Nigerian Journal of Paediatrics 2004, 31 (2) 33-38

REVIEW ARTICLE

Managing Neonatal Jaundice at the General Practice and Primary Health Care Level: An Overview

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Summary

Ogunlesi TA. Managing Neonatal Jaundice at the General Practice and Primary Health Care Level: An Overview. *Nigerian Journal of Paediatrics* 2004; 31: 33. Neonatal Jaundice (NNJ) is one of the commonest causes of neonatal morbidity and mortality in the developing world. The physiological form of NNJ occurs in about two thirds of newborns. In addition to this however, are the various pathological forms which apart from being potentially fatal if not well managed, are often very difficult to differentiate from the benign physiological form, except with detailed laboratory investigations. Although the pathological forms of NNJ are ordinarily beyond the facilities usually available to General Practitioners (GPs) in developing countries, it is important that these GPs and the health workers at the primary health care level be well informed about NNJ since they are usually the first set of practitioners to receive babies with this illness. For better case management and reduction of mortality in NNJ, GPs should be able to sort babies with NNJ and manage them according to the severity of the illness. Mothers should be educated against harmful traditional practices which may provoke severe NNJ like the home use of naphthalene-containing balls. Home treatment of NNJ with the various local remedies should also be discouraged since these may not be helpful and may inadvertently cause them to seek medical advice late, with the attendant grave consequences.

Introduction

NEONATAL jaundice (NNJ) is a significant contributor to neonatal morbidity and mortality in the developing world.[1-5] Jaundice, which is an abnormal yellowish discoloration of skin and mucous membranes as a result of bilirubin accumulation, is not a disease but a manifestation of an on-going clinical disorder. Bilirubin is the end product of haemoglobin degradation in the reticuloendothelial system as well as from dyserythropoiesis. The heme portion of haemoglobin is converted by the enzyme heme oxygenase into biliverdin which in turn, is reduced by the enzyme biliverdin reductase to bilirubin. Bilirubin in the unconjugated or indirectly reacting form, is fat soluble. It is able to cross membranes and stain body tissues especially the brain, where its toxic effect manifests clinically as an irreversible damage known as kernicterus.[6] Bilirubin is transported in the plasma bound to albumin and taken up in the liver by specialized proteins. It is received by receptors on hepatocytes called the ligandin, for conjugation by the enzyme, glucuronyl transferase which converts the fat soluble unconjugated bilirubin to water soluble conjugated bilirubin in preparation for excretion through the biliary system.[6]

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Classification of Neonatal Jaundice

A. Unconjugated Neonatal Hyperbilirubinaemia

Most of the cases of NNJ seen in the developing world are unconjugated in form. The clinical significance of this form of jaundice lies in its ability to cause kernicterus. Common causes include the following:

Physiological Jaundice

This is the commonest type of NNJ. It is basically a diagnosis of exclusion and results from the immaturity

of the hepatic conjugating enzyme. It is defined[7] as jaundice with the following characteristics:

i. it does not appear until the 48th hour of life.
ii. the serum bilirubin level does not rise above 12mg/dl (204μmol/l) among term infants or 15mg/dl (255μmol/l) among preterm infants.
iii. the serum conjugated bilirubin is not higher than 2mg/dl (34μmol/l) at any time.
iv. it does not persist beyond seven days in term infants and 14 days in preterm infants.
v. the infant is well.

Prematurity

Close to three quarters of preterm infants are known to develop NNJ[8] mainly as a result of a higher rate of haemolysis, inadequate caloric intake with increased entero-hepatic circulation and an under-developed conjugating system. More importantly, preterms are at higher risk of kernicterus than term babies.[6]

Glucose-6-Phosphate Dehydrogenase (G6PD) Deficiency

This is reportedly the most important aetiological factor associated with severe NNJ and kernicterus in Nigeria.[9] NNJ in G6PD deficiency usually follows the ingestion of, or exposure to oxidants like drugs (aspirin, excessive doses of chloroquine, sulphonamides, quinine, chloramphenicol, nalidixic acid, nitrofurantoin, griseofulvin), naphthalene-containing home products such as camphor balls commonly used as insect repellants, and menthol-containing powders and balms.[1,10,11] Favism in which haemolysis follows ingestion of Fava beans is common in the Mediterranean.[1] NNJ due to G6PD deficiency may present at any time, but usually towards the end of the first week.

Blood Group Incompatibilities

These are the principal causes of early onset NNJ; i.e. jaundice that presents within the first 24 hours of life.[7] The direct anti-globulin test (Direct Coomb's Test) is usually positive, suggesting an immune based aetiology. While ABO incompatibility is a commoner clinical finding, Rhesus incompatibility, which is a more severe cause of early onset NNJ, is relatively uncommon among Nigerians.[1,9]

Septicaemia

This is a common cause of NNJ because of the high rate of neonatal sepsis in the developing world where deliveries are often unhygienic.[12]

Others

Table I shows some of the other less common causes of neonatal unconjugated hyperbilirunaemia.

B. Conjugated Neonatal Hyperbilirubinaemia.

This is not a common finding in clinical practice. It is defined as serum direct or conjugated bilirubin greater than 20 percent of the total serum bilirubin. It is usually due to cholestasis as a result of congenital obstruction to bile flow; it may however, less commonly be due to primarily hepatic disorders with difficulty in excretion of conjugated bilirubin.[6,13] The clinical significance of this lies in the likelihood of causing damage to the liver with resultant chronic liver diseases.[13,14] Common causes of conjugated hyperbilirubinaemia are indicated in Table I.

Table I

Some Other Causes of Neonatal Hyperbilirubinaemia

Unconjugated Hyperbilirubinaemia	*Conjugated Hyperbilirubinaemia*
1. Extravasated blood collection	1. Idiopathic neonatal hepatitis
2. Polycythaemia	2. Bacterial sepsis
3. Breastmilk	3. Viral hepatitis
4. Pyloric stenosis	4. Biliary atresia
5. Hypothyroidism	5. Galactosaemia, Tyrosinaemia
6. Spherocytosis, elliptocytosis	6. Trisomies 18, 21
7. Gilbert syndrome	7. Bile plug syndrome
8. Crigler Najjar syndrome	8. Choledochal cyst

Management of Neonatal Jaundice where Facilities are Limited

The management of NNJ at the primary care level as well as by general practitioners (GPs) in the developing world where facilities are limited, is expectedly fraught with poor investigation and the tendency to mismanagement. Apart from the fact that severe unconjugated hyperbilirubinaemia could cause neonatal death and chronic handicapping conditions such as cerebral palsy,[15,16] deafness, speech disorders, learning disability and mental retardation, it is important to investigate it thoroughly, because the underlying aetiology may themselves lead to devastating effects. Examples of these include hypothyroidism, galactosaemia and septicaemia. This principle is also applicable to conjugated hyperbilirubinaemia which may cause severe hepatic damage despite the fact that the aetiology may be readily amenable to treatment. Examples include septicaemia which can be treated with antibiotics, galactosaemia which responds well to dietary manipulation, and biliary atresia which may be surgically correctable.

The first and most important step in the management of babies with NNJ is to define its form. As stated above, a large number of causes of unconjugated hyperbilirubinaemia are benign and physiological but the physicians and health workers privileged to be the first to attend to such babies must be alert to the possibility that a few cases may be pathological and thus, potentially fatal. They must also acknowledge their limitation in this regard. Non-invasive methods of detecting jaundice like the use of Icterometer, the Jaundice meter,[17] and the Bilicheck which are routinely used in developed countries, should be made available at the primary level of health care to facilitate identification of babies at risk of severe NNJ. In the absence of these devices, health workers at the primary level of health care and GPs who cannot estimate serum bilirubin should regard NNJ as an emergency[18] and handle it as such. The following questions must be satisfactorily answered for jaundiced babies to be retained at the primary level of health care or by the GP:

i. Is the baby unwell? A baby that is active, sucking well, not unduly irritable and not febrile or abnormally cold is likely to be well.
ii. Is the baby preterm? A baby that weighs less than 2500g, with poor muscle tone, thin transparent skin, long straight hair, breast nodule that is not palpable and absent plantar creases or creases that are limited to the anterior two-third of the soles is likely to be a preterm.[6]
iii. Is the baby older than 14 days of age? Jaundice persisting beyond the age of 14 days is regarded as Prolonged NNJ and must be extensively investigated.
iv. Is the jaundice noticeable within 36 hours of birth? It is important to add that pathological jaundice can appear at any age but jaundice that is noticed within the first 36 hours of life is not physiological.
v. Is the jaundice noticeable on the lower extremities? NNJ has been observed to have a cephalocaudal spread with increasing severity for unknown reasons.[19] The limitation of this clinical method must however, be acknowledeged.[20]
vi. Does the baby's urine stain its diapers deep yellow? Conjugated bilirubin is mainly excreted in the urine, hence, bilirubinuria that stains diapers is likely to be due to serum conjugated bilirubin greater than 2mg/dl (34μmol/l).

If the response to any of the above questions is in the affirmative, the baby probably has a pathological NNJ that would require extensive investigations and a definite mode of management. Prompt referral to the next higher level of health care that is adequately equipped to manage such babies must be instituted.

Neonatal jaundice, unlike other problems peculiar to the developing world, such as polio or measles infections, is not amenable to eradication, hence, efforts must be concentrated on reducing its impact on newborn infants. Although kernicterus is still a common finding in our clinical practice, its resurgence in the developed world is being attributed to early discharges of newborn babies from the hospital, such that the rate of re-hospitalisation for NNJ is alarming and usually with more severe morbidity and mortality.[21,22] Where there is pressure for early discharge from the hospital, serum bilirubin levels at specific times within the first 24hours of life are being used as predictors of babies that may require re-hospitalisation following discharge.[22-24] These appear reliable and should be considered for incorporation into our local practices.

Specific Forms of Management

In practice, the management of NNJ is aimed at rapidly reducing the serum unconjugated bilirubin level before the brain is permanently stained and damaged.

(1) Phototherapy

This uses the blue part of ultraviolet light to convert non-polar bilirubin to polar isomers that can be readily excreted in bile without conjugation. In most secondary and tertiary health facilities in the developing world, blue light is not available for standard phototherapy; hence, white light from fluorescent tubes is substituted. The

output of this in terms of irradiance is difficult to assess and quantify.[25] In actual fact, the dearth of facilities has prompted the use of locally designed wooden phototherapy stands once electricity is fairly stable. For this to be clinically useful, laboratory facilities for the estimation of serum bilirubin must be available. In the experience of the author, these locally constructed wooden stands which use four white fluorescent tubes kept at a distance of about 45cm from the baby, are reliably effective in the management of NNJ. In an attempt to cope with the pressure of early hospital discharge, phototherapy can also be arranged in the homes of the patients with physiologic NNJ but with close monitoring by a team of neonatal nurses who would be able to monitor the serum bilirubin.[26]

Fibreoptic phototherapy was recently introduced for the management of NNJ but it is not yet available in developing countries. It is not more effective than the conventional phototherapy although it has the advantage of fostering better mother-infant interaction and bonding.[27]

Exposure of jaundiced babies to sunlight (solar therapy) is equally effective; it is cheap and reduces the demand on personnel but it may give a false sense of security especially when serum bilirubin cannot be measured.[1] Where sunlight is abundant with intense irradiation, like in the Middle East, it might equally be, if not more effective than conventional phototherapy in managing NNJ.[28] A higher risk of skin neoplasia later in life in places like Australia, is suspected, hence, the practice is being discouraged in such places.[29]

(2) Exchange Blood Transfusion

This method achieves reduction of serum bilirubin most rapidly but requires a great deal of expertise and asepsis.[1] This is definitely not a procedure for GPs or for health workers at the primary level of care.

(3) Drugs

Drugs like the metalloporphyrins[30] are new products which prevent NNJ or reduce the rate of rise of serum bilirubin by inhibiting heme oxygenase. Unfortunately, these are also not yet available for routine use in the developing world. The use of phenobarbitone in managing NNJ may be risky because of its slow onset of action in the face of rapidly rising serum bilirubin.[1,6] Antibiotics are not indicated in the primary management of NNJ because they do not reduce serum bilirubin levels; if anything, some of them like chloramphenicol, co-trimoxazole and ceftriaxone may increase serum bilirubin levels.[6] They are only useful when septicaemia is confirmed as the aetiology of the jaundice.

(4) Diet and Hydration

Diet was not known to have a direct effect on the clearance of serum bilirubin until lately. Casein-containing formulae are now known to inhibit beta-glucuronidase in the intestine,[31-33] thus reducing serum bilirubin levels and the need for phototherapy. It is also more effective when it is combined with conventional phototherapy. Beta glucuronidase is the enzyme that deconjugates bilirubin thus allowing its reabsorption through the entero-hepatic circulation.[6] The major limitation of this practice however, is the tacit routing of nursing mothers in the developing world away from exclusive breastfeeding back to infant formula feeding. This is particularly dangerous where there is a high level of illiteracy and ignorance. Adequate hydration, though likely to be easily under-rated, is another important step in the management of babies with NNJ, especially with on-going phototherapy.

The Role of Health Education in NNJ

The GPs and the primary health centre (PHC) workers are often the groups of health workers to whom most newborn babies in the developing world first present. They should therefore, be able to detect NNJ and sort the babies out using the criteria outlined above, so that high risk babies can be referred to specialists for prompt and appropriate management. Reduction of mortality in NNJ in the developing world is hinged on appropriate information, education and communication. Mothers must be adequately informed on the early recognition of NNJ, the various risks associated with it and the need to act promptly when they notice that their babies are jaundiced. The opportunities of antenatal visits by expectant mothers should be used to educate them adequately about the problem of NNJ along with other common issues like breastfeeding and childhood immunizations. Audiovisual means like wall posters produced in local languages as well as the mass media, may also be employed in educating the general populace about the dangers associated with NNJ.

Specifically, the mothers should be discouraged from harmful traditional practices which may provoke severe jaundice in their babies like the ingestion of herbal preparations containing naphthalene, the use of naphthalene-containing balls in preserving clothes and the use of menthol-containing balms purportedly to keep the body warm.[34] These may be harmful since they are precipitants of haemolysis in G6PD deficiency, a condition for which there is no routine screening in most centres. It is also important to note that delay in seeking appropriate medical assistance is one of the

reasons why NNJ is still associated with significant morbidities and mortality in the developing world.[34] The practices of administering glucose drinks and oral antibiotics to babies with jaundice, exposing them to early morning sun as well as bathing jaundiced babies in local herbal preparations as home remedies for NNJ, do not have any known clinical usefulness. Rather, they cause distraction and delay in seeking appropriate medical help with grave consequences; these must also be discouraged. These steps are essential for reducing the incidence of severe NNJ as well as the mortality and severe morbidities associated with it, in the developing world.

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