

When, Why and How to do BIND Scoring?

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Introduction:

- Bilirubin Induced Neurological Dysfunction (BIND) was defined by Shapiro as subtle neurodevelopmental disabilities without classical findings of kernicterus that, after careful evaluation and consideration, appear to be due to bilirubin neurotoxicity. These may include disturbances of sensory and sensorimotor integration, central auditory processing, coordination, and muscle tone.
- Term and late preterm infants who are at risk for developing BIND are those with TB concentrations ≥ 30 mg/dL (500 micromol/L)
- At this threshold, unconjugated bilirubin that is not bound to albumin (also referred to as "free" or "unbound" bilirubin) enters the brain and cause cell death by apoptosis (programmed cell death) and/or necrosis
- Neonates with severe hyperbilirubinemia should be monitored for BIND. This can be done using BIND score.
- **BIND Score:**
- The BIND score is a tool to objectify and facilitate a clinical diagnosis of ABE as well as to monitor the neonatal neurological exam in infants with progressive hyperbilirubinemia as a predecessor to encephalopathy.
- The BIND score uses the mental state, muscle tone and cry pattern to categorize neonates into three levels of increasing abnormality (mild, moderate, severe).
 - A score of zero indicates a normal neonate.
 - A score of 1- 3 signifies mild encephalopathy
 - A score of 4-6 moderate encephalopathy
 - A score of 7-9 severe encephalopathy
- The simplicity of the BIND scoring system, similar to the Apgar score, makes it an attractive tool for clinical diagnosis of ABE in resource limited locations that lack ready access to MRI) and ABR testing.
- The BIND score was modified for use primarily in low-resource settings often without ancillary testing such as ABRs and MRIs.

The modified bilirubin-induced neurologic dysfunction scale (M-BIND)

- It is a 12-point score, incorporates eye abnormalities such as a divergent gaze, paralysis of upward gaze, anxious appearance and nystagmus, and serves to better discriminate degrees of BIND severity and to aid in distinguishing ABE from other common causes of neonatal morbidity and mortality such as tetanus still seen in low-resources settings.
- A score of 1-4 was predicted to be indicative of mild ABE, which is generally considered to be reversible if treated promptly and aggressively.
- An intermediate score 5-6 was predicted to be indicative of moderate ABE, which might be reversible with urgent and prompt bilirubin reduction.
- Higher scores ≥ 7 would likely indicate severe/very severe ABE, probably representing irreversible brain damage in most infants.

Table 1. BIND Score

Score	Clinical Signs
Mental Status	
0	Normal mental status
1	Sleepy, Difficult to Awaken for Feeding
2	Very sleepy; Alternatively very irritable
3	Semi-Coma; Apnea; Convulsions
Muscle Tone	
0	Normal muscle tone
1	Persistent mild hypotonia
2	Moderate hypotonia; moderate hypertonia; increasing arching of neck and trunk on stimulation without spasms of arms & legs and without trismus
3	Persistent retrocollis; opisthotonus; crossing or scissoring of arms or legs but without spasms of arms & legs and without trismus
Altered Cry	
0	Normal cry
1	High-pitched cry
2	Shrill cry
3	Inconsolable crying, or cry weak or absent in child with previous history of high pitched or shrill cry

Table 2. Modified BIND Score

Score	Clinical Signs
Mental Status	
0	Normal mental status
1	Sleepy, Difficult to Awaken for Feeding
2	Very sleepy; Alternatively very irritable
3	Semi-Coma; Apnea; Convulsions
Muscle Tone	
0	Normal muscle tone
1	Persistent mild hypotonia
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Altered Cry	
0	Normal cry
1	High-pitched cry
2	Shrill cry
3	Inconsolable crying, or cry weak or absent in child with previous history of high pitched or shrill cry
Altered Gaze	
0	Normal Gaze
3	Sun-setting; paralysis of upward gaze

References

1. Johnson L, Brown AK, Bhutani VK. BIND-a clinical score for bilirubin induced neurologic dysfunction in newborns. *Pediatrics*.1999;104(3):746.
2. Shapiro SM. Definition of the clinical spectrum of kernicterus and bilirubin-induced neurologic dysfunction (BIND) J Perinatol. 2005;25:54–9.
3. Radmacher PG, Groves FD, Owa JA, et al. A modified bilirubin-induced neurologic dysfunction (BIND-M) algorithm is useful in evaluating severity of jaundice in a resource-limited setting. *BMC Pediatr*. 2015;15:28.
4. Radmacher PG, Groves FD, Owa JA, Ofovwe GE, Amaubunos EA, Olusanya BO, *et al*. A modified Bilirubin induced neurologic dysfunction (BIND-M) algorithm is useful in evaluating the severity of jaundice in a resource limited setting. *BMC Pediatr*. 2015;15:28.