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Original Article

Accuracy of the Indonesian child development pre-screening questionnaire

Syahperlan Wendi Simangunsong, Soeroyo Machfudz, Mei Neni Sitaresmi

Abstract

Background Early stimulation, detection and intervention are important for child development and are recommended in the early years of childhood for optimal results. The Indonesian child development pre-screening questionnaire, *Kuesioner Pra Skrining Perkembangan* (KPSP), has been widely used in public health centers (PHC) and community health centers (CHC) in the country. However, the accuracy of this test has not been adequately assessed.

Objective To assess the diagnostic value of KPSP as a pre-screening tool for child development compared to that of the Denver II developmental screening test.

Methods We conducted a KPSP diagnostic study, using the Denver II test as a gold standard for comparison. Subjects were children aged 3 to 60 months. They were recruited from one of three settings: hospital, community (child care centers) or schools (kindergarten).

Results Of 210 children recruited, 182 were included in our study. The overall sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy of KPSP were 68.8%, 86.6%, 64.7%, 88.6% and 81.9%, respectively. The comparison of diagnostic value based on age groups showed better results in the 3 – 24 month group than that of the older group. Sensitivity, specificity and accuracy of the younger group vs. the older group were 92.3% vs. 60.0%, 78.6% vs. 87.5% and 85.2% vs. 81.3%, respectively.

Conclusion The accuracy of KPSP compared to Denver II test was good for the 3 – 24 month age group. However, this tool should be revised for the older age group. **[Paediatr Indones. 2012;52:6-9]**.

Keywords: *Developmental screening, diagnostic test, KPSP, Denver II*

The growth and development of children partly determine their quality of life throughout their lifetime. All deviations in development should be detected early so that intervention can be done to prevent more severe and permanent effects.[1] Early intervention may minimize developmental delays and should be performed during the critical growth period.[2] The first five years of life are a critical period involving the intensive formation of human personality, as well as development of the abilities of sensing, thinking, language/speaking skills, and intelligence.[3] A study conducted by Fadlyana in West Java showed that nearly 30% of children had developmental delay, mostly (80%) due to lack of stimulation.[9] In 2003, the Ministry of Health conducted developmental screening in 30 provinces in Indonesia, reporting that 45.12% of infants had developmental disorders. In Yogyakarta, that figure was 34.5%.[2]

The Ministry of Health launched a book, *Early Stimulation, Detection and Intervention of Child Growth and Development* (SIDTKA), which included

From the Department of Child Health, Gadjah Mada University Medical School, Sardjito Hospital, Yogyakarta, Indonesia.

Reprint requests to: Syahperlan Wendi S, Department of Child Health, Medical School, Gadjah Mada University, Jalan Kesehatan No. 1 Sekip, Yogyakarta 55284, Indonesia. Tel. +62-274-561616, Fax. +62-274-583745. E-mail: *erlandwendi@gmail.com*

the KPSP. It was distributed to all primary health centers and health facilities in Indonesia. However, the sensitivity and specificity of this screening tool has not been adequately assessed. The Denver II test is a standardized, screening development test that has been used worldwide. This comprehensive instrument can also be used for all developmental aspects of early detection, functional diagnosis, prognosis, therapy, as well as evaluation and follow-up.[2]

A previous study assessed the sensitivity and specificity of KPSP compared to those of the Denver II test, and was conducted in slum areas (community-based) in Bandung. However, the subjects were children between the ages of 15-18 months only.[4] The aim of this study was to assess the sensitivity and specificity of KPSP compared to those of the Denver II test, in children aged from 3 - 72 months.

Methods

This study compared KPSP as a pre-screening tool for child development to the Denver II test as the standard screening tool. The target population was children aged 3-72 months living in Yogyakarta. We included children aged 3-72 months who visited the growth and development clinic in Sardjito Hospital or attended the kindergartens or day care facilities affiliated with Sardjito Hospital (namely TK Budi Mulia, TK Batik, TPA Sardjito and TPA UGM, Yogyakarta) in July and August 2009. Subjects were accompanied by their mothers or caregivers who gave written informed consent for participation. We excluded children suffering from acute illnesses, such as fever, diarrhea, pneumonia, or other diseases that may affect test results.

The estimated sample size needed was 198, for a 70% sensitivity of KPSP, 95% confidence interval (Z = 1.96), 5% precision, and 45% prevalence (according to the results of the survey conducted by Ministry of Health, 2003).[2] Subjects were obtained by consecutive sampling. The KPSP and Denver II tests were performed by trained examiners. Prior to the study, an inter-examiner agreement test was assessed with a Kappa value of more than 0.75 (excellent agreement) for both Denver II and KPSP.

Prior to the developmental examination, a general health examination was performed by a physician to determine the eligibility of subjects for the study. Parents/caregivers were given an explanation of the purpose and procedures of the study. Each subject underwent both the KPSP and the Denver II tests with a 15 minute resting time in between tests. The KPSP and Denver II tests were administered by different examiners in separate rooms, without knowledge of the other's results. Data analysis was performed using manual methods by traditional 2 x 2 table to calculate interobserver agreement (kappa value) and diagnostic values.

Results

Of the 216 children initially recruited, 34 were excluded (8 had acute illness, 6 parents refused consent, and 20 were untestable by Denver II test). Baseline characteristics of subjects are shown in **Table 1**.

We found that the sensitivity, specificity, positive predictive value, and negative predictive value of the KPSP test were 68.8%, 86.6%, 64.7% and 88.6%, respectively **(Table 2).**

We analyzed the data based on age stratification into two categories, 3 - 24 months and > 24 months. The 3 - 24 month-old group had higher sensitivity and

Table 1. Baseline characteristics of subjects

Characteristic	n = 182
Male, n (%)	88 (48)
Age, n (%)	
3 – 24 months	27 (15)
> 24 months	155 (85)
Recruitment location, n (%)	
Hospital	21 (12)
Day care	64 (35)
Kindergarten	97 (53)

Table 2. KPSP test diagnostic values compared to Denver II test for all subjects

Diagnostic value	Value
Sensitivity, %	68.8
Specificity, %	86.6
Positive predictive value, %	64.7
Negative predictive value, %	88.6
Accuracy, %	81.9
Positive likelihood ratio	6.9
Negative likelihood ratio	0.4

Table 3. Comparison of diagnostic value of KPSP for children aged 3 - 24 months to those > 24 months

Diagnostic value	3-24 months-old	> 24 months-old
Sensitivity, %	92.3	60.0
Specificity, %	78.6	87.5
Positive predictive value, %	92.3	58.3
Negative predictive value, %	91.7	88.2
Accuracy, %	85.2	81.3
Positive likehood ratio	4.4	4.8
Negative likehood ratio	0.1	0.4

negative predictive value compared to those of the older group, 92.3% vs. 60.0% and 91.7% vs. 88.2%, respectively **(Table 3).**

Discussion

In comparing the KPSP test to the Denver II test, we found that the KPSP test may not detect children with developmental delay. If the minimum sensitivity for a pre-screening tool to be considered useful is 70%, then the KPSP test did not meet that requirement for children over 24 months in age. For younger children under 24 months, the KPSP sensitivity was high, at 92.3%. Consequently, there may be many Indonesian children with undetected developmental problems who have not received adequate early intervention. If a child is diagnosed and treated later in life, an optimal outcome may not be achieved.[5,6] Detection of developmental delay should be done as early as possible when the brain is growing and plastic, in order to allow intervention, with stimulation and rehabilitation.[7] It is hoped that developmental delay can be detected at less than 2 years of age, or at most under 5 years of age.[8]

A possible cause of low sensitivity and negative predictive value in the older group was that there were too few number of tasks compared to the level of development that should be achieved by a child in the older age group. In KPSP for each age group, there were only 10 tasks tested, therefore, some children with developmental delay may not have been detected since there were too few tasks tested in all the specific developmental domains. We recommend that for the > 24 month age group, at least 15 tasks be tested, with each domain of development assessed by 3-4 test tasks.

A study conducted in a slum area (low socio-economic group), with subjects aged 15 - 18 months, found that the KPSP sensitivity and specificity compared to that of the Denver II test were 60% and 92%, respectively.[1] The KPSP used in this study was not yet revised. A similar study with subjects aged 12 - 24 months with a history of low birth weight in Bandung reported the sensitivity and specificity of KPSP to be 95% and 63%, respectively.[10] We also found that KPSP had good sensitivity for use as a pre-screening tool for 3-24 month-old children, including those with risk factors such as low birth weight, as well as for the general population .

A limitation of our study was its small sample size. Since we found that 26.4% of our subjects experienced developmental disorders, the minimum sample size required for further study is 307 subjects. In addition, the subject distribution by age and location was not evenly distributed. We suggest that further research should be done with a larger sample size and subjects should be gathered from the public health center. Nevertheless, the results of this study are quite consistent with previous research. Sensitivity of the KPSP test is low compared to that of the Denver II test as a standard for developmental screening.

Overall, KPSP had good specificity but low sensitivity. For 3 - 24 month-old children, KPSP had good sensitivity, but this was not true for the older age group (> 24 month-olds). Therefore, the KPSP test, especially the components for children aged > 24 months should be revised.

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