of Age

	Number	Mean	SD	Minimum	Maximum	Median
FOLLOW UP AT 3 MONTHS HINE	86	64.7907	8.2834	32.0000	72.0000	68.0000
FOLLOW UP AT 6 MONTHS HINE	73	68.9041	8.5994	38.0000	76.0000	73.0000
FOLLOW UP AT 1 YEAR OF AGE HINE	63	71.9262	9.3576	35.5000	78.0000	76.0000

Table: Distribution of DDST Scoring During Follow Up At 6 Months

FOLLOW UP AT 6 MONTHS DDST	Frequency	Percent
Delay	19	29.2%
Normal	46	70.8%
Total	65	100.0%

Table: Distribution of DDST Scoring During Follow Up At 1 Year Of Age

FOLLOW UP AT 1 YEAR OF AGE DDST	Frequency	Percent
Delay	16	25.4%
Normal	47	74.6%
Total	63	100.0%

Table: Distribution of DASII

DASII	Frequency	Percent
DONE	16	16.0%
NOT DONE	84	84.0%
Total	100	100.0%

Table: Distribution of mean DMeQ

	Number	Mean	SD	Minimum	Maximum	Median
DMeQ	16	59.2250	12.4706	42.0000	96.0000	58.6500

Table: Distribution of DASII INFERENCE

DASII INFERENCE	Frequency	Percent
Delayed Motor + Mental Development	15	93.8%
Normal	1	6.3%
Total	16	100.0%

Table: Distribution of FOLLOW UP STATUS

FOLLOW UP STATUS	Frequency	Percent
Completed	63	63.0%
Incomplete	37	37.0%
Total	100	100.0%

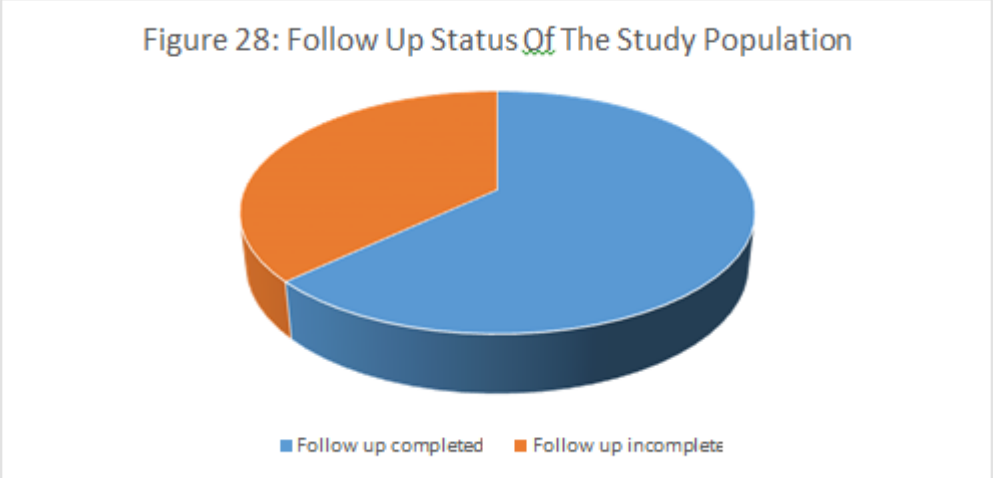

Table: Distribution of follow up outcome

FINAL IMPRESSION	Frequency	Percent
DELAY	15	15.0%
NO DELAY	48	48.0%
Lost to followup	37	37.0%
Total	100	100.0%

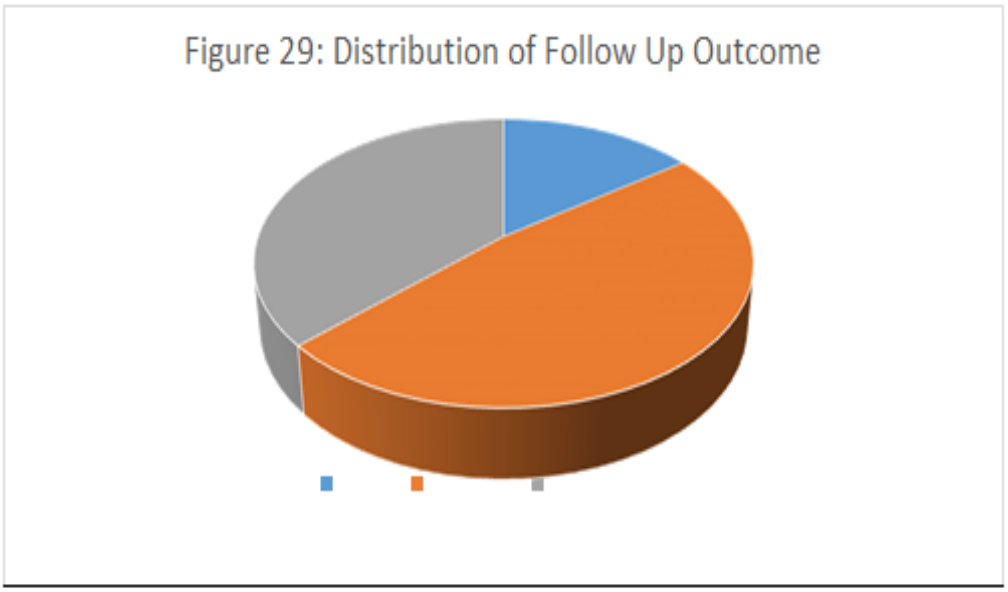

Table: Distribution of Developmental Delay in The Babies That Completed FollowUp

VARIABLE	Frequency	Percent
Delay	**15**	**23.8%**
No Delay	**48**	**76.2%**
Total	**63**	**100%**

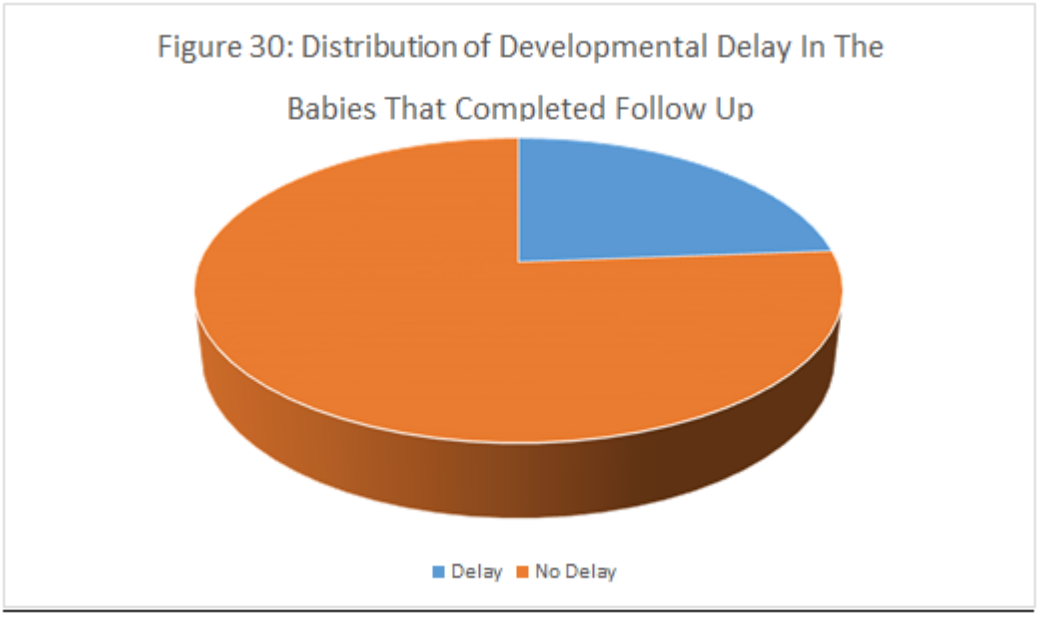

Table: Distribution of mean Mother Age

	Number	Mean	SD	Minimum	Maximum	Median
Mother Age	100	23.5500	4.4685	16.0000	37.0000	23.5000

Table: Distribution of mean Father Age

	Number	Mean	SD	Minimum	Maximum	Median
Father Age	100	28.7800	4.6157	21.0000	42.0000	28.0000

Table: Distribution of Education among Mothers

Education	Frequency	Percent
Diploma	1	1.0%
Graduate	3	3.0%
High School	17	17.0%
Illiterate	38	38.0%
Middle School	25	25.0%
Primary School	16	16.0%
Total	100	100.0%

Table: Distribution of mean Income

	Number	Mean	SD	Minimum	Maximum	Median
Income	98	16122.4490	10114.0561	0.0000	50000.0000	12000.0000

Table: Distribution of Modified Kuppuswamy's Socio-economic status scale of totalstudy population (n=100)

Kuppuswamy's Socio-economic status scale(class)	Frequency	Percent
Upper	0	0 %
Upper Middle	24	24 %
Lower Middle	26	26%
Upper lower	41	41%
Lower	9	9%
Total	100	100.0%

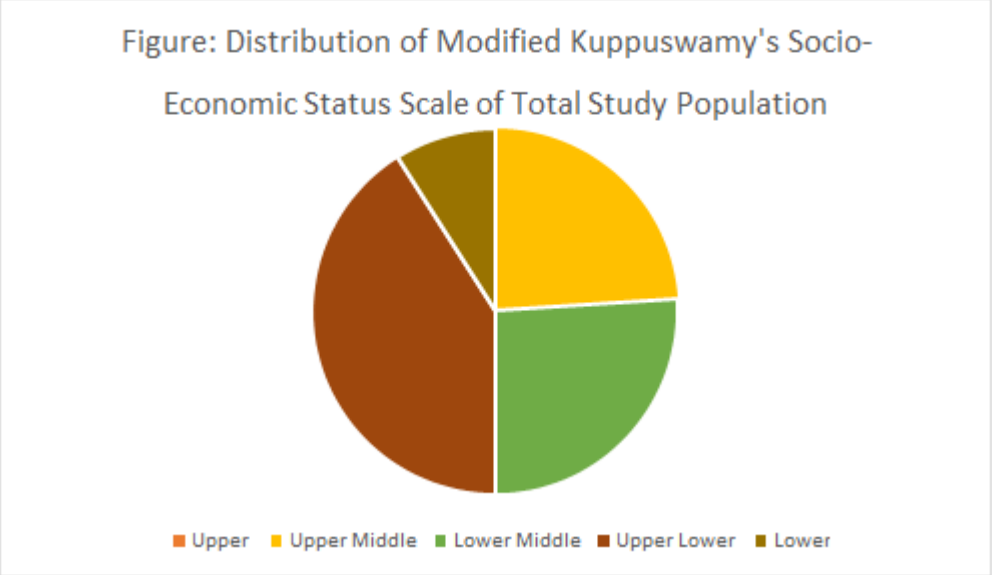

Table: Distribution of Modified Kuppuswamy's Socio-economic status scale and development delay among babies completing follow-up (n=63)

Kuppuswamy's Socio-economic status scale(class)	Babies completing follow up	Babies having Delay	Percentage of delay among babies that completed follow up with respect to each economic class
Upper	0	0	0 %
Upper Middle	15	1	6.7 %
Lower Middle	17	3	17.6%
Upper lower	25	9	36%
Lower	6	2	33.3%
Total	63	15	23.8%

Discussion:

In this study, 100 high risk babies were enrolled for follow-up up to 1 year. The mean birth weight was 2.1924 kg with a minimum of 0.755 kg and maximum of 3.880 kg. The mean gestational age was 36.1735 weeks with minimum gestational age of 28 weeks and maximum gestational age of 41 weeks. Of the total babies enrolled for follow up, 59 were males and 41 females. The mean duration of hospital stay was 16.47 days with minimum being 2 days and maximum being 62 days. Out of 100 enrolled high risk babies, 37% (n = 37) babies were lost of follow up and only 63% (n = 63) babies completed the follow up. 50% (n = 50) , 86% (n = 86), 73% (n = 73) and 63% (n = 63) babies were available for follow up at 1 month, 3 months, 6 months and 1 year of age.

Among the babies completing follow up(n=63), 15 (23.8%) were found to have developmental delay at the end of 1 year. In this study, the incidence of developmental delay among high risk infants completing follow up is quite high (23.8%) and similar to the high incidence found by Chatterjee et al. (31.6%) , Calame et al. (29%) and Shrestha et al. (28.6%).[3,7,35] The demographic characteristic of high risk babies enrolled for

follow up consisted of 24 cases of perinatal asphyxia (9 having severe HIE and 15 having moderate HIE by Levene's Scoring[36] at birth) , 21 cases of neonatal convulsion, 7 cases of invasive ventilation, 11 cases of symptomatic hypoglycemia, 31 cases of sepsis/meningitis, 45 cases of pathological jaundice of which 5 cases required double volume exchange transfusion, 15 cases having gestational age less than 34 weeks and 31 cases with a birth weight of less than 1800 grams. However, the babies that completed follow up consisted of 16 cases of perinatal asphyxia (11 moderate HIE and 5 severe HIE), 13 cases of neonatal convulsion, 5 cases of invasive ventilation, 6 cases of symptomatic hypoglycemia, 23 cases of sepsis/meningitis, 23 cases of pathological jaundice of which 4 cases required double volume exchange transfusion, 9 cases having gestational age less than 34 weeks and 19 cases with a birth weight of less than 1800 grams. In this study, we found that the occurrence of developmental delay in relation to the risk factors among the babies who completed follow up was more with perinatal asphyxia (severe HIE) with 5 out of 5 babies (100%) having developmental delay at the end of 1 year. It was followed by neonatal convulsion with 9 out of 13 babies (69.2%), mechanical ventilation with 3 out of 5 babies (60%), gestational age less than 34 weeks with 3 out of 9 babies(33.3%), sepsis with 5 out of 19 babies(26.3%), sepsis with meningitis with 1 out of 4 babies(25%), pathological jaundice with DVET with 1 out of 4 (25%), pathological jaundice without DVET with 4 out of 19 babies (21.05%) , birth weight less than 1800 grams with 4 out of 19 babies(21.05%) and perinatal asphyxia (moderate HIE) with 1 out of 11 babies (9.1%) having developmental delay at the end of 1 year. Chandrasekaran et al in his study to find the effect of blood glucose levels (< 51 mg%) in the first 3 days of life on developmental outcome at 1 year in low birth weight neonates less than 2000 grams found positive correlation between low blood glucose levels and lower developmental outcome.[38] However, even though high risk neonates with blood glucose <51 mg% had a lower developmental outcome than those with blood glucose levels >50 mg% at 1 year, other morbidities were found to determine their composite outcome. In this study, no association was found between symptomatic hypoglycemia and developmental delay at the end of one year. Chatterjee et al in her study of neurodevelopmental outcome of high risk newborns discharged from special care baby units in a rural district in India detected developmental delay in 31.6% of the study population.[7] Of the 134 with developmental delay, 61 were preterm, 80 were low birth weight, 52 with history of sepsis, convulsion in 14, birth asphyxia in 39 and jaundice in 14 babies.[7] Of the 19 babies with cerebral palsy, only 6 gave a history of birth asphyxia.[7] In the group with sepsis, incidence of developmental delay showed no difference from the general population. In the group with seizures, 46.6% (14 out of 30) babies had some developmental delay, while all 3 babies with meningitis were also affected. Eleven out of 14 with seizures and 3 out of 3 with meningitis had motor delays. This points to the fact that insult to the neonatal brain in the form of infections or metabolic derangement may be detrimental to development.[7]

In similar study by Shrestha M., Bajracharya L. and Shrestha L. for neurodevelopmental outcome of high risk babies at one year of age, 28 babies were enrolled.[3] Of the total babies, half of them were term babies and half of the babies were low birth weight. Male babies (61%) were more than female babies (39%). Mechanical ventilation was required for 8 (28.6%) babies. At the end of one year, 20 children were found to be developmentally normal whereas 8 (28.6%) had developmental delay (7 had global delay and one had spastic cerebral palsy).[3]

In the study for neurological outcome in high risk weight appropriate for gestational age preterm children at early school age by R.H. Largo and L. Molinari , neurological outcome at 5-6 years of age in the majority of preterm children was comparable to that of term children(control group). However, 15% of boys and 9% of girls in the preterm group were diagnosed to have cerebral palsy where mild diplegia was most frequently observed among whom 4 % of the children were severely impaired.[16] In this study, HINE scoring showed an increasing trend with age; mean HINE scores at 3 months of age was 64.79 and at 1 year of age was 71.92.

In our study, at the age of 6 months, out of 65 babies undergoing DDST, 19 were found to be suspects for developmental delay. Whereas at the age of 1 year, out of 63 babies undergoing DDST, 16 babies were found to be suspects. All the 16 babies who were found to be suspects of developmental delay during DDST scoring at 1 year of life underwent DASII scoring which showed both motor and mental developmental delay in 15 and normal motor and mental development in 1. In the 16 babies undergoing DASII, the mean DMoQ was 59.118 with minimum 42 and maximum of 78. The mean DMeQ was 59.2250 with minimum value of 42 and maximum 96. Out of 16 babies, 15 babies had both their DMoQ and DMeQ below 70. In the study by Mukhopadhyay et al.[2], of 101 VLBW babies available for follow up at chronological age(CA) of 1

year, 3 (3%) babies had Cerebral Palsy (CP) and 3%(n=3) had suspect abnormality (mild hypotonia), 11% (n=11) had gross motor and 8% (n=8) had language abnormality. Their mean mental (MeDQ) and motor (MoDQ) quotients were 80.4±10.7 and 77.2±13.3 respectively and a score of less than 70 was found in 17% (MeDQ) and 25.7% (MoDQ) VLBW babies. Amongst ELBW babies (<1000 g), 6.6% (n=1) had CP, 25% (n=3) and 42% (n=5) had low MeDQ and MoDQ respectively.

In our study, 71 % (n=71) babies of all the entire study population (consisting of both those who completed follow up and those that were lost to follow up) had USG Brain done. Out of the 71 babies in whom USG brain was done, 16.9% (n=12) had some abnormal findings. 31% (n=31) of the study population had their MRI brain done. Out of the 31 babies 58.1% (n=18) had abnormal findings in their MRI brain. A total of 74% (n=74) of all enrolled babies had BERA. Out of the 74 babies, 10.8% (n=8) of the babies had confirmed SNHL and 89.2% (n=66) showed normal results.

However, among babies that completed follow up (n=63), USG Brain was done only in 45 babies (71.4%), MRI in 29 babies (46.0%) and BERA in 63 babies (100%). Out of 45 babies undergoing USG Brain, 9 (20%) showed abnormal findings and among those with abnormal USG Brain findings 44.4% (4 out of 9) babies were found to have developmental delay at the end of one year. Out of 29 babies who had MRI brain done, 15 (51.7%) had abnormal findings and among those with abnormal findings 73.3% (11 out of 15) babies had delay. 63 babies who completed follow up had BERA, of which 7 (11.1%) showed confirmed sensorineural hearing loss and developmental delay was found all of them. In our study, a total of 5 babies had ROP out of which 4 (80%) had normal vision at the end of 1 year and 1 (20%) had impaired vision at the end of 1 year. In the study by Chatterjee et al., 11 children had visual impairment of which 10 were preterm babies but only 2 were considered to be definite sequelae of ROP.[7]

Among the parents of the enrolled babies the mean age of mothers was 23.5 years and mean age of fathers was 28.78 years. 97% of the mothers were housewives with 38% being illiterate. 30% of the fathers were either labourers or farmers with 24% of them being illiterate. Socio-economic status by Modified Kuppuswamy socio-economic status scale showed majority of the study population (41%) belonged to upper-lower class followed by lower middle class (26%). In this study, the incidence of developmental delay was more among babies belonging to the lower socio-economic classes. In the babies completing follow up, out of 25 babies belonging to upper-lower class 9 (36%) babies had developmental delay and out of 6 babies belonging to the lower class 2 (33.3%) had developmental delay. Whereas out of 15 babies of upper middle and 17 babies of lower middle only 1 (6.7%) and 3(17.6%) respectively had developmental delay.

Another factor bearing influence on development is environment of a child. Lower maternal education and socio-economic status are indices of a poor rearing environment. These were associated with an adverse mental outcome.[9] M Juneja, A Shankar and S. Ramji in their study found that while being born LBW and the degree of growth retardation at birth places one at a definite disadvantage for all growth parameters and to some extent for mental development, overall developmental delay is increased in a background of a poor socio-economic status and poor maternal education.[9] Similar to the finding by Chatterjee et al., in this study too, many babies presented with more than one risk factor or neonatal illness, therefore a direct association of developmental delay with a particular risk factor was difficult to be elicited.[7] In this study, among the 15 babies having delay at the end of 1 year, 33.3% (n=5) had severe HIE, 6.7% (n=1) had moderate HIE, 20% (n=3) had sepsis with prematurity and very low birth weight, 13.3% (n=2) had sepsis with pathological jaundice, 6.7%(n=1) had sepsis with meningitis, 13.3%(n=2) had pathological jaundice alone and 6.7%(n=1) had pathological jaundice requiring DVET .

Conclusion:

High risk infants have increased incidence of neurodevelopmental delay and therefore they need to be followed up regularly. Appropriate and timely intervention is necessary to reduce developmental delay due to the neonatal risk factors and handicap caused by associated co-morbidities. The aim of our study was to assess the neurological outcome of high risk infants discharged from Sick Neonatal Care Unit and NICU. The study started with 100 high risk babies who were to be followed up for one year. Babies having perinatal asphyxia, sepsis, symptomatic hypocalcemia, convulsion, pathological jaundice with or without DVET , those with birth weight <1800 grams and gestational age < 34 weeks and those who received mechanical ventilation for >24 hours were included in the study. However due to financial reasons, lack of proper transportation facilities, remoteness of the homes of the enrolled babies and in some cases due to

apathy of the family members , many cases were lost to follow up. The follow-up of the remaining high risk babies however showed considerable developmental delay with 23.8 % of the babies who had completed follow up showing developmental delay , 11.1% having bilateral sensorineural hearing loss and 1 baby with abnormality of vision at the end of 1 year.

Many babies who have risk factors for developing neurodevelopmental delay may not show any clinical signs of developmental delay at birth but these neurological deficits may manifest later on during pre-school and school age. These children may be faced with problems such as attention deficit disorders, autism, speech and language disorders, problems of vision and hearing, learning disabilities etc. In almost every place in the world, people with disabilities are faced with social stigma which hinders their normal social life. They are also faced with limited access to basic facilities like employment, education etc.

Therefore, it is very necessary that high risk babies be followed up from time to time using standardized screening tools as these can detect neurological deficits which may otherwise not be apparent clinically during the early stages at which intervention can be most effective. Early detection and appropriate intervention can reduce the future morbidity and improve the quality of life.

Limitation of Study:

Due to socio-economic reasons and difficulty in transportation from far off areas, a significant number of cases was lost to follow up. This study is an observational and single center study. Due to non-compliance by parents many babies did not have BERA and MRI tests as advised on discharge. USG brain was not done in many babies either because the babies were not clinically fit to be sent for USG brain during hospital stay (as trained personnel and proper facility for USG brain not available at SNCU or NICU) or non- adherence to the advice for USG brain on discharge. Due to the non-availability of facilities for developmental assessment like DASII in our center, babies had to be taken to other higher center (SSKM Hospital, Kolkata) for developmental assessment by DASII.

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