Original Research Article

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Growth outcome, feeding practices and co morbidities in follow up of discharged newborns from special newborn care unit Gwalior, India

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ABSTRACT

Background: In spite of advances in neonatal care, infant mortality is still high in India. Regular follow up of discharged newborns could bring down infant mortality and reduce long term disability by early identification and intervention. The primary objective of the study is evaluating the Special Newborn Care Unit(SNCU) graduates for Comorbidities, feeding and immunization practices, growth assessment and outcome during follow up.

Methods: The discharged neonates from SNCU, GRMC were examined for their morbidity and growth monitoring done. Feeding and immunization practices were observed.

Results: Among 100 neonates observed, 2 neonates were excluded and 41(41.8%) were females and 57(58.1%) were males. Major causes of indication of admission were prematurity (25.5%) and birth asphyxia (22.4%). During follow up, 23(23.4%) neonates had respiratory infections followed by 19 cases (19.3%) of diarrhea. Around 45(45.9%) infants' weight fall between -1 to +1 SD which was around 55 infants during admission. Length monitoring showed that around 68(69.3%) infants length fall between -1 to +1 SD which was 72 during admission. Exclusive breast feeding was observed in 68(69.3%) infants, 7 infants (7.1%) were exclusively top fed, and 19 infants (19.3%) were mixed fed. Immunization was appropriately done in only 51 infants (52%). Retinopathy of prematurity was observed in 2 infants during follow up. Hearing difficulty was observed in 1 infants.

Conclusions: Most common indication of admission in SNCU was prematurity. Most common comorbidity during follow up was respiratory infection. Weight monitoring of infants showed the reduction in weight during follow up than admission whereas length and head circumference was relatively static during admission and follow up.

Keywords: Co-morbidity, Feeding practices, Growth, Immunization, Length, Weight

INTRODUCTION

The neonatal period is a transition from intrauterine to independent life. The neonatal period is a very vulnerable period due to several physical and physiological problems of which most of these are preventable. The most common causes for neonatal mortality are prematurity and low birth weight (LBW). As per report published in the lancet, the major direct causes of

neonatal mortality are prematurity (27%), infection (26%), asphyxia (23%), congenital anomalies, tetanus (7% each) and diarrhea (3%).⁴

Improving outcomes beyond survival is an emerging challenge for high-risk newborns in resource-limited countries. Advancement in perinatal and neonatal care have significantly helped in reducing Neonatal Mortality Rate (NMR) in developed countries but the mortality and

morbidity are still high in developing countries.⁵ With the advancement in neonatal intensive care units and efforts behind saving of newborns, the numbers of surviving low birth weight infants is increasing and the potential of having children with long term disabilities is on the rise. Numerous studies have shown that despite reduction in neonatal mortality, the incidence of chronic morbidities and adverse outcomes are on the rise. In India, the neurological sequelae of a composite high risk cohort were evaluated by Chaudhari at 3 years and by Paul and Sukumaran at 1 year, and Baburaj evaluated the growth and development of graduates from a rural NICU at 1 year.⁶⁻⁹

Neurodevelopmental impairments include motor function deficits such as cerebral palsy, cognitive delay and sensory impairments such as visual and auditory deficits. This highlights the paramount importance of monitoring the growth and neurodevelopmental outcome of NICU graduates through a multidisciplinary approach. So in order to overcome these difficulties, a method of early detection and hence early intervention is mandatory. Researchers found that the best solution for these problems is based on the development of proper neonatal follow-up program in every neonatal intensive care unit and specialized care must be taken for problems of growth, development, and chronic disease and is best provided within the setting of neonatal follow-up program. It

Hence a preliminary study was undertaken on the morbidity pattern and survival pattern of neonates admitted to neonatal intensive care unit after their discharge from the tertiary care hospital located at Gajra Raja Medical College, Gwalior.

METHODS

The observational longitudinal prospective study was performed at the follow up clinic of Department of Paediatrics, Gajra Raja Medical College, Gwalior during January 2019 to June 2019 on discharged new-born from SNCU Gwalior after approval of research protocol from ethical committee of G.R.M.C, Gwalior(Madhya Pradesh). Then written informed consent were obtained from the parents of any infant in the study. Total 100 discharged new-borns from SNCU Gwalior was taken into study during follow up.

The follow-up schedule according to the SNCU protocol are at 8 days, 1 month, 3 month, 6 month, 12 months of age. Infants attending the follow up were examined and their growth were assessed. History of the infants were obtained regarding the chief complaints, immunization and feeding practices. Growth assessment (measurement of weight, length, and head circumference) was done and plotted on World Health Organization (WHO) growth charts. Weight was measured on an electronic weighing machine with $\pm 10 \, \mathrm{gm}$ accuracy. Length and head

circumference (HC) were measured using infant meter and non-stretchable tape respectively.

Retinopathy of prematurity (ROP) screening was done in ophthalmology department, GRMC for premature infants, following the standard timing schedule based on postnatal age. Hearing screening was done for indicated infants in ENT department, GRMC according to standard schedule based on postnatal age.

Inclusion criteria

All new-borns discharged from SNCU with proper documentation.

Exclusion criteria

Infants with major congenital anomaly, new-borns discharged against medical advice and parental refusal to give consent of participation were excluded.

Tools used

- Follow up proforma
- Weighing machine (approx. 10 gms)
- Infantometer
- Non-stretchable measuring tape

Statistics

Data collected were compiled in MS excel sheet and analysis was done. Descriptive and frequency analysis was done.

RESULTS

A total of 100 neonates during follow up were taken in the study and out of which 2 neonates were excluded due to congenital anomaly. Out of this 41(41.8%) were female and 57(58.1%) were males. The ratio of male to female infants during follow up was 1.4:1. Major causes of indication of admission to SNCU were prematurity (25.5%), birth asphyxia (22.4%), Neonatal hyperbilirubinemia (14.2%), neonatal sepsis (11.2%), respiratory distress syndrome (RDS) (7.1%), Meconium aspiration syndrome (7.1%), transient tachypnoea of new-born (6.1%), Meningitis (6.1%). Among the admitted neonates, the morbidity profile during the period of admission due to various reasons were hypoglycaemia, which was observed in 12 neonates, hypocalcemia was observed in 9 neonates, seizures were present in 13 neonates. Other morbidity during admission were blood culture positive sepsis in 11 neonates, neonatal hyperbilirubinemia in 13 neonates and hypothermia in 5 neonates.

In follow up schedule of 8 days, 1 month, 3 month, 6 month, 12 months of age, the maximum number of neonates around 41(41.8%) attended follow up in the first schedule of 8 days after which gradually the neonates were reduced in the further schedule. In the remaining

schedule, 27(27.5%) neonates came for 1 month follow up, 14(14.2%) neonates attended 3 month schedule, 12(12.2%) neonates attended 6 month schedule, and 4(4%) attended 12 month schedule. Out of the total 98 neonates in the study, 39(39.7%) neonates had missed their follow up schedule previously (Table 1).

Table 1: Follow up schedule of infants.

S.No	Follow up schedule	No (%)
1	8 days	41(41.8%)
2	1 month	27(27.5%)
3	3 month	14(14.2%)
4	6 month	12(12.2%)
5	12 month	4(4%)

Among the neonates attended the follow up, the most common comorbidity found was respiratory infection in which the neonates were presented with chief complaints of cough, cold and fever. About 25 infants came for follow up according to their schedule without any complaints. Around 23(23.4%) neonates were presented with respiratory infections followed by 19 cases (19.3%) of diarrhoea. Among the neonates attending the follow up, around 12(12.2%) of them came with complaints of growth failure, out of which only 4 of them were having weight for age <-3 SD according to WHO growth chart. Other co morbidities found during follow up were jaundice in 6(6.1%) infants, convulsions in 5 infants (5.1%), development delay in 4 infants (4%), Retinopathy of prematurity in 2 infants (2%), hearing difficulties

diagnosed by BERA in 1 infant(1%) and chronic bilirubin encephalopathy in 1 infant (1%) (Table 2).

Table 2: Profile of Co morbidities of infants during follow up.

S.no	Co morbidities during follow up	No (%)
1	Respiratory infection	23(23.4%)
2	Diarrhea	19(19.3%)
3	Seizures	5(5.1%)
4	Jaundice	6(6.1%)
5	Growth failure	12(12.2%)
6	Development delay	4(4%)
7	ROP	2(2%)
8	Hearing difficulties(by BERA)	1(1%)
9	Chronic bilirubin encephalopathy	1(1%)
10	No specific complaints	25(25.5%)

In the growth assessment of infants during follow up, weight, length and head circumference of infants were measured. Outcome of infants during follow up was observed that 4 infants were having weight < -3 SD out of which only 2 were <-3 SD during admission. Around 45(45.9%) infants weight fall between -1 to +1 SD which was around 55 infants during admission. Number of infants whose weight between -2 to -1 SD was increased from 21 infants during admission to 26 infants during follow up and those weight between -3 to -2 SD was increased from 15 infants during admission to 19 infants during follow up (Table 3).

Table 3: Weight outcome of infants during follow up.

S.No	Weight	On Admission No of infants	On Discharge No of infants	On Follow up No of infants(%)
1	<-3SD	2	2	4(4%)
2	-3SD to -2 SD	15	15	19(19.3%)
3	-2 SD to -1 SD	21	21	26(26.5%)
4	-1 SD to median	25	25	21(21.4%)
5	Median to +1 SD	30	30	24(24.4%)
6	+1 SD to +2 SD	5	5	4(4%)
7	+2SD to +3 SD	0	0	0
8	>+3 SD	0	0	0

Length assessment of infants during follow up observed that none of the infants fall <-3 SD in their length. Around 68(69.3%) infants length fall between -1 to +1 SD which was around 72 infants during admission. Number of infants whose length between -2 to -1 SD was increased from 11 infants during admission to 15 infants during follow up and those length between -3 to -2 SD was increased from 7 infants during admission to 9 infants during follow up (Table 4). Head circumference

assessment of infants during follow up observed that 1 infant had head circumference <-3 SD during admission and also during follow up. Around 69(70.4%) infants' head circumference fall between -1 to +1 SD during follow up which was reduced from 71 infants during admission. Number of infants whose head circumference between -2 to -1 SD was increased from 12 infants during admission to 14 infants during follow up and those head circumference between -3 to -2 SD was 6 infants both during admission and follow up (Table 5).

Table 4: Length outcome of infants during follow up.

S.No	Length	On Admission No of infants	On Discharge No of infants	On Follow up No of infants(%)
1	<-3SD	0	0	0
2	-3SD to -2 SD	7	7	9(9.1%)
3	-2 SD to -1 SD	11	11	15(15.3%)
4	-1 SD to median	38	38	36(36.7%)
5	Median to +1 SD	34	34	32(32.6%)
6	+1 SD to +2 SD	8	8	6(6.1%)
7	+2 SD to +3 SD	0	0	0
8	>+3 SD	0	0	0

Table 5: Head circumference outcome of infants during follow up.

S.No	Head circumference	On Admission No of infants	On Discharge No of infants	On Follow up No of infants(%)
1	<-3SD	1	1	1(1%)
2	-3SD to -2 SD	6	6	6(6.1%)
3	-2 SD to -1 SD	12	12	14(14.2%)
4	-1 SD to median	34	34	33(33.6%)
5	Median to +1 SD	37	37	36(36.7%)
6	+1 SD to +2 SD	8	8	8(8.1%)
7	+2SD to +3 SD	0	0	0
8	> +3 SD	0	0	0

In the feeding practices, among 98 infants who attended the follow up around 94 infants were less than 6 months of age.

Among 94 infants who were less than 6 months of age, exclusive breast feeding was observed in 68(69.3%) infants, 7 infants (7.1%) were exclusively top fed, and 19 infants (19.3%) were mixed fed (Table 6).

Table 6: Profile of feeding practices of infants during follow up.

S.No	Feeding practices	No(%)
1	Exclusive breast feeds	68(69.3%)
2	Mixed feeds	19(19.3%)
3	Exclusive top feeds	7(7.1%)
4	Complementary feeds	4(4%)

Among the 98 infants studied, immunization was appropriately done in only 51 infants (52%) and remaining 47 infants were not immunized appropriately. Retinopathy of prematurity was observed in 2 infants during follow up out of which one infant was having stage 1 ROP who was closely followed up and other was having stage 3 ROP with plus disease who was referred to higher centre for further management. Hearing difficulty was observed in 1 infant which was diagnosed by BERA at 6 months of age who was referred to ENT department for further management and was regularly followed up.

DISCUSSION

A total of 100 neonates during follow up were taken in the study and out of which 2 neonates were excluded due to congenital anomaly. The ratio of male to female infants during follow up was 1.4:1. Most common indication of admission in SNCU was prematurity followed by birth asphyxia. Other indication for admission were neonatal hyperbilirubinemia, sepsis, respiratory distress syndrome, meconium aspiration syndrome, transient tachypnea of newborn and Meningitis. Among the admitted neonates, the morbidity profile during the period of admission due to various reasons were found. Among them hypoglycemia was most commonly observed in preterm and small for gestation age babies. Hypocalcemia was most commonly observed in HIE babies. Seizures was observed in HIE babies and meningitis. Other morbidity during admission were blood culture positive sepsis in 11 neonates, neonatal hyperbilirubinemia in 13 neonates and hypothermia in 5 neonates out of which all the morbidities were common among the preterm and small for gestational age babies.

In follow up schedule, the maximum number of neonates attended follow up in the first schedule of 8 days after which gradually the neonates were reduced in the further schedule. This could be due to fact that initially during discharge the parents of the infants were strictly informed and insisted about the follow up date and counseled about the danger signs of the infant, which caused the parents to

attend the first schedule strictly. Out of the total 98 neonates in the study, 39.7% neonates had missed their follow up schedule previously which could be due to lack of information provided to the parents during follow up.

Among the neonates attended the follow up, the most common comorbidity found was respiratory infection. Other co morbidities observed were diarrhoea, growth failure, jaundice, convulsions, development delay, retinopathy of prematurity, hearing difficulties. About 25 infants attended follow up without any complaints. Among the neonates attending the follow up, around 12 of them came with complaints of growth failure, out of which only 4 of them were having weight for age <-3 SD according to WHO growth chart. Among the infants who presented with diarrhoea, hardly none of the infants had dehydration and gastrocolic reflex which was normal in infancy was misinterpreted as diarrhoea by the parents. In the study conducted by Padmaja D, Mohanty NC, morbidities identified were fever associated with cold and cough suggestive of respiratory infections (91.96%), diarrhoea (36.14%), failure to gain weight (12.85%), jaundice (1.60%), convulsion (0.8%), and developmental delay (1.2%).12

In the growth assessment of infants during follow up, weight, length and head circumference of infants were measured and plotted in WHO growth charts and compared with their admission parameters. Infants were having reduction in weight during follow up than their admission weight whereas length and head circumference was relatively static during admission and follow up. Major reason behind reduction in weight during follow up could be due to faulty feeding practices and lack of knowledge about frequency and type of breast feeding which differs according to gestational age. This was also shown by Suman Das, Bhattacharya M, Sanyal D, Basu S, Chatterjee A, Paul D.K, Sen S, Bhakta S, Aich B in which among 16 infants with birth weight <1.5kg, 3 (18.75%) had normal weight and 13 (81.25%) had weight <3rd percentiles at 1 year of age.¹³

In the feeding pattern, faulty feeding practices were observed in 26.5 % infant's majority of whom belong to low socio economic status families. Infants were either mixed fed due to lack of knowledge or exclusively top fed due to unavailability of mothers. This concludes that parents should be counselled properly during follow up regarding infant and young child feeding practices. Immunisation was missed in 47.9% of infants from their schedule in which majority of the parents were not informed during discharge. This also concludes that counselling regarding immunization should be insisted among parents during follow up. Retinopathy of prematurity was observed in 2 infants during follow up out of which one infant was having stage 1 ROP who was closely followed up and other was having stage 3 ROP with plus disease who was referred to higher centre for further management. Hearing difficulty was observed in 1 infant which was diagnosed by BERA at 6 months of age

who was referred to ENT department for further management and was regularly followed up. Infants who were in need of ROP screening and hearing screening, had not undergone screening regularly because of missed follow up. Those who attended the follow up clinic regularly according to schedule had their screening properly. The appropriate screening for those infants who were indicated should be done and proper intervention should be taken which forms the integral part of the follow up. This discussion concludes that follow up program and counselling is an integral part of SNCU graduates especially in low birth weight babies which could prevent long term disabilities among them in future.

CONCLUSION

The ratio of male to female infants during follow up was 1.4:1. Most common indication of admission in SNCU was prematurity followed by birth asphyxia. In follow up schedule, the maximum number of neonates attended follow up in the first schedule of 8 days after which gradually the neonates were reduced in the further schedule. Among the neonates attended the follow up, the most common comorbidity found was respiratory infection. Other co morbidities observed were diarrhoea, growth failure, jaundice, convulsions, development delay, retinopathy of prematurity, hearing difficulties. Weight outcome of infants showed that infants were having reduction in weight during follow up than their admission weight whereas length and head circumference was relatively static during admission and follow up. In the feeding pattern, faulty feeding practices were observed in 26.5% infants. Immunisation was missed in 47.9% of infants. Retinopathy of prematurity was observed in 2 infants during follow up and Hearing difficulty was observed in 1 infant.

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Institutional Ethics Committee

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