Original Article

Can Alberta infant motor scale and milani comparetti motor development screening test be rapid alternatives to bayley scales of infant development-II at high-risk infants

Zeynep Hoşbay Yıldırım, Nur Aydınlı, Barış Ekici, Burak Tatlı, Mine Çalışkan

Department of Pediatric Neurology, Istanbul Medical Faculty, Fatih/Istanbul, Turkey

Abstract

Purpose: The main object of the present study is to assess neuromotor development of high-risk infants by using three tests, and to determine inter-test concordance and the feasibility of these tests. **Materials and Methods:** One-hundred and nine patients aged between 0 and 6 months and identified as "high-risk infant" according to the Kliegman's criteria were enrolled to the study. Three different tests were used to assess neuromotor development of the patients: Bayley scales of infant development-II (BSID-II), Alberta infant motor scale (AIMS), and Milani Comparetti Motor Development Screening Test (MCMDST). **Results:** Correlation analysis was performed between pure scores of BSID-II motor scale and total scores of AIMS. These two tests were highly correlated (*r*:0.92). Moderate concordance was found between BSID-II and AIMS (k:0.35). Slight concordance was found between BSID-II and MCMDST; and the concordance was slight again for AIMS and MCMDST (k:0.11 and k:0.16, respectively) too. **Conclusion:** AIMS has a high correlation and consistency with BSID-II and can be used with routine neurological examination as it is based on observations, has few items, and requires less time to complete.

Key Words

Alberta infant motor scale, bayley scales of infant development-II, high-risk infant, milani comparetti motor development screening test

For correspondence:

Dr. Barış Ekici, Ortakoy Dereboyu cad. Arkeon sitesi A 5 blok D 3, Besiktas/Istanbul, Turkey. E-mail: ekicibaris@yahoo.com

Ann Indian Acad Neurol 2012;15:196-9

Introduction

Infants with a history of negative environmental and/or biologic factors that may lead to neuromotor development problems are identified as "high-risk infants." Kleigman has classified this term depending on the social and demographic features of the parents, the medical history of the mother, and all gestational and perinatal risk factors affecting neonatal period.[1]

It is difficult to predict neurologic outcome in high-risk infants at neonatal period. Infants with heavy neurologic symptoms in early periods may show normal development whereas infants with mild neurologic symptoms could have more retarded course.[2] Neuromotor examinations of infants are performed to differentiate infants with motor dysfunction from those with normal development (discriminative tool), to predict which infants will have future motor problems based on the current performance (predictive tool), and to evaluate changes over time (evaluative tool).[3,4]

"Gold standard" test that is used for assessment of neuromotor development in high-risk infants is Bayley scales of infant development-II (BSID-II). It is appropriate for assessment of motor, mental, and behavioral developments of children aged 1–42 months.[5,6] Alberta infant motor scale (AIMS) and Milani Comparetti Motor Development Screening Test (MCMDST) are rapid observational tests that assess the infants' motor development from birth to 18 months and from birth to 2 years of age, respectively.[7-9]

The main object of the present study is to assess neuromotor development of high-risk infants by using three tests mentioned above, and investigate efficacy of these tests.

Materials and Methods

This study was carried out for 1-year period at Pediatric Neurology Department. A total of 109 infants aged between 0 and 6 months and identified as "high-risk infant" according to the Kliegman's criteria[1] were enrolled into the study. The research protocol was approved by the Medical Ethics Committee of the Istanbul Medical Faculty.

Access this article online

Quick Response Code:

Website: www.annalsofian.org

DOI: 10.4103/0972-2327.99714

All patients underwent a routine physical and neurological examination by same pediatric neurologist (N.A.) and a detailed history of gestation, parturition, and postnatal period was taken. Patients found to have severe neurological impairment were excluded from the study. Infants with severe visual or auditory impairment were also excluded.

Three different tests were performed by the same physiotherapist (Z.Y.H.) to assess neuromotor development of the patients: BSID-II, AIMS, and MCMDST.

BSID-II is appropriate for assessment of motor, mental, and behavior developments of children aged 1–42 months. It is comprises three separate scales (the Mental Scale, the Motor Scale, and the Behavior Rating Scale); only the Mental and Motor Scales were administered in the present study. Raw scores on the Mental Scale are converted to a Mental Developmental Index (MDI) and similarly raw scores on the Motor Scale are converted to a Psychomotor Developmental Index (PDI).

Results of BSID-II test were assessed according to index scores: scores equal to or above 115 were accepted as rapid performance, 85–114 as normal, 70–84 as delayed performance, and 69 or below as highly delayed performance.[5,6]

The second test is AIMS. This test assesses motor development of babies from birth to 18 months. A total number of 58 items in four positions (supine, prone, sitting, and standing) can be scored. Each item contains three components of movement: weight-bearing, postural alignment, and antigravity movement. For the interpretation of AIMS scores, we used tables containing adequate means and standard deviations for each month. According to the tables, infants with an SD more than -2 were considered as 'abnormal,' infants with an SD between -1 and -2 were considered as 'suspicious,' and infants with an SD lower than -1 were considered as 'normal.'[7]

The third assessment test is MCMDST. MCMDST can be used for assessment of motor development from birth to 2 years of age. It contains 27 items. MCMDST is based on chronologic age. Behaviors which correspond to 1 month below than chronologic age or better were considered as 'normal,' whereas others that were worse than 1 month below chronologic age were considered as 'abnormal.'[8,9]

We started with AIMS that is based on observational assessment. AIMS took approximately 15–20 minutes. Then, MCMDST that includes similar items to AIMS was performed. Application time was 5–10 min for MCMDST. BSID-II was the last test, which had more items and required more different positions of the baby. Average time to complete BSID-II was 20–25 min. Tests were not employed for sick, hungry, or sleepy infants. All tests were administered in a silent room. Each test was evaluated according to individual manual book. We accepted BSID–II as "gold standard" and compared with the remaining two.

Statistical analysis

Statistical analysis was performed by SPSS 15 for Windows. The relation between the raw score of BSID-II motor scale and total score of AIMS was evaluated by Pearson's correlation coefficient (*r*). Cohen's Kappa statistics were used to determine concordance of BSID-II with AIMS, BSID-II with MCMDST, and AIMS with MCMDST.

Results

Fifty-six patients were female (51.4%) and 53 were male (48.6%). At the time of the tests, the chronological ages varied between 1 and 8 months, and the average age was 3.7 ± 1.9 months. Seventy-seven of the infants (70.6%) were born preterm whereas 32 (29.4%) of them born following a term gestation. Birth weight of 68 infants was less than 2500 grams. Study group included 20 twins (18.4%) and 6 (5.5%) triplets [Table 1].

As an identified risk factor, 78 of the patients (71.4%) had neonatal jaundice, 4 (3.6%) had intraventricular hemorrhage, 14 (12.9%) had perinatal asphyxia, 15 (13.8%) had neonatal seizures, 3 (2.8%) had meconium aspiration, and 10 (9.8%) had respiratory distress syndrome.

In Table 2, the number and percentage of the cases, which are assessed as normal, suspicious, and abnormal according to BSID-II, AIMS, and MCMDST, are given. According to BSID-II, 28 cases have been assessed as normal, 55 cases as suspicious, and 26 cases as abnormal. According to AIMS, 51 cases have

Table 1: Characteristics of our study group that included 109 cases diagnosed as high-risk infant

Variate	N	%
Sex		
Girl	56	51.4
Boy	53	48.6
Gestational age		
Term	32	29.4
Preterm	77	70.6
Birth weight (g)		
<2500	68	62.4
≥2500	41	37.6
Risk factors*		
Prenatal	77	70.7
Perinatal	17	15.6
Postnatal	107	98.2
Age (month)	Mean	Range
Chronologic age	3.7 ± 1.9	1–8 months
Corrected age	2.5 ± 1.7	16 days–6 months

*Cases may carry more than one risk factor

Table 2: Results of BSID-II, AIMS, and MCMDST tests

	Motor scale		
	BSID-II	AIMS	MCMDST
Results	*n* (%)	*n* (%)	*n* (%)
Normal	28 (25.7)	51 (46.7)	99 (90.8)
Suspicious	55 (50.4)	41 (37.6)	-
Abnormal	26 (23.9)	17 (15.7)	10 (9.2)

been assessed as normal, 41 cases as suspicious, and 17 cases as abnormal. Finally, according to MCMDST, 99 cases have been assessed as normal and 10 cases as abnormal.

Correlation analysis was performed between pure scores of BSID-II motor scale and total scores of AIMS. Pearson's correlation coefficient (r=0.92) was found statistically significant (P<0.01). This result indicated that these two tests were highly correlated.

Comparison of BSID-II and AIMS test results gave a k value of 0.35. This value indicates moderate concordance of the tests. The k values for comparisons of BSID-II and MCMDST test results and AIMS and MCMDST test results are 0.11 and 0.16, respectively. These values indicate slight concordance of the tests.

Discussion

The most frequent early observable delays in high-risk infants occur in the gross motor development. Early identification of gross motor delays is, therefore, essential to maximize the child's potential for positive developmental and functional outcomes.[10] In recent years, some reports which indicate the positive impacts of early physiotherapy on the neuromotor development of high-risk infants were published and various tests were used to distinguish the infants who are at risk for permanent motor deficits and to start early physiotherapy and to determine the effects of the physiotherapy.[4,11,12] Early identification takes advantage of this critical developmental period and provides a window of opportunity to maximize the benefits of early intervention programs.[10] In Turkey, because of the high birth rates and the busy outpatient clinics, it is necessary to choose a practical test to be used with the routine neurological examination. To our knowledge, this is the first study in Turkey assessing the feasibility and validity of different tests, which can be practiced together in a routine neurological examination.

Among the tests that assess neuromotor development of infants, BSID-II, validity and reliability of which were accomplished, has a wide range of use including mental, motor, and behavioral situations of the infants in a wide spectrum in terms of their ages. Benefits of choosing the BSID-II include compatibility with the BSID-II Mental Scale, little need for equipment, and a combined score for both fine and gross motor areas.[10,13] It is recommended to complete the motor and mental scales of BSID-II together in the test book. Mental scale is necessary for assessment of child's cognitive, language, motor, and social fields separately. Therefore, we used mental scale of BSID-II together with motor scale. However, we had no chance to compare the mental scale with AIMS and MCMDST as these tests lack of their own mental scales. BSID-II is recognized as gold standard because of these properties. Another important property of BSID-II is that it has a high stability. The most crucial disadvantage of BSID-II is long length of its practice.[5,6,14]

MCMDST is based on observation. It is practiced in a short time and it assesses the spontaneous movements and postural reactions that are practiced during the neurological examination.[8,9] It can assess the infants that are 1 month old or older as chronological age. We chose this test as it is mostly observational, requires short time, and contains similar items with AIMS. Five items were the same in MCMDST and AIMS for 0-6 month babies so that we were able to administer these tests together. Normally, when administered alone MCMDST takes 10–15 minutes, but after AIMS, it took average 5 minutes. We did not face any problem. The infants who have distinctive motor retardation are classified as abnormal by the test.[9,15] However, the test does not classify infants as suspicious, so it is not useful for early physiotherapy programs. We believe that its correlation with other tests is weak because of the fact that it classifies the cases as only normal and abnormal.

We have detected a high correlation between AIMS and BSID-II. In the similar studies conducted in Brazil and Taiwan by Almeida KM *et al*.[16] and Jeng SF *et al*.,[17] they also reported correlation for the entire population of infants, with higher values at 12 months. However, it seems to be inferior to BSID-II in picking up suspicious cases, so that close follow-up schedule for these children must be instituted. AIMS involves observation of the infant's movement repertoire with minimal or no handling that can be accomplished before the scheduled neurological examination.[3] Its standardization has been accomplished in Canada and Greece. There is no standardization study for Turkey, but because the infants between 0 and 6 months of ages show unique neuromotor patterns, we do not expect local factors to affect the results.[16-21]

We think that an important limitation of our study is the lack of prospective follow-up, which limits evaluation of continuity of the correlation at advanced ages and predictive power of the tests.

Although BSID-II is a superior test with detailed motor and mental evaluations, we concluded that AIMS, which has a high correlation and consistency with BSID-II, can be used with routine neurological examination as it is based on observations, has few items, and can be performed in a shorter duration.

References

1. Barbara J, Kliegman RM, Kliegman S. The high-risk infant. In: Behrman RE, Kliegman RM, JeNson HB, editors. Nelson Text book of Pediatrics. 17th ed. Philadelphia: Saunders; 2004. p. 547-50.
2. Forrest CB, Guralnic MJ. Effectiveness of developmental intervention in the first five years of life. Pediatr Clin North Am 1991;38:1513-28.
3. Spittle AJ, Doyle LW, Boyd RN. A systematic review of the clinimetric properties of neuromotor assessments for preterm infants during first year of life Dev Med Child Neurol 2008;50: 254-66.
4. Campos D, Santos DC, Gonçalves VM, Goto MM, Arias AV, Brianeze AC, *et al.* Agreement between scales for screening and diagnosis of motor development at 6 months. J Pediatr (Rio J) 2006;82:470-4.
5. Bayley N. Manual for bayley scales of ınfant development. 2nd ed. San Antoino TX: The Psycohological Corporation; 1993.
6. Black MM, Matula K. Essentials of bayley scales of ınfant development-II assessment. New-York: John Wiley and Sons; 2000.
7. Piper MC, Darrah J. Motor assessment of the developing infant. 2nd ed. Philadelphia: WB Saunders; 1994.
8. Stuberg W. Milani-comparetti motor development screening test

for infants and young children - A manuel. 3rd ed. Meyer Children's Rehabilitation Institute, Omaha, Nebraska, USA: University of Nebraska Medical Center; 1992.
9. Milani-Comparetti A, Gidoni EA. Routine developmental examination in normal and retarded children. Dev Med Child Neurol 1967;9:631-8.
10. Jackson BJ, Needelman H, Roberts H, Willet S, McMorris C. Bayley scales of infant development screening test-gross motor subtest: Efficacy in determining need for services. Pediatr Phys Ther 2012;24:58-62.
11. Blauw-Hospers CH, De Graaf-Peters VB, Dirks T, Bos AF, Hadders-Algra M. Does early intervention in infants at high risk for a developmental motor disorder improve motor and cognitive development? Neurosci Biobehav Rev 2007;31:1201-12.
12. Spittle AJ, Orton J, Doyle LW, Boyd R. Early developmental intervention programs post hospital discharge to prevent motor and cognitive impairments in preterm infants. Cochrane Database Syst Rev 2007;2:CD005495.
13. Provost B, Heimerl S, McClain C, Kim NH, Lopez BR, Kodituwakku P. Concurrent validity of the Bayley Scales of Infant Development II Motor Scale and the Peabody Developmental Motor Scales-2 in children with developmental delays. Pediatr Phys Ther 2004;16:149-56.
14. Harris SR, Megens AM, Backman CL, Hayes VE. Stability of the Bayley II Scales of Infant Development in a sample of low-risk and high-risk infants. Dev Med Child Neurol 2005;47:820-3.
15. Stuberg WA, White PJ, Miedaner JA, Dehne PR. Item reliability of the Milani-Comparetti Motor Development Screening Test. Phys Ther 1989;69:328-35.
16. Almeida KM, Dutra MV, Mello RR, Reis AB, Martins PS. Concurrent validity and reliability of the Alberta Infant Motor Scale in premature infants. J Pediatr (Rio J) 2008;84:442-8.
17. Jeng SF, Yau KT, Chen LC, Hsiao SF. Alberta infant motor scale: Reliability and validity when used on preterm infants in Taiwan. Phys Ther 2000;80:168-78.
18. Darah J, Piper M. Assessment of gross motor skills of at risk infants: Predictive validity of the Alberta infant motor scale. Dev Med Child Neurol 1998;40:485-91.
19. Snyder P, Eason JM, Philibert D, Ridgway A, McCaughey T. Concurrent validity and reliability of the Alberta Infant Motor Scale in infants at dual risk for motor delays. Phys Occup Ther Pediatr 2008;28:267-82.
20. Syrengelas D, Siahanidou T, Kourlaba G, Kleisiouni P, Bakoula C, Chrousos GP. Standardization of the Alberta infant motor scale in full-term Greek infants: Preliminary results. Early Hum Dev 2010;86:245-9.
21. Pin TW, de Valle K, Eldridge B, Galea MP. Clinimetric properties of the alberta infant motor scale in infants born preterm. Pediatr Phys Ther 2010;22:278-86.

How to cite this article: Yildirim ZH, Aydinli N, Ekici B, Tatli B, Çaliskan M. Can Alberta infant motor scale and milani comparetti motor development screening test be rapid alternatives to bayley scales of infant development-II at high-risk infants. Ann Indian Acad Neurol 2012;15:196-9.

Received: 18-12-11 **Revised:** 30-12-11, **Accepted:** 14-02-12

Source of Support: Nil, **Conflict of Interest:** Nil