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Original Research Article

An Observational Study on Risk Factors and Outcomes of Severe Neonatal Jaundice Requiring Exchange Transfusion in Tertiary Care Hospital in Hyderabad

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Abstract

Aim: To find out the prevalence of specific risk factors among babies who received exchange transfusion for severe neonatal jaundice and to note their clinical outcome at the end of one month post procedure.

Materials and Methods: Retrospective Observational Study done in NICU, SNCU and Level-3 ICU at Niloufer Hospital for Women and Children from 18 months. 56 neonates who received exchange transfusion for severe neonatal jaundice

Results: Majority of the babies were admitted on the day of birth (39%) followed by 1st DOL (14%) followed by 5th DOL (13%). Majority of the babies underwent ET on 1st DOL (18%) followed by day of birth (16%) followed by 5th DOL (16%) neonates. %). Maximum admissions for hyperbilirubinemia occurred on birth day itself. Mean TSB on DOA was 24.58±4.68 mg/dl. Most common risk factors found during the study were absence of breast feeding (63%), Rh incompatibility (35.7%), ABO incompatibility (25%), Birth Asphyxia (14%), Sepsis (9%), GDM (9%), Preeclampsia (7%). Among the outcomes studied, 4 cases underwent mortality (7%). Of the cases that died, 2 were born preterm at 32 weeks and 35 weeks respectively. All babies had the uniform risk factor of lack of breastfeeding. Two cases had Rh incompatibility, of which one also had a positive sibling history. One case showed ABO incompatibility. 39.2% cases showed no morbidity. 53.5% cases showed morbidities, of which most commonly noted morbidities were thrombocytopenia(23%) followed by sepsis (21%) . Hypocalcaemia was found in 14.2 % cases.

Conclusions: Exchange Transfusion, though a lifesaving procedure, effective in rapidly bring down bilirubin levels is not bereft of complications. Significant morbidities identified after the procedure must prompt us to be more stringent in preventive care aspects for severe neonatal jaundice.

Keywords: Exchange Transfusion, Neonatal jaundice, hyperbilirubinemia.

Introduction

Jaundice is the most common morbidity in first week of life, occurring in 60 % of term and 80 % of preterm new born and it is the most common cause of readmission after birth hospitalization. [1]

Physiological jaundice is very common; most babies look yellow for a few days and recover with no intervention. However a few babies may develop Severe Neonatal Jaundice that can result in irreversible neuro disability or death if not managed timely and appropriately. [1]

Severe neonatal jaundice is defined as jaundice related to any of the clinical outcomes including acute bilirubin encephalopathy, kernicterus, Exchange transfusion or jaundice related death. SNJ is probably the commonest cause of preventable neuro disability; it is associated with cerebral palsy, deafness and language problems. [2] Major risk factors for development of severe hyperbilirubinemia include pre- discharge TSB in high risk zone (>95th centile on AAP nomogram), jaundice within first 24 hours of life, immune or other haemolytic disease, prematurity, previous sibling with neonatal jaundice, cephal-hematoma and significant bruising, east Asian race. [1] SNJ is not evenly distributed across the world, the low and middle income countries are most affected. A systematic review of population based studies showed extremely high incidence in South East Asian region 251(132 to 473)/10,000 births in sharp contrast to 4.4 (1.8 to 10.5) and 3.7(1.7 to 8) in America and Europe respectively. The incidence

of ET was 107 in South East Asian region as compared to 0.38 in Europe and America. [2]

Exchange Transfusion is the removal of an infant's blood with high bilirubin level and/or antibody coated red blood cells and replacement with fresh donor blood. It is indicated when hyperbilirubinemia remains at high levels despite intensive phototherapy and is particularly useful when there is excessive haemolysis. Another indication for ET is moderate-severe acute bilirubin encephalopathy (ABE), regardless of the bilirubin level at the time. [3]

Although the frequency of neonatal ET has declined markedly in the last two decades, which is associated with the widespread use of intensive phototherapy, anti-D prophylaxis use for Rh-negative mothers, intravenous immunoglobulin (IVIG) use in infants with haemolysis, and advances in prenatal and postnatal care, this procedure is still performed in many countries, especially in those with a high incidence of severe hyperbilirubinemia. [3]

However, ET is not a risk-free procedure. Adverse events associated with ET have been reported even in settings with advanced clinical care. It may be associated with complications such as sepsis, electrolyte imbalance, air embolism, portal vein thrombosis, cardiac overload, thrombophlebitis, thrombocytopenia, necrotizing enterocolitis, the transmission of blood borne diseases, and even mortality. [3]

Anti D prophylaxis for Rh negative mothers in pregnancy and postpartum period, Risk stratification of new born for SNJ at birth with accurate pre discharge serum bilirubin estimation, timely follow up and initiation of effective phototherapy, frequent breastfeeding on demand have eliminated the need for ET in developed countries, where it has now become almost non-existent. But in India as well as other Low and Middle income countries, cases of Severe Neonatal Jaundice are frequently encountered, where Exchange transfusion becomes mandatory to prevent adverse neuro developmental outcome. [3] Taking into consideration the preventable nature of this condition, and the scope for timely small yet effective measures in preventing SNJ, we aim to study the risk factors and outcomes of babies receiving exchange transfusion of SNJ.

As exchange transfusion is a proxy indicator of the burden of SNJ, by this study, we aim to find out specific risk factors found in such babies. Analysis of the data collected, will help us to find out the relatively more important risk factors among the studied risk factors. We also aim to study the clinical outcome of those babies who received ET.

Materials and Methods

Retrospective Observational Study done in NICU, SNCU and Level-3 ICU at Niloufer Hospital for Women and Children from 18 months (JANUARY 2020 – JUNE 2021) 56 neonates who received exchange transfusion for severe neonatal jaundice

Inclusion Criteria

All neonates who received Exchange Transfusion for Severe Neonatal Jaundice.

Exclusion Criteria

Babies who received Exchange Transfusion for causes other than Severe Neonatal Jaundice, such as polycythaemia.

Ethical clearance was obtained from Institutional ethics committee, Osmania Medical College, Hyderabad. This study was conducted in Niloufer Hospital, Hyderabad, which is a tertiary care paediatric hospital, with a separate neonatology department, where both inborn and out born neonates are admitted and managed. Exchange Transfusion procedure for Severe Neonatal Jaundice is performed in either SNCU or Level 3 ICU, where separate registers are maintained for data collection exclusively for babies who have undergone exchange transfusion.

Basic details of the patient such as name, age, sex and IP no are stored in these registers. Niloufer hospital has an online patient database where patient's lab reports are uploaded.The IP number of the patient is utilized to access the online patient database from where we can gain access to the lab reports and the contact numbers. Patient's parent/ guardian are contacted and introduced to the study. Informed verbal consent is sought. If consent is refused that subject is excluded from the study. In obtaining history special focus was given to obtaining Sibling History of pathological Neonatal Jaundice, Antenatal History, Mother's and baby's Blood Group , Whether anti D injections were taken by Rh negative mother or not, Gestational Age, Birth weight , H/O birth asphyxia , Duration and type of phototherapy received , Whether baby was Breastfed while on phototherapy, Whether baby received IV fluids while on phototherapy , Any features of Bilirubin Induced Neurological Dysfunction prior to Exchange Transfusion (seizures, irritability, excessive cry, increased or decreased tone, dull activity). The data was cross checked using online patient database for Sex, Age on Day of admission, age on Day of Exchange Transfusion, total Serum bilirubin values, Haemoglobin value at presentation, Total Leukocyte count at presentation, CRP values at presentation, Investigations uploaded post exchange transfusion procedure were checked specifically for the complications like Thrombocytopenia, Sepsis (CRP+ or

Leucocytosis), Hypocalcaemia and Other Electrolyte abnormalities

Statistical Analysis

Data Entry was done using Microsoft Excel 2010 version. Data was analysed using Microsoft Excel 2010 and Epi Info 7.2.0. Data was represented as percentages, bar charts, tables and pie charts. Results on continuous measurements were presented as mean + SD (minimum to maximum) and results on categorical measurements were presented as Numbers and Percentages.

Results

Data of 80 babies who received Exchange Transfusion over the study period of 18 months was collected from the Exchange Transfusion register. Of those 24 cases could not be traced as they did not pick the call despite repeated attempts and some contact numbers were out of network. We were able to trace and follow up56 neonates, all of whose parents/guardians gave verbal consent to participate in this study, and all of them were recruited in this study. There were 27 (48%) males and 29 (52%) females.

Among these 56 neonates, 44 had normal birth weight (78.5%) 10 were LBW (17.8%) and 2 were VLBW (3.5%) Of the 56 babies in the study, 46 (82%) neonates were born at term gestation, 10 (18%) neonates were born preterm. There were no extremely preterm babies found in this study. There were 30 Rh negative mothers of whom 22 (73.3%) had received anti D immunoglobulin injection.

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Table 1: Distribution of blood group incompatibility found in the case subjects

Blood Group Incompatibility		
	N	**%**
Rh Incompatibility	20	35.7%
ABO Incompatibility	14	25%
Both	10	17.8%
None	12	21.4%

Among the 56 neonates, when their blood group was compared with their mother's blood group, it was found that 20(35.7%) neonates were having Rh incompatibility and 14(25%) neonates were having ABO incompatibility, 10(17.8%)neonates had both ABO and Rh incompatibility and 12(21.4%) had no incompatibility

Table 2: TSB and UCB values

	Mean Higest TSB Value	**Mean Highest UCB Value**
day of admission	24.58 + 4.68	19.9 + 6.05
day of exchange transfusion	27.38 + 4.28	25.97 + 5.97

Table 3: Distribution of neonates based on age on day of admission and day of exchange transfusion

	Age (DOL) Of Neonate On Day Of Admission		**Age (DOL) of the neonate on day of et**	
Age (DOI)	**N**	**%**	N	**%**
0 days	22	39%	9	16%
1 day	8	14%	10	18%
2 days	5	9%	7	13%
3 days	6	11%	4	7%
4 days	1	2%	5	9%
5 days	7	13%	9	16%
6 days	4	7%	5	9%
7 days	1	2%	4	7%
8 days	1	2%	1	2%
9 days	0	0%	1	2%
10 days	1	2%	0	0%
11 days			1	2%

Age of neonate on day of admission expressed as "day of life (DOL)" on day of admission was zero DOL for 22 (39%), 1 DOL for 8(14%), 5 DOL for 7(13%), 3 DOL for 6 (11%), 2 DOL for 5(9%), 6 DOL for 4(7%), 4 DOL for 1(2%), 7 DOL for 1(2%), 8 DOL for 1(2%), and 10 DOL for 1 (2%).[Table] [Graph].

Age on the day of Exchange Transfusion as expressed in "day of life (DOL)" was 1st DOL for 10 (18%) neonates, zero days for 9 (16%) neonates, 5th DOL for 9 (16%) neonates, 2nd DOL for 7

(13%) neonates, 4th DOL for 5 (9%) neonates, 6th DOL for 5 (9%) neonates, 3rd DOL for 4 (7%) neonates, 7th DOL for 4 (7%) neonates, 8th DOL for 1 (2%) neonate, 9th DOL for 1 (2%) neonate, 11th DOL for 1 (2%) neonate.

Table 4: Distribution of antenatal complications among mothers of neonates included in the study

	N	%
GDM	4	7%
Pre Eclampsia	3	5%
Hypothyroidism	1	2%
PIH	1	2%
Pre-eclampsia + known t2dm	1	2%
Not significant	46	82%

Of the 56 neonates, 25 (46%) neonates did not have history of pathological jaundice in sibling, 23 (41%) had such history and 7 (13%) neonates did not have any sibling. Of the 56 mothers, 4 (7%) had GDM, 3 (5%) had pre-eclampsia, 1 (2%) had hypothyroidism, 1 (2%) had PIH, and 1 (2%) mother was a known case of T2DM with pre-eclampsia. 46 (82%) mothers did not have any h/o antenatal complication. 43 (77%) neonates were delivered through normal vaginal delivery and 13 (23%) neonates were delivered through caesarean section. of the 56 neonates, 48 (86%) neonates did not have any history of birth asphyxia and 8 (14%) neonates had h/o birth asphyxia.

Table 5: Distribution based on duration of phototherapy received by neonates prior to exchange transfusion

Duration of phototherapy	N	%
2 hrs	1	2%
4 hrs	7	13%
5 hrs	1	2%
6 hrs	10	18%
8 hrs	4	7%
24 hrs	22	39%
48 hrs	9	16%
72 hrs	2	4%

Of the 56 neonates, 24 hours of phototherapy was given to 22 (39%) neonates, 6 hours of phototherapy was given to 10 (18%) neonates, 48 hours of phototherapy was given to 9 (16%) neonates, 4 hours of phototherapy was given to 7 (13%) neonates, 8 hours of phototherapy was given to 4 (7%) neonates, 72 hours of phototherapy was given to 2 (4%) neonates, 2 hours and 5 hours of phototherapy was given to 1(2%) neonates respectively.

Table 6: Distribution of risk factors found in babies with severe neonatal jaundice who underwent exchange transfusion

Risk factor	No of neonates with risk factor	% of babies with risk factor
Lack of breastfeeding	35	63%
RH incompatibility	27	48.2%
Sibling history of pathological neonatal jaundice	23	41%
ABOincompatbility.	20	35.7%
History of birth asphyxia	8	14%
Sepsis	5	9%
Maternal gestational diabetes	4	7%
Maternal pre ecclampsia	3	5%
Maternal hypothyroidism	1	2%

Of the 56 neonates recruited in study, double surface phototherapy (DSPT) was given to 23 (41%) and triple surface phototherapy (TSPT) was given to 33 (59%) neonates. Of the 56 neonates recruited in study, 35(63%) neonates did not receive breastfeeding during phototherapy while 21 (38%) neonates received breastfeeding. Of the 56 neonates recruited in study, 45 (80%) neonates received I.V. fluids during phototherapy while 11 (20%) neonates did not receive any I.V. fluid during phototherapy. mean Hb at presentation was 14.78±4.16 g%. This was within our reference

range normal Hb. TLC values at admission were available for 33 patients and none of them had a value above 33000/cu mm. of the 56 neonates, 5 (9%) neonates were CRP+, 5 (9%) neonates were CRP- while status of remaining 46 was unknown [Graph]. According to data obtained sepsis markers were found in 9% of subjects. out of 56 neonates, 4 neonates had BIND

Clinical outcome at the end of one month

4 cases underwent mortality. 22 cases showed no morbidity and no mortality 30 cases showed one or more significant morbidities.

Table 7: Distribution of outcomes of babies with severe neonatal jaundice who received exchange transfusion

Outcome	Number of cases with that outcome	Percentage of cases with that outcome
No morbidity and no mortality	22	39.2%
Mortality	4	7.1%
Significant morbidity	30	53.5%

Table 8: Association between age of neonate on day of ET and risk factors and outcomes of those neonates

Age on Day of ET	Sibling history of pathological Neonatal jaundice	ABO incompatibility	Rh incompatibility	Lack of breastfeeding	Sepsis	Birth asphyxia	Outcome at the end of one month
0 DOL (n=9)	50%	40%	50%	100%	0%	10%	40% no morbidity and no mortality 30% thrombocytopenia 10% thrombocytopenia and sepsis 10% hypocalcaemia and AKI 10% mortality
1 DOL (n=10)	30%	50%	40%	100%	0%	60%	30% no morbidity and no mortality 30% sepsis 10%hypocalcaemia 10% thrombocytopenia 10% hypocalcaemia and sepsis
2 DOL (n=7)	40%	80%	40%	80%	20%	0%	40% no morbidity and no mortality 20% AKI 20% sepsis and coagulopathy 20% thrombocytopenia
3 DOL (n=4)	75%	50%	50%	75%	25%	0%	25% mortality 25% no morbidity
							and no mortality 25% sepsis 25% AKI

4 DOL (n=5)	50%	0%	75%	50%	0%	0%	50% no morbidity and no mortality 25% AKI 25% hypernatremia
5 DOL (n=9)	22%	33.3%	33.3%	44.4%	11.1%	0%	44% No morbidity and no mortality 22% mortality 11% thrombocytopenia 11%hypocalcaemia 11% thrombocytopenia + hypocalcaemia + sepsis
6 DOL (n=5)	60%	20%	100%	0%	20%	0%	20% no morbidity and no mortality 20% AKI 20% thrombocytopenia 20% sepsis + thrombocytopenia 20% AKI + hypocalcaemia
7 DOL (n=4)	25%	75%	25%	0%	25%	0%	25% no morbidity and no mortality 25% thrombocytopenia 25% AKI 25% AKI + hypocalcaemia
8 DOL (n=1)	0%	100%	0%	0%	0%	0%	100% no morbidity and no mortality
9 DOL (n=1)	0%	100%	100%	0%	0%	0%	100% no morbidity and no mortality
11 DOL (n=1)	100%	0%	100%	0%	0%	0%	100% no morbidity and no mortality

Discussion

This study was undertaken to identify the risk factors and outcomes at the end of one month of babies who received exchange transfusion for severe neonatal jaundice in our hospital. Out of the 56 cases of babies who received exchange transfusion for severe neonatal jaundice, there was an almost equal sex distribution with 52% males and 48% females. Both sexes have shown similar risk for requirement of exchange transfusion. An almost equal sex distribution of 50% males and females was found in a study by Nidhi Bedi et al [4]. Other Previous studies too have not shown any gender preposition towards development of hyperbilirubinemia or requirement of exchange transfusion. Among the 56 neonates, 13 (23%) were LBW and 43 (77%) had normal birth weight. Exchange transfusion for hyperbilirubinemia was required for LBW neonates but their numbers were lesser compared to those neonates having normal birth weight. Our results are in accordance with those of previous studies as done by Wolf et. al [5] who reported that ET was required by neonates of LBW as well as those having normal body weight.

Majority were born at term gestation (82%) and a small minority were born preterm from 32 to 36 weeks (18%). Pre term babies have always been considered as at risk towards various complications but population of pre term neonates was quite less compared to full term neonates. In Nigeria, ET is

routinely indicated at TSB ≥20 mg/dl even for healthy term infants and sometimes at TSB <20 mg/dl in sick term infants with or without features of kernicterus. While for pre term infants, ET is advised at TSB levels between 10 to 12 mg/dl/kg Olusanya et al. [6] suggested that gestational age of being term or pre term do not govern requirement of ET Bujandric et al. [7] reported that in their 17 years of experience of ET in Serbia only 7% population was preterm. Hence pre term neonates do not have higher risk of requirement of ET. This also adds to conclusion that all full term neonates cannot be excluded from risk of developing hyperbilirubinemia and requirement of ET.

Of the 56 mothers, 4 (7%) had GDM, 3 (5%) had pre-eclampsia, 1 (2%) had hypothyroidism, 1 (2%) had PIH, and 1 (2%) mother was a known case of T2DM with pre-eclampsia. As per this data antenatal complications like GDM, pre-eclampsia, PIH, etc do not have strong association with requirement of ET. Majority of the babies were born by Normal Vaginal Delivery (77%).13 (23%) neonates were delivered through caesarean section. This number is less compared to number of neonates born through normal vaginal delivery. Similar results were found in previous studies. Hence caesarean section cannot be taken as the only risk factor for requirement for ET, children born through normal vaginal delivery have equal or higher chance for requirement of ET. This point can also be attributed to the fact that in our hospital vaginal deliveries outnumber caesarean.

Majority of the babies were admitted on the day of birth (39%) followed by 1st DOL (14%) followed by 5th DOL (13%). Majority of the babies underwent ET on 1st DOL (18%) followed by day of birth (16%) followed by 5th DOL (16%) neonates. (%). Maximum admissions for hyperbilirubinemia occurred on birth day itself. This highlights the importance of assessing the risk factors for hyperbilirubinemia from gestation itself. Assessment of risk factors should continue till 8 days of life.

Mean TSB on DOA was 24.58±4.68 mg/dl. World Health Organization recommends ET at TSB ≥15 mg/dl on 1st DOL and at TSB ≥25 mg/dl on the 2nd DOL. All babies who underwent the ET procedure received phototherapy for a duration ranging from 2 hours to 72 hours. Majority of the neonates 24 hours of phototherapy was given to 22 (39%) neonates, 6 hours of phototherapy was given to 10 (18%) neonates, 48 hours of phototherapy was given to 9 (16%) neonates. 59% of the babies received Triple Surface Phototherapy while 41% of babies received Double Surface Phototherapy.[8]

Most common risk factors found during the study were absence of breast feeding (63%), Rh incompatibility 35.7%), ABO incompatibility(25%), Birth Asphyxia(14%), Sepsis (9%), GDM (9%), Preeclampsia(7%). This is in common with studies by SahooM et al [9] and Nidhi Bedi et al, [10] where breast feeding jaundice was found to be the most common cause of pathological neonatal jaundice. In the study by SahooM et al [9] 48% of cases had breastfeeding jaundice. While in the study by Nidhi Bedi et al [10] 46% of the cases had Breastfeeding jaundice. In our study the prevalence of breastfeeding jaundice is significantly higher at 63%.

This can be explained by the fact that, Niloufer Hospital being a well-known tertiary care hospital, is a centre of referral for cases from all over the state as well as neighbouring states. Sick babies are usually bought by relatives, while the mother is still recovering in the immediate post-partum period at home or hospital.

This separation of the mother-baby dyad seems to be the cause for breastfeeding jaundice. Next most prevalent risk factor in our study is haemolytic jaundice with cases of Rh incompatibility (35.7%) being more common than ABO incompatibility(25%). In most other studies, cases of ABO incompatibility were found to be more common than Rh incompatibility. In a study by SahooM et al [9] 16% cases had ABO incompatibility and 5.7% cases had Rh incompatibility. In a study by Nidhi Bedi et al [6] 25% cases had ABO incompatibility and 11% cases had Rh incompatibility.

In a study by Mala Kumar et al [11], 32% cases had ABO incompatibility and 14% cases had Rh incompatibility. But these three studies investigated on risk factors of all cases of pathological neonatal jaundice. While in our study, we have only included cases of Severe Neonatal Jaundice.

It could be explained by understanding the basic premise that ABO incompatibility is inherently more common than Rh incompatibility. But since Rh incompatibility is responsible for increased severity of neonatal jaundice, it is more prevalent among cases included in our study.

EmelOkulu et al [3] conducted a study very similar to ours, where in they performed a multicentre trial in Turkey to find out the risk factors and outcomes of babies receiving Exchange Transfusion for Severe Neonatal Jaundice. In that study, there is an almost equal prevalence of cases with ABO incompatibility (44%) and Rh incompatibility (40.5%).

The third most commonly prevalent risk factor was found out to be Birth Asphyxia which was found in 14% of the cases, which is much higher when compared to 3.8% prevalence in a study by Sahoo M et al [9] The fourth most commonly prevalent risk factor was sepsis which was present in 9% of

the cases. In the study by Sahoo M et al [3, 9]. 8% of the cases had sepsis, where as in the study by Nidhi Bedi et al [10] 0.93% of the cases had sepsis.

Among the outcomes studied, 4 cases underwent mortality (7%). Of the cases that died, 2 were born preterm at 32 weeks and 35 weeks respectively. All babies had the uniform risk factor of lack of breastfeeding. Two cases had Rh incompatibility, of which one also had a positive sibling history.

One case showed ABO incompatibility. 39.2% cases showed no morbidity and no mortality. 53.5% cases showed morbidities, of which most commonly noted morbidities were thrombocytopenia(23%) followed by sepsis (21%). Other morbidities noted were Acute Kidney Injury (17.8%), hypocalcaemia (14.2%), coagulopathy (3%).

There was one other study found which a Turkish multicentre study was by EmelOkulu et al [3] on risk factors and outcomes of babies receiving Exchange Transfusion. In that study of the 132 infants that underwent exchange transfusion, there were no mortalities recorded. Morbidities noted in this study were thrombocytopenia (40%), hypocalcaemia (20%), hypocalcaemia + thrombocytopenia (13.3%), Necrotising Enterocolitis (13.3%), hypocalcaemia + thrombocytopenia + sepsis (6.7%), sepsis (6.7%).

There is similarity in the most common morbidity, being thrombocytopenia, which was noted in 23% of cases in our study, while it was found in 40% of cases in the study by EmelOkulu et al [3] Hypocalcaemia was found in 14.2 % cases in our study, while it's incidence was higher in the study by EmelOkulu et al [3]Sepsis was found in 21% of cases in our study which is higher than 13.4 % of cases found in study by EmelOkulu et al [3]. A study was conducted by Mala Kumar et al [11] to find out the outcomes of babies with severe hyperbilirubinemia. Of the 64 neonates included in the study, 28(44%) had ABE on admission. There was an overall mortality of 8.3% in this study, of which ABE related mortality was 5%.

The mortality rate in our study is less than that found in study by Mala Kumar et al[11], but more than the mortality found in study by EmelOkulu et al [3] This study has demonstrated that Severe Neonatal jaundice requiring Exchange Transfusion is preventable if appropriate actions are taken to establish and continue breastfeeding by offering empathetic and patient lactation support to all mothers, timely anti – D administration to mothers who have Rh negative Blood groups, screening of all new-borns in post-natal wards for neonatal jaundice, advice on follow up for neonatal jaundice check-up after discharge from post-natal ward and by maintaining appropriate aseptic precautions around a neonate.

Exchange Transfusion, though a lifesaving procedure, effective in rapidly bring down bilirubin levels is not bereft of complications. Significant morbidities identified after the procedure must prompt us to be more stringent in preventive care aspects for severe neonatal jaundice.

Conclusions

Severe Neonatal Jaundice is often caused due to preventable risk factors. Lack of breastfeeding is found to be the most important risk factor for Severe Neonatal Jaundice in our study. Education, early identification of problems like inverted/flat nipples and counselling regarding breastfeeding must be started right from the antenatal period to troubleshoot this issue. Haemolytic jaundice due to Rhesus disease is also preventable if anti-D is given in a timely manner. Early identification of neonatal jaundice, timely phototherapy and adequate breastfeeding while on phototherapy can prevent progression to Severe Neonatal Jaundice. Since Exchange Transfusion is associated with significant morbidities, it is crucial to focus on these preventive aspects.

Limitations of the Study

The sample size may not reflect the magnitude of studied problem of Severe Neonatal Jaundice. Larger multi-centric studies focussed exclusively on cases of Severe Neonatal Jaundice are needed to make a true estimate of the problem.

An inclusion of all cases of pathological neonatal jaundice, studying on it's prevalence in babies admitted to the NICU, and also a study on prevalence of cases among them who progress to develop Severe Neonatal Jaundice would make the study more comprehensive.

For including details of duration and type of phototherapy received by the babies in this study, we had to rely on history stated by the parent / guardian, which in some cases could be inaccurate. If a prospective observational study can be undertaken this recall bias could be eliminated.

Long term follow up on neuro-developmental outcome of the babies who received Exchange Transfusion was not within the purview of our study. But if a long term prospective study was done on this aspect, more light could be shed on long term morbidities associated with this procedure.

Recommendations

A prospective study including all cases of pathological neonatal jaundice, and among those a special focus on cases that progress to develop Severe Neonatal jaundice. A study including G6PD

levels and it's effect on causing Severe Neonatal Jaundice in the neonate. A larger scale interventional study using double LED phototherapy to surpass the need for Exchange Transfusion for Severe Neonatal Jaundice. In the study done by Shinya Abe et al [13] this was done only on one neonate.

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