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Clinical Study of Pathological Jaundice in Newborns

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Abstract:
Background:*Neonataljaundice is one of the common clinical findings in the neonates. It is bothphysiological and pathological. The risk of morbidity and mortality of pathological jaundice is amplified by associated risk factors which are preventable.*
Aims and objectives of the study*: To study the incidence of pathological jaundice, associated risk factors, and to assess the mortality and morbidity of neonatal jaundice associated with various risk factors in both term and preterm babies.*
Study design:*Hospital based observational study.*
Materials and methods*:This is an observational study which includes 6972 newborns admitted inNICUNiloufer Hospital, over a period of 6months from July 2014 to December 2014, who were screened for jaundice, out of which 2892 newborns had clinicaljaundicecomprising 41.48 %. Out of 2892 newborns that had clinical jaundice 360 were selected using inclusion and exclusion criteria. They were studied in detail and evaluated by appropriate investigations.*
Results: *Out of 360 cases studied, high incidence of pathological jaundice were found in female babies, low birth weight babies, babies with risk factors like birth asphyxia and septicaemia, babies born to high risk mothers, babies born by vaginal delivery and babies delivered at home.*
Conclusions:*Pathological jaundice in newborns is one of the significant contributing factors for mortality and morbidity in newborns. When evaluated, majority of the etiological factorsin our study are both preventable and curable with proper preventive measures and timely intervention.*
Keywords:*Mortality, Morbidity, Neonatal jaundice, Pathological jaundice, risk factors,*

I. Introduction

Neonatal jaundice occurs frequently in newborn babies [1] and has long been a concern for healthcare professionals. If leftuntreated, it can have severe consequences for the child, hence early detection and prompt management isenforced. Newborns appear jaundiced when serum bilirubin levels are between 4 to 7 mg /dl[2-7]. Jaundice is observed during first week of life in 60 % of term infants and 80 % of preterm infants. It is the commonest physical finding during first week of life[2-7].About 6.1 % of term newborns have a maximum serum bilirubin of12.9mg/dl, and 3% of normal term newborns have serum bilirubin of 15mg/dl[2-7].Neonatal jaundice includes newborns with physiological and pathological jaundice. Physiological jaundice in term babies appears between 24to72 hours of life. Maximum intensity is seen on 4th day of life which does not exceed 12mg/dl and disappears by 10th day of life. In pre terms maximum intensity is seen on 5th or 6th day which rises up to 15mg/dl andmaypersistsup to14 days. Persisting jaundice is more common in breastfed infants than artificially-fed infants. At least 9% of breastfed infants are still jaundiced at 28 days of age[8]. When jaundice in newborns does not fit in the above criteria it is designated as pathological and demands investigative work up. Severe hyperbilirubinaemia is relatively uncommon, elevation of unconjugated bilirubin is neurotoxic to neonates and at certain concentrations it may cause kernicterus (bilirubin encephalopathy)[9].Kernicterus - the pathological finding of deep-yellow staining of neurons and neuronal necrosis of the basal ganglia and brainstem nuclei. Acute bilirubin encephalopathy- a clinical syndrome, in the presence of severe hyperbilirubinemia, of lethargy, hypotonia and poor suck, which may progress to hypertonia (with opisthotonus and retro Collis) with a high-pitched cry and fever, and eventually to seizures and coma. Chronic bilirubin encephalopathy – the clinical sequalae of acute encephalopathy with athetoid cerebral palsy with or without seizures, developmental delay, hearing deficit, occulomotor disturbances, dental dysplasia and mental deficiency [9-11].The prevention, detection and management of jaundice in otherwise healthy term and late preterm newborn infants remain a challenge, partly because jaundice is so common and kernicterus is so rare in comparison[12-14.]
Common causes of jaundice in India are: [15]
1. Physiological,
2. Blood group incompatibilities,
3. G6PD deficiency,

4. Cephalohematoma,
5. Intrauterine and post natal infections,
6. Breast milk jaundice

The present study is evaluating neonatal jaundice, to identify the etiological factors, clinical features, various modalities of treatment and to assess the prognosis. The present study is conducted in the newborns admitted in the department of neonatology, Niloufer Hospital, Osmania medical college, over a period of 6 months from July 2014 to December 2014.

II. Aim Of The Study

Hence the aim of our study is to study the incidence of neonatal jaundice, early detection of pathological jaundice, assess the risk factors, mortality and morbidity associated with various risk factors, and appropriate management of neonatal jaundice which is of paramount importance especially when the bilirubin is in the pathological range which may cause permanent neurological damage.

III. Materials And Methods

Study Design: Hospital based observational study.

A total number of 6972 newborns admitted in NICU Niloufer Hospital, Osmania medical college, during the period of 6 months from July 2014 to December2014. among 6972 newborns admitted during this period, 2892 had clinical jaundice, out of which 360 cases were selected by Inclusion and Exclusion criteria .These newborns were studied in detail by taking detailed history and through clinical evaluation and were evaluated by appropriate investigations which includes serum bilirubin levels total direct and indirect levels, blood group and Rh typing of baby and mother, peripheral smear, haemoglobin levels, complete blood picture, septic screening which includes CRP, Micro ESR, band cells, reticulocyte count, Coombs test (direct), liver function tests ,G6PD enzyme assay, ultrasound abdomen.

Inclusion Criteria: Babies who developed jaundice on the first day of life. 2. persisting beyond 14 days of life.3.Serum bilirubin levels more than 12 mg/dl in term babies and more than 15mg/dl in preterm babies. 4. Sick babies.5 .Palms and soles stained. Physical examination of the baby reveals abnormality. **Exclusion Criteria**:1. Jaundice appearing after 24hrs. 2. Healthy baby3.No risk factors.
4.Palms and soles are not yellow. 5. Serum bilirubin levels less than 12mg/dl .6.Physical examination normal.

Proforma:

Proforma includes Baby's name, date of birth, age of the baby, mode of delivery, place of delivery, sex of the baby Date of admission chief complaints, age of onset of jaundice.

Antenatal history which includes booked case/unbooked case, any history of maternal illness like pregnancy induced hypertension, diabetes mellitus, Drug intake, premature rupture of membranes,, antepartum haemorrhage.Natal history, which includes mode of delivery vaginal/ C-section, Indication for C-section, intrapartum drugs, time of cry- immediate cry/delayed cry.

Post natal history includes birth weight, length, and time of passing meconium, breast fed or top fed. Family history of anaemia, jaundice and splenectomises.

Physical examination of new-borns includes;

Gestational assessment by new Ballard score, dysmorphic features, evidence of trauma during delivery, clinical assessment of jaundice by Kramer's method[8], activity of the baby, systemic examination, followed by appropriate investigations.

Statistical Analysis:

Data was collected, tabulatedand analysed using epiinfo software 7.1.5 version and significance was assessed by Chi square test. P value <0.05 was considered significant.

IV. Results

Admissions and neonatal jaundice:

In total 6972 neonates admitted in NICU over a period of 6 months, 2892 neonates had clinical jaundice.This is 41.8%, includes both physical and pathological jaundice. Out of 2892 cases 360 neonates were selected by inclusion and exclusion criteria, these 360 babies fulfilled inclusioncriteria, which consist of 12.44%.

When overall sex wise incidence was seen:

Total no of admissions were 6972, in that 3648 were male babies and 3324 were female babies. Out of 6972 babies 2892 babies had clinical jaundice. In 2892 babies 1532(52.97%) were male babies and (47.02%)1360 were female babies. Male predominance was seen in overall sex incidence.p-value is <0.05. The result is statistically significant.

Sex wise incidence in study group (pathological):

Out of 360 cases which were studied in detail the incidence of pathological jaundice in male and female babies were 156 (43.4%) and 204(56.6%) respectively male: female ratio is 1:1.6, incidence of pathological jaundice is more in female babies in study group. The result is statistically significant at p-value <0.05.

Gestational age and neonatal jaundice (pathological) in the study group:

Out of 360 cases 206 were preterm babies and 154 were term babies comprising of 57.22%% and 42.77% respectively. Incidence of pathological jaundice also more in preterm babies, which is statistically significant at p-value <0.05.

Mode of delivery and neonatal jaundice in study group (pathological):

In 360 studied, 304(84.44%) cases were delivered by normal vaginal delivery. 56 cases were delivered by Caesarean section (15.55%). Incidence of pathological jaundice is also more in babies delivered by vaginal delivery, which is of statistical significance with p- value of 0.0009.

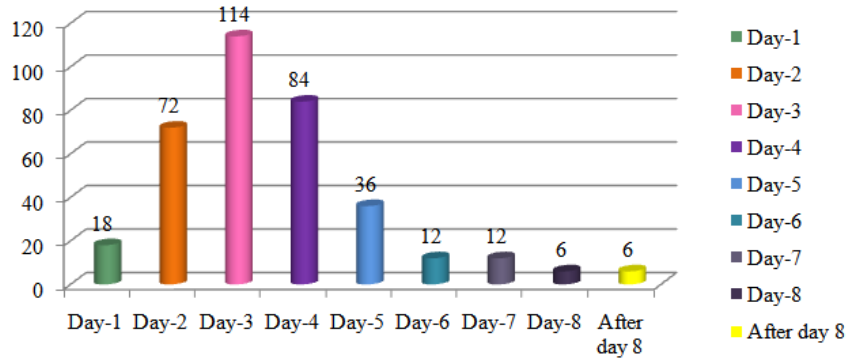
Place of delivery and neonatal jaundice in study group (pathological): In 360 cases 278 cases were delivered at hospital comprising of 77% and 82 cases were delivered at home, which is about 23%.p-value is 0.015is considered statistically significant.

Table 1: Birth weight and neonatal jaundice

Birth weight	No. of newborns	Percentage
<1kg	18	5%
1 to 1.5kg	72	20%
1.5 to 2.5 kg	198	55%
>2.5 kg	72	20%

Out of 360 cases large number of newborns that is 288 cases with serum bilirubin more than 15 mg/dl weighed below 2.5 kg (80%). Only 72(20%) had weight above 2.5kg. Total low birth weight babies were 2091 in 6972 admissions.p value is 0.0001, is considered statistically significant at p-value less than 0.05.

Chart 1: Age of onset of jaundice:



Above analysis shows that majority of newborns developed jaundiced before 5 days of life comprising 90%. Only 36 cases developed neonatal jaundice on day 1 comprising 10%.

Mode of feeding and neonatal jaundice in study group (pathological):

When history of feeding was taken, 282 babies were breast fed (78.3%), 78babies (21.7%) were top fed.

Consanguinity and neonatal jaundice:

When history of consanguinity was elicited, in 360 babies, 108 babies were born to consanguineous parents,, that is 30%.babies born to non-consanguineous parents were 252.

Table 2:Maternal illness and neonatal jaundice:

Maternal illness	No. of newborns	Percentage
Baby born to mothers with risk factors	264	73.4%
Babies born to healthy mothers	96	26.6%

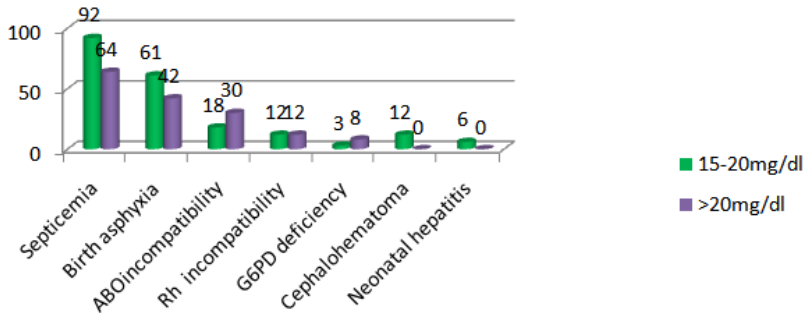
Babies born to mothers with risk factors (73.4%) had significant jaundice. Risk factors beingunbooked cases, pregnancy induced hypertension, premature rupture of membranes, antepartum haemorrhage, and gestational diabetes mellitus.

Table 3: Serum bilirubin levels:

Serum bilirubin levels	No. of newborns	Percentage
15-20mg/dl	210	58.3%
>20mg/dl	150	41.7%

High serum bilirubin levels >20mg/dl were found in low birth weight babies and preterm babies and babies with risk factors.

Chart 2: Aetiology and serum bilirubin levels:



Sepsis was one of the major associated risk factors in neonates with jaundice.Outof 360 neonates, 156 had sepsis. Out of these 156 neonates, 64 neonates had serum bilirubin levels more than 20mg/dl. This was followed by other risk factors like birth asphyxia, ABO incompatibility, Rh isoimmunisation and G6PD deficiency, where few babies had serum bilirubin levels of more than 20mg%.

Table 4: Mode of treatment and neonatal jaundice:

Mode of treatment	Number of newborns	Percentage
Phototherapy	360	100%
Exchange transfusion	98	27%

All new-bornswere treated with phototherapy.98 cases (27%) required exchange transfusion.Maximum serum bilirubin levels were 32mg/dl in our study.Exchange transfusion was done to the babies who were not responding to phototherapy. Babies with risk factors like sepsis, G6PD deficiency, Rh incompatibility and blood group incompatibilities also required exchange transfusion.

Outcome:

Out of 360 babies who were evaluated and treated for pathological jaundice, 54 new-borns died, cause of death being sepsis, and associated serious illness like birth asphyxia in spite of exchange transfusion. 98 babies required exchange transfusion, rest required only phototherapy. 5 babies had signs of bilirubin encephalopathy, 14 babies left against medical advice, and 290 babies were discharged and kept in follow up.

Table 5 Cause ofdeath and serum bilirubin levels:

Cause of death	Newborns with serum bilirubin levels between 15-20mg/dl.	Newborns with serum bilirubin levels >20mg/dl	Total
Sepsis	12	18	30
Birth asphyxia	12	12	24
ABO incompatibility	-	-	-
RH incompatibility.	-	-	-
G6PD deficiency	-	-	-
Cephalohematoma	-	-	-
Neonatal hepatitis	-	-	-

Out of 360 neonates 54 died, these newborns were having serum bilirubin levels more than 20 cause of death could be associated risk factors like sepsis, birth asphyxia, which can be preventable.

V. Discussion

Duringthestudyencompassed 6months period of admissions the incidence of neonatal jaundice is 41.8 %(2892), incidence of pathological jaundice is 12.44% in total jaundicecases. Nearly in accordance with Anil Narang et al studies[16] showed incidence of pathological jaundice 14.56%. Whereas C Henny-Harry, HTrotman et al studies[17]incidence of significant jaundice is 4.6%. When sex incidence is compared in our study there is female predominance[male (43.4%), female (56.6%)] in contrary to other studies. Anil Narang et al studies[16] showed male predominance that is 56.2% of cases in group1 (<15mg/dl) and 64.2% of group 2 cases (>15mg/dl of serum bilirubin). In Tiosesco JA et al study[18]incidence is higher in male babies. In our studies we got high preponderance in female low birth weight babiesprobably because female babies are socially shown indifferent attitude and brought to the hospital late, by that time they were affected by factors like sepsis.

In study group preterm babieshad high incidence when compared to term babies, 52.22% and 42.77% respectively. This is in accordance with previous studies.Incidence was found more in low birth weight Babies with weight less than 2.5kg which is statistically significant with P-value of 0.0001. Incidence of pathological jaundice was found less in babies delivered by caesarean section (18.33%)than babies born by vaginal delivery (81.6%). Most of these babies were delivered at home (23%), where delivery is not attended by skilled personnel and strict asepsis is not maintained.Incidence was found more in breast fed babies (78.3%)in our study, compared to top fed babies (21.7%) which is also in accordance with Bertini G et al studies[19], and Maisals MJ etal studies[20] where it stated that breast feeding is associated with increased hyperbilirubinemia after 3 days of life. Babies born to mothers with risk factors like pregnancy induced hypertension, gestational diabetes, premature rupture of membranes, antepartum haemorrhage, had high incidence (73.4%) when compared to babies born to mothers without risk factors (26.6%). 30% were born to consanguineousparentsMaximum serum bilirubin levels of more than 20 mg/dl were found in 41.7% of new-borns studied. Sepsis was found as major associated risk factors in neonates with jaundice, 156 (43.33%) babies had sepsis, followed by birth asphyxia, ABO Incompatibility, Rh incompatibility, G6PD deficiency. Incidence of G6PD was found 3%, ABO incompatibility accounted for 13.33%,.Rh isoimmunisation found in 6.66% Most of the babies were treated with Phototherapy, only few 27% required exchange transfusion. Indications were blood group incompatibilities, Rh isoimmunisation, sepsis, and G6PDdeficiency. Sepsis and birth asphyxia were found to be the major causes of death (54), with serum bilirubin levels >20mg/dl. No deaths with ABO Incompatibility, Rh isoimmunisation and G6PD deficiency. Incidence due to Rh isoimmunisation has reduced probably due to anti-D given to the mothers.

VI. Conclusion

Neonatal hyperbilirubinemia is one of the commonest problems. Most of the times,hyperbilirubinemia is physiological.Based on exclusion and inclusion criteria 360 newborns were selected and studied in detail.

Significant pathological jaundice occurred in low birth weight babies, female babies, breast fed babies, babies delivered by vaginal deliveries, babies born athome, babies born to high risk mothers, babies with risk factors like blood group incompatibilities, G6PD deficiency, sepsis and birth asphyxia .Deaths due to neonatal jaundice per se is not found, however associated risk factors likesepsis and birth asphyxia were found as major cause of death.

In conclusion, early detection of jaundice is vital, to prevent permanent neurological damage to the child. Identifying mothers with risk factors and transporting them to tertiary care centres, where newborns will be taken care of, may reduce significant jaundice. Birth attendants should be trained. Strict hand washing should be practised; strict asepsis should be followed during delivery.By following these simple measures sepsis and birth asphyxia can be prevented, which are major causes of neonatal deaths associated with neonatal jaundice.

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