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Original Research Article

Correlation of Maternal Factors on Neonatal Jaundice

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ABSTRACT
Background: *Neonatal jaundice is a common problem affecting the newborn. About 25-50% of term newborn and higher percentage of premature newborn develop clinical jaundice and serum bilirubin >15mg/dl is seen in 3% normal term babies.*
Materials and Methods: *This is an observational case control study of 250 randomly selected pregnant women who delivered at SAT Hospital, Medical College, Thiruvavananthapuram. They were followed up for one week in the postnatal ward following delivery and babies were observed for the development of jaundice.*
Results: *73 babies developed neonatal jaundice and were considered as group I or cases. 177 babies did not develop NNJ, taken as group II and were considered as controls. The significant risk factors associated with NNJ in the present study were history of abortion and NNJ in previous pregnancy, Prematurity, ABO incompatibility, Rh incompatibility, Oxytocin use, PROM / PPROM, instrumental deliveries, birth asphyxia and sepsis.*
Conclusion: *Neonatal jaundice is a major causeof neonatal morbidity and NICU admission. Hence all efforts should be made to identify the preventable causes of neonatal jaundice.*
Keywords: *Neonatal jaundice, Hyperbilirubinemia.*

INTRODUCTION

Neonatal jaundice is a common problem affecting the newborn. About 25-50% of term newborn and higher percentage of premature newborn develop clinical jaundice and serum bilirubin >15mg/dl is seen in 3% normal term babies. In approximately 15% of term newborn, bilirubin causes yellowish discoloration of skin termed physiological jaundice.[1]

Hyperbilirubinemia causes brain damage and deafness. Bilirubin: Albumin ratio > 3.5 is associated with brain injury. The presence of asphyxia and acidosis facilitates neurotoxicity of bilirubin. Kernicterus refers to the yellow staining of brain by bilirubin together with evidence of neuronal injury. [2,3] The major maternal factors contributing to NNJ are hemolytic disease due to ABO, Rh incompatibility, use of oxytocin, instrumental deliveries, prematurity, birth

asphyxia and sepsis. Treatment options for NNJ are phototherapy, exchange transfer, IV immunoglobulins and phenobarbitone. [4]

MATERIALS AND METHODS

This is an observational case control study of 250 randomly selected pregnant women. Unbooked cases and babies developing NNJ after first post-natal week were excluded from this study. After informed consent, the following information was collected from patients based on history and necessary antenatal investigations; Patients name, age, IP number, socioeconomic status, parity, religion, educational status. The present pregnancy was evaluated for antenatal complications, PROM, use of oxytocin and mode of delivery. Gestational age, birth weight, APGAR scores were recorded. Cord blood of mothers with Rh negative / O group were sent for Blood grouping and Rh typing and serum bilirubin values were done. Abnormal babies were followed up for the development of NNJ and need for NICU admission. Deteriorating cases were further managed by phototherapy, exchange transfusion or a combination of both.

Aim of the study

The study aims to analyse the maternal risk factors influencing neonatal jaundice.

Study setting and design

This is a prospective case control study of 250 randomly selected pregnant women who delivered at SAT Hospital, Medical College, Thiruvavanan-thapuram. They were followed up for one week in the postnatal ward following delivery and babies were observed for the development of jaundice. 73 babies developed neonatal jaundice and were considered as group I or cases. 177 babies did not develop NNJ, taken as group II and were considered as controls.

Group I – jaundiced group (cases)

Group II – non jaundiced group (controls)

Socio-demographic factors, obstetric factors and perinatal outcome were compared between the two groups.

The **sociodemographic factors** analysed were Maternal age, Socioeconomic status, Education and Religion.

The **obstetric risk factors** assessed between the two groups were parity, gestational age, previous history of abortion, maternal blood group and Rh type, development of PROM / PPROM, medical disorders (like Gestational Hypertension, Gestational Diabetes, Heart disease, Jaundice, anemia, maternal fever / infections), Obstetric complications (like Previous CS, multiple pregnancy, APH, Malpresentation) and mode of delivery.

The **perinatal factors** studied between the two groups were birth weight, sex of the babies, birth asphyxia and neonatal sepsis.

Statistical method used for analysis was chi-square test and students t test wherever appropriate. $P<0.05$ was taken as significant. Data entry was done using Microsoft excel and analysis done using SPSS.

RESULTS

73 babies developed neonatal jaundice and were considered as group I or cases. 177 babies did not develop NNJ, taken as group II and were considered as controls.

Socio-demographic factors

All the four sociodemographic parameters were found to be comparable between the two groups.

In both groups majority were in the 20-24 yr age group. The percentage distribution of mothers in the study group almost follows the age distribution of mothers in the control group. Likewise, no significant association was found between socioeconomic status and incidence of neonatal jaundice in the present study.(x^2=2.57, P = 0.275) Majority of the patients belonged to low socio-economic group. While considering the level of education in both the groups, majority of women had secondary school education. Similarly, no significant association was found between religion and occurrence of neonatal jaundice. (x^2= 0.008 P = 0.990).

OBSTETRIC FACTORS

The findings are summarised in the table - 1

Table 1 – correlation between obstetric risk factors & NNJ

Obstetric factor	P value	x^2
Parity	0.950	0.102
h/o abortion	0.000	12.12
Prematurity	0.000	14.805
h/o NNJ in previous pregnancy	0.000	2.123
ABO incompatibility	0.000	38.800
Rh incompatibility	0.000	17.301
Oxytocin use	0.000	2.201
PROM / PPROM	0.000	21.432
GHTN	0.000	3.600
GDM	0.028	1.900
UTI	0.054	1.610
Previous CS	0.115	1.201
APH	0.097	1.302
MODE OF DELIVERY		
LSCS	0.87	0.1922
Instrumental delivery	0.003	3.603

Parity

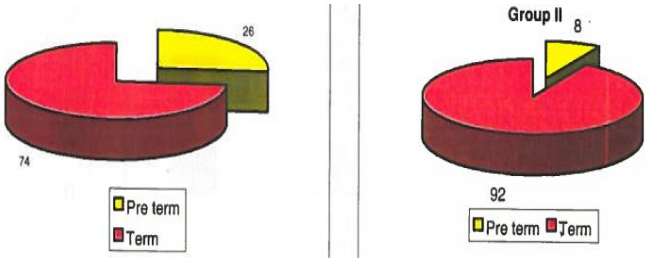
In the study group 65.8% were primigravida, 30 % were second gravidas and third gravidas constituted 4.1%. The control group also almost follow the same pattern (x^2 = 0.102 P = 0.950)

Prematurity

Among the jaundiced infants, 26% were preterm whereas in non- jaundiced group only 8% were preterm. (x^2 =14.8, P 0 .000). (fig 1)

Fig 1 - showing correlation between the 2 groups with regards to prematurity

Group I



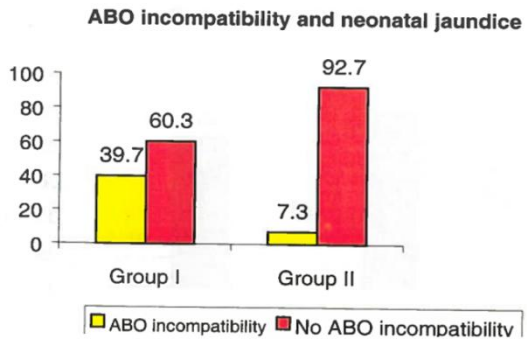
Previous history of neonatal jaundice

In the present study, 19.2% babies in group I had a previous baby with history of neonatal jaundice compared to 1.2% in group II. The association between previous history of neonatal jaundice and recurrence of neonatal jaundice in subsequent pregnancies was proved statistically (fisher's exact test, p = .000).

ABO incompatibility

39.7% of babies with jaundice had ABO incompatibility compared to 7.3% of babies who had ABO incompatibility in the non-jaundiced group. The statistical test showed strong association between neonatal jaundice and ABO incompatibility. (x^2= 38.8 P=0.000)

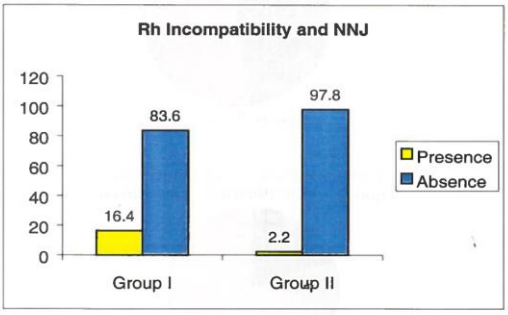
Fig 2 Relation between ABO incompatibility & neonatal jaundice



Rh incompatibility

Among the jaundiced group 16.4% babies had Rh incompatibility while in the non- jaundiced group only 2.2% of babies had Rh incompatibility. The difference in percentage is statistically significant (x^2 = 17.3 P=0.01). (fig 3)

Fig 3 Rh incompatibility and Neonatal jaundice



Premature Rupture of Membranes

47.9% of jaundiced babies had a history of PROM, compared to 19.2% having similar history in the non-jaundiced group. (x^2= 21.4 P = 0.01). The association between premature rupture of membranes and development of jaundice was proved statistically.

Oxytocin induction and NNJ

Among the jaundiced babies history of oxytocin use was present in 39.7% compared to 14.1% of in non jaundiced group. This difference in the

percentage was statistically significant. (x^2.20; P-0.000).

Pregnancy Complications

Pregnancy complications were present in 63% of group I compared to 29% in group II. This difference was statistically significant (x^2=24.5 P=0.000)

Medical disorders like Gestational hypertension and gestational diabetes had statistically significant association with the development of NNJ.

Gestational hypertension was the major pregnancy complication attributable to neonatal jaundice. It was found in 26% of total cases compared to 5.6% in non- jaundiced group. GDM was seen in 6.8% of cases in jaundiced group compared to 1.1% in non-jaundiced group. P value of 0.0287 and the difference was statistically significant.

Table 2showing distribution of pregnancy complications & NNJ

Pregnancy Complications	Group I		Group II		x^2	P value
	No	%	No	%		
G.HTN	19	26	10	5.6	3.6	0.000
GDM	5	6.8	2	1.1	1.9	0.0287
Mal-presentation	1	1.4	5	2.8	-	-
Twins	0	-	2	1.1	1.2	-
Previous Caesarean	9	12.3	13	7.2	1.2	0.1151
APH	6	8.2	2	1.1	1.3	0.0968
Maternal Infections						
UTI	5	6.8	3	1.7	1.6	0.0548
URI	1	1.4	2	1.1	-	-
Chickenpox	0	-	2	1.1	-	-
Enteric fever	0	-	1	0.6	-	-
Others						
Anemia	1	1.4	2	1.1	-	-
Hereditary spherocytosis	0	-	1	0.6	-	-
Jaundice						
Heart disease	0	-	4	2.3	-	-
	1	-	1	0.6	-	-

Mode of delivery

Comparing the delivery pattern between the two groups, the non jaundiced group had more vaginal deliveries (72.9%) compared to the jaundiced group (47.9%) and the finding was statistically significant.

In group I 15.1% of jaundiced babies were delivered by vacuum or forceps in contrast to 2.7% in non-jaundiced group (group II). This difference was statistically significant (P 0.0035). Emergency caesarean was more among the jaundiced group (23.3% vis 18%). But the difference was not significant statistically. (table 3)

Table 3 – Mode of delivery & NNJ

Mode of delivery	Group I		Group II		x^2	P value
	no	%	no	%		
Normal delivery	35	47.9	129	72.9	3.6	0.000
Instrumental delivery	11	15.1		2.8	2.7	0.0035
a) Vacuum	9		5			
b) Forceps	2		0			
LSCS	27	37	43	24.2	0.87	0.1922
Emergency caesarean	17	23.3	32	18.0		
Elective caesarean	10	13.7	11	6.2		
Total	73	100	177	100		

Perinatal factors associated with NNJ

Birth weight, sex of the babies, birth asphyxia and neonatal sepsis were compared between the two groups.

The findings are summarised in table 5

Table 5 – correlation between Perinatal Factors & NNJ

Parameter	P value	x^2
Birth weight	0.05	3.8
Sex of the baby	0.986	0.19
Birth asphyxia	0.001	10.9
Neonatal sepsis	0.001	21.27

Birth Weight

40% of babies in the jaundiced group had birth weight between < 2.5 kg whereas 27% of babies had babies weight <2.5kg in non-jaundiced group. The difference in percentage was statistically significant (x^2 =3.8, P= 0.05)

Sex of newborn

56 % of babies in the jaundiced group were male 'compared to 53% male babies in non-jaundiced group. But this was not statistically significant. (x^2 = 0.19, P = 0.986)

Birth asphyxia

Among the jaundiced babies, 19.2% had asphyxia compared to 5.6% of babies in the non- jaundiced group. Hence it was inferred that birth asphyxia was a significant factor (x^2 =10.9, P = 0.001)

Newborn sepsis

Among the jaundiced group 31.5% babies had sepsis compared to 8.4% babies in non-jaundiced group. This difference was statistically significant. (x^2= 21.27, p = 0.001)

DISCUSSION

The present study was done to find out the relationship between maternal factors and development of neonatal jaundice. Out of the 250 women who were followed up, 73 (29.3%) babies had clinically significant jaundice, whereas 177 babies were non-jaundiced. NNJ contributes to 16-18% of NICU admissions, next only to respiratory diseases and sepsis

In the present study sociodemographic factors like age, socioeconomic status, education, did not show any statically significant association. However significant association was found with ABO and Rhincompatibility, obstetric and pregnancy related complication, intrapartum events, prematurity and mode of delivery.

Among the jaundiced group 26% babies were preterm but in non-jaundiced babies only 8% were preterm.[5] The finding is similar to that reported in previous studies. In preterm infants, there is functional immaturity of liver leading to exaggerated physiologic jaundice. ABO incompatibility is associated with 15% incidence of NNJ.[6] ABO incompatibility is usually milder compared to Rh incompatibility and is frequent in first born infants. As the incidence of stillborn associated with ABO incompatibility is nil, there is no role for early induction or amniocentesis. Blood group O should be considered as an independent risk factor for NNJ.[7]

Among the jaundiced group 16.4% of babies had Rh incompatibility, while in the non- jaundiced group, 2.2% babies had Rh incompatibility. About 5% of Indian population is Rh negative, all pregnant women need to be checked for Rh typing. If mother is Rh negative and antibody is screen positive, repeat at 16-18 weeks and 2 weeks thereafter. If antibody titre is below critical value, titre is repeated every 4 weeks.[8]Amniocentesis is indicated for titres> 1/16. If fetus is too immature intrauterine transfusion is indicated and early delivery if mature. The incidence of Rh iso-immunization has reduced from 5% to <0.2% with the administration of Anti D immunoglobulin, with significant reduction of infant death rate.[9,10]

In countries without access to Rh Anti D immunoglobulin, 10% Rh negative pregnancies are complicated by hemolytic disease of newborn.[9]Among the jaundiced group, 48% of babies had history of either PROM/PPROM was present in 19.2% of the non-jaundiced group. Study by Linetal[11] showed significant association between hyperbilirubinemia and PROM. In the

present study, 40% of jaundiced baby had h/o oxytocin use for induction and acceleration of labor. Oxytocin was found to increase the osmotic fragility and produce water retention similar to that reported in literature.[12]

In the present study PIH was the major pregnancy complication attributable for NNJ. Infants of diabetic mothers had also prolonged hyperbilirubinemia[13]. Maternal intake of sulphonamide, frusemide and gentamycin results in NNJ by displacing bilirubin from albumin.

Instrumental deliveries, both vacuum and forceps application were higher among jaundiced group. Serum bilirubin values were found to be higher in vacuum extracted babies compared to normally delivered babies in the first 72 hours of life.[14] Higher neonatal bilirubin values were found in male babies, maternal diabetes, G.HTN, instrumental deliveries and low birth weight babies. [1,5]

Birth asphyxia was present in 19% of jaundiced group while incidence of birth asphyxia was only 5.6% in non-jaundiced group. NNJ developing as a result of sepsis occurred in 31% of babies in Group I compared to 8.4% in Group II.

CONCLUSION

Neonatal jaundice is a major cause of neonatal morbidity and NICU admission. Hence all efforts should be made to identify the preventable causes of neonatal jaundice. The wide spread use of Anti D immunoglobulin had significantly reduced the incidence and severity of NNJ. Hence all non-immunized Rh negative mothers should be given Anti D within 72 hours of delivery and antenatal administration of Anti D is to be recommended for all invasive procedures. Moreover modifiable risk factors like prematurity can be prevented by proper education, improving anemia and nutritional status of expectant mothers. Optimal management of medical disorders like diabetes, sepsis will help to reduce the incidence of neonatal hyperbilirubinemia.

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