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ORIGINAL ARTICLE

Problems of Neonatal Jaundice in Indonesia

The Incidence and Etiological Factors in the Dr Cipto Mangunkusumo Hospital Jakarta*

by

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Abstract

The etiological factors and the incidence of neonatal jaundice in Indonesia have never been systematically studied. The figures were adopted from western textbooks which might differ from what is actually found, since the problems may be different.

This study revealed the incidence of neonatal jaundice in the Dr. Cipto Mangunkusumo Hospital Jakarta to be 32,1%, i.e 42,97% in low birth weight infants and 29,70% in fullterm infants.

No pathological basis was proven in many cases. The factors which may cause pathological jaundice according to the frequency are as follows: infections, anoxia and hypoxia, hemolysis due to G_6PD deficiency, multiple factors and hypoglycemia etc.

This study also revealed that 69,5% of jaundiced infants had bilirubin concentration of more than 10 mg%. Analysis of the factors showed that most of them were preventable.

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Introduction

The presence of jaundice in the newborn infants requires special attention from the physician. A greater percentage of neonatal jaundice has a non pathological basis, causing no adverse effect on the infants. As such, it is referred as physiological jaundice and considered to be the reflection of the newborns' process of adaptation with life outside the womb. This kind of jaundice usually appears on the second or third day of life and disappears within 10 days.

However, progress of research in this field begins to doubt the conventional approach towards neonatal jaundice. Hyperbilirubinemia, in which indirect bilirubin level shows a potency to develop into kern-icterus if appropriate management is not given, has been known to develop from non pathologically based jaundice. Considering these aspects it would be wise to appraise the onset, the development and the morbidity of a neonatal jaundice before deciding whether it is physiological. In other words, jaundice in the newborn could be classified as physiological only in the absence of a pathological basis.

The minimal level of indirect bilirubin which may cause damage to the brain has not been decided up to now (Illingsworth 1972, Brown 1973). Many factors seem to facilitate bilirubin deposit in brain cells while many other factors seem to prevent it from happening. The simplest form of bilirubin toxicity might be only in the form of feeding difficulty (Brown 1974).

The incidence of neonatal jaundice varies widely in literature. According to Smith and McKay (1962) it was 50%, while according to Schaffer (1971), it was 50% in fullterms and 75% in prematures. His figures agreed with Brown's (1974). Chiung (1974) from Taiwan found a very high incidence of 91,4%. On the other hand Siripoonya et al. (1974) from Bangkok reported a low incidence of only 30.7%.

Neonatal jaundice could have one or many etiological factors and the difficulty lies in identifying the main factor. The etiology may vay in many clinics since the morbidity in each clinic might be different. The etiology could change from time to time as management of pregnancy, delivery and newborns also changes.

Etiological factors in neonatal jaundice according to Crosse and Hill (1975), and Black (1972), modified by the present authors are as follows :

1. Process of hemolysis

— hemolytic disease of the newborn,
— G_6PD deficiency
— enclosed hemorrhages
— polycythemia

2. Hepatic immaturity

3. Infections

— viral infections, toxoplasmosis, syphyllis,

— bacterial sepsis,
— meningitis,
— dehydration and acidosis.

4. Hypoxia and anoxia

— hypoxia,
— neonatal asphyxia,
— RDS and IRDS,

5. Drugs

— drugs during pregnancy
— drugs during delivery
— drugs in the neonatal period

6. Diseases of the mothers

— diabetes mellitus
— hepatitis.

7. Hypothyroidism
8. Liver diseases, inborn errors of metabolism, galactosemia
9. Instability of the red blood cells
10. Crigger-Najar syndrome, Gilbert syndrome
11. Obstructive jaundice
12. Miscellaneous

The purposes of our study are :

1. To observe the incidence of neonatal jaundice in the Dr. Ciptomangunkusumo Hospital, Jakarta.
2. To find out possible etiological factors of the jaundice.

With these, we hope to have a lead for better management and prevention of neonatal jaundice.

Material and Methods

Material :

Newborns admitted to the Neonatal Ward of the Dr. Cipto Mangunkusumo Hospital between January 1976 to December 1976 were all included in this study. A larger part (92,5%) was born in the hospital while the rest was referred from other Maternity Hospitals in Jakarta.

Those born in our hospital came mostly from low-income families and 70 - 80% had no prenatal care.

Methods :

1. The babies were observed carefully for sign of jaundice, time of its appearance, increasing intensity and disappearance.

2. Jaundice was diagnosed by looking at the skin under sunlight.

3. Infants with jaundice were evaluated for :

a) Periodical bilirubin examination
b) Qualitative method for G_6PD screening
c) Complete blood count
d) If suspicion of blood incompatibility arose, blood group and Coombs' test were determined
e) Whenever septicemia was suspected, a blood culture was taken
f) Examination of direct blirubin in suspicion of obstructive jaundice
g) Liver biopsy if needed.

Management of the neonates.

The size of each room was 5 × 5 meters, each had three TL lamps of 40 Watts and enough sunlight throughout the year.

Newborns weighing more than 2500 g were fed 2 - 6 hours after birth while those between 1500 - 2500 g were fed 6 - 10 hours post-natally.

LBW infants under 1500g were given a solution containing glucose 10% and NaCl 1,5%, using fluid and calorie calculation of our hospital.

If the bilirubin level rose above 12,5 mg%, the infant was put under photo therapy.

If the bilirubin level was below 12,5 mg% and the infant appeared jaundiced 5 mg/kg BW phenobarbital was given.

The criteria for exchange transfusion was described elsewhere (8).

Pre and post exchange transfusion phototherapy was instituted.

Before exchange transfusion, a plasma transfusion 20ml/kg BW was started to bind the free bilirubin in the infants' circulation.

The total bilirubin was examined using the ABO bilirubinometer No10220, and direct bilirubin using BMI blood analyzer Model 6300.

Determination of the etiological factors.

Only one etiology was selected and if there were more than one possible factors, the main factor would be chosen.

If the main etiology was difficult to decide, then the etiological factor would be stated as multiple factors.

Results

From 3261 infants admitted to the Subdivision of Neonatology, Dr Cipto Mangunkusumo Hospital during 1976, 1050 developed jaundice (32,19%), in which 25,04% were low birth weights and 7.15% were fullterm infants. Complete results are given in Table 1 — 4.

TABLE 1: *The Incidence of Neonatal Jaundice in the Dr. Cipto Mangunkusumo Hospital during 1976*

Total live births	3261 babies
Low Birth Weights	612 babies
Babies weighing more than 2500 g	2649 babies
Incidence of jaundice in LBWs	42,97%
Incidence of jaundice in infants weighing more than 2500 g	29,70%
Total incidence of jaundice	32,19%

TABLE 2 : *Etiological Factors*

	BW ⩽ 2500 g		BW > 2500 g		All live births	
	Total	%	Total	%	Total	%
I. *Single factor*						
Hemolysis :						
ABO incompatibility	1	0,38	13	1,65	14	1,33
Rh incompatibility	—	—	1	0,12	1	0,09
G_6PD deficiency	2	0,76	36	6,09	38	3,61
Closed hemorrhages	1	0,38	30	3,81	31	2,95
Infections :						
Septicemia	22	8,36	52	6,60	74	7,05
Meningitis	3	1,14	4	0,50	7	0,66
Miscelaneous :						
Asphyxia + RDS	25	9,50	81	10,29	106	10,09
Dehydration + Acidosis	26	9,88	103	13,08	129	12,28
Hypoglycemia	21	7,89	33	4,19	54	5,14
Polycythemia	3	1,14	6	0,76	9	0,85
No Morbidity :						
Premature + AGA	75	28,51	—	—	75	7,14
Premature + SGA	29	11,02	—	—	29	2,76
Fullterm + AGA	—	—	361	45,87	361	35,52
Fullterm + SGA	—	—	31	3,93	31	2,95
II. Multiple Factors	55	20.91	24	3,04	79	7,52
	263	100	787	100	1050	100

BW = Birth Weight; AGA = Appropriate for Gestational Age; SGA = Small for Gestational age.

TABLE 3 : *The Peak Bilirubin Levels in Jaundiced Infants*

Bilirubin level (mg%)	BW 2500 g		BW 2500 g		Total	%
	Total	%	Total	%		
⩽ 10	49	18,63	271	34,43	320	30,47
10 — 15	144	54,75	356	45,23	500	47,61
15 — 20	56	21,29	147	18,67	203	19,33
> 20	14	5,32	13	1,65	27	2,57
	263	100	787	100	1050	100

BW = Birth Weight.

TABLE 4 : *Exchange Transfusion in the Neonatal Special Care Unit, Dr. Cipto Mangunkusumo Hospital, Jakarta 1976*

Etiology	Total
Rh Incompatibility	1
ABO Incompatibility	10
G_6PD Deficiency	9
Subaponeurotic bleeding	2
Septicemia	8
Multiple etiological factors	4
Total exchange transfusions	34

Discussion

1. Incidence

From the data presented in Table 1, it is evident that the incidence of neonatal jaundice in our study was much lower than reported in the western literature. The figures in the literature were documented when management of neonates and jaundice was not as it is today. Brown in 1973 did not mention whether his data were taken before or after the improvement of knowledge in the management of neonatal jaundice.

It is interesting that our figures corespond with those reported by Siripoonya et al, in Bangkok (1976), a country with the same weather, socio-economic condition and where neonatal management is not unlike our management in Jakarta.

The authors therefore conclude that the differences lie in :

1. Colour of the skin.

Uttley (1974), Harper and Ying (1974) reported that jaundice could begin to be detected when billirubin level passed 2 mg%. According to Brown (1973) it was 5 mg%. In our brown skinned neonates, we observed that ja-

undice started to appear as the bilirubin level reached 6 mg%. This could reduced the incidence in our study.

2. *The intensity of illumination.*

Eversince Cremer et al. (1978) reported the influence of sunlight and artificial light in lowering bilirubin level, phototherapy has been widely used in this last decade. Light therapy is used as prophylaxis and as therapy. The question arises as to why sunlight is not preferred, since it costs nothing. Observations by Lucey (1974) proved that indirect sunlight as a source produced greater dosage in light and energy compared to artificial light. The difficulty lies in measuring the dosage of sunlight and the fact that it is not available at night. The implication is that enough sunlight serves to lower the incidence of neonatal jaundice.

3. *General care of the newborn.*

During this last decade, general care of the newborn underwent many changes and improvements. These include: early feeding, better management of asphyxia, prevention of infections and thorough antenatal care. The limited use of drugs during pregnancy, delivery and antenatal period and also the prevention of hemolysis in Rh incommpatibility and G_6PD deficiency help to lower the incidence of neonatal jaundice.

4. *The management during pregnancy and delivery.*

In our study, most babies who developed jaundice had no antenatal care. This was reported in a special study concerning the effect of maternal morbidity on neonatal jaundice by Monintja et al. (1978), in which it was seen that antenatal care has an influence in the development of jaundice.

5. *The incidence of G6PD deficiency.*

The incidence and recognition of factors that might trigger the hemolysis are important. We found G_6PD deficiency in 3% of subjects and jaundice in 40% of them. With longer observation, the incidence might be higher.

6. *Drugs used during pregnancy and delivery.*

Drugs were said to have an important role in the devolopment of jaundice. According to Beazly and Alderman (1975), oxytocin increased bilirubin level in the newborn.

7. *Blood Incompatibility.*

The incidence of blood group incompatibility greatly influence the incidence of neonatal jaundice. Rh incompatibility was found only in 1 or 2 cases per year, while ABO incompatibility in 1.33% of our cases. If screening toward ABO incompatibility was also performed in jaundice appearing during the first week, the incidence might be higher (Siripoonya et al., 1976).

II. *Etiological Factors*

It is agreed upon that neonatal jaundice is caused mainly by hemolysis. Other known factors are: liver immaturity, hypothyroidism, Down's syndrome, defect of red blood cell and "breast milk jaundice". Factors as drugs, anoxia, diabetic mothers, septicemia, dehydration and acidosis were also propo-

sed to be etiological factors by Crosse and Hill (1975).

Analysis of Table 2 revealed that the important etiological factors in neonatal jaundice in the Dr. Cipto Mangunkusumo Hospital Jakarta, during 1976 were:

1. Physiological jaundice.
2. Infections and its resulting morbidity (Septicemia, meningitis, dehydration and acidosis).
3. Anoxia and hypoxia manifesting as neonatal asphyxia and respiratory distress syndrome.
4. Hemolytic jaundice especially caused by G_6PD deficiency.
5. Multiple factors.
6. Miscellaneous factors such as hypoglycemia, polycythemia.

The spectrum of etiology in our study was very different from those reported in the Western literature where hemolytic process was the main cause.

Physiological jaundice was the most frequently found, although it was probable that if we had better laboratory equipment, some might turn out to have had a pathological basis. In this group, the usual pattern was seen, jaundice in low birth weights exceeded jaundice in the heavier infants.

Infections, especially gastroenteritis was observed to be an important factor of etiology. This was the result of "overcrowding", lack of nurses, rooming in facilities and also because of restoration done to part of the hospital's buildings. Gastroenteritis with the resulting dehydration and acidosis may increase bilirubin level in the blood. After gastroenteritis, the next was septicemia. In one year, it was proven in 22 low birth weights and 52 fullterms. The organisms involved were mostly S. paratyphi and E. coli (Aminullah et al., 1978).

Hypoxia and anoxia were revealed as main etiological factors. The magnitude of this problem was reported by Aminullah et al. (1974) and Budjang et al. (1974).

G_6PD deficiency was our main cause of hemolysis, even if the incidence was not as high as reported by Chiung (1974). If the observation time was longer, the incidence possibly could be higher. The trigger factors for hemolysis were infection, salicylates and acidosis. The role of traditional herbs had never been evaluated. Camphor as a trigger factor was not encountered in our series.

Difficulties in deciding the etiology of jaundice was frequently experienced, escpecially if a combination of factors in which each may cause jaundice by itself was present. In our study, 7,52% of cases were caused by multiple factors.

During our one year study, no case of neonatal hepatitis nor obstructive jaundice were found. The expected number of cases in the literature was about 2 - 4 cases per year.

Analysis of Table 3 shows that in 69,5% the bilirubin level was higher than 10 mg%, in 47,61% it was between 10 - 15 mg%, while in 21,8% it

was higher than 15 mg%. An absolute indication for exchange transfusion was found in 27 cases or 2,57%. The details were presented in Table 4. Even though intensive care and enough sunlight were available, there were 34 exchanges needed. The main cause was ABO incompatibility followed by septicemia and G_6PD deficiency. Many cases not caused by blood incompatibility were referrals from other hospitals.

As a conclusion, it is appropriate for the authors to say that neonatal jaundice in Indonesia still needs further observation and study by experts.

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