ORIGINAL ARTICLE

Developmental Profile of Infants Visiting the Growth and Development Clinic, Child Health Department, Medical School, Padjadjaran University

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ABSTRACT Development of a child is the result of a continuous interaction between biological factor serving as basis and the environment that gives stimulation. Indonesia as a developing country has an environmental characteristically different from that of advanced countries such as USA, where the Bayley developmental test tool was constructed, so that as an initial step in order to find out how far the level of development of the Indonesian child in general was, a study was made on the level of developmental of healthy 18-month-old infants visiting the Growth & Development Clinic in the Child Health Department of Dr. Hasan Sadikin General Hospital Bandung. Thirty healthy infants were chosen comprising 19 (63%) male and 11 (37%) female infants who were born normally without any congenital deviation, with good nutritional status, not anemic, never been hospitalized and had a good physical status during the study period. This study yielded an average Index of Mental Development (IPM) of 124.2 (6.94) and an index of Psychomotor Development (IPP) of 110.7 (6.16). The resulting IPM and IPP were higher compared to the normal Bayley scale for 18-month-old infants ($p<0.0001$). This could be due to the absence of several biological risk factors in the subjects and to the sufficient amount of attention given by all members of the family so that the child developed well. **[Paediatr Indones 1999; 39:57-65]**

Introduction

Functional development acquired by a child during the first year forms the base for the future development. In this matter the brain as the center of coordination of all living activities, whether motoric, mental or behavioral is the organ that determines

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those developments.[1,2] Therefore, all factors that exert influence on the development of the brain are able to promote or inhibit the child's development.[3] Of the many factors influencing the child development, two of them are the main factors, namely biological and environmental factors.[3-6]

Although stimuli from the environment already start at birth, the impact of the influence of the environment may show distinct changes of development at the age between 18-36 months. This is due to the fact that at the age the transition period of the cognitive development is taking place, the moment when the functions of symbolization start to develop, speech development and formation concepts begin to expand.[4,7-9] Nowadays many tools have been invented for the diagnosis of child development The Bayley Scale for the investigation of child development is considered one of the best tools.[10-12] Considering the numerous differences in social conditions, a study was carried out in order to find out how far the level of development is in healthy infants visiting the Growth & Development Clinic at the Department of Child Health at the General Hospital. It was hoped that the results of the study could be used as basic data in determining the infant's motoric and mental development conditions by using the Bayley scale that had been adjusted to the conditions in Indonesia.

Methods

Study subjects comprised 30 infants aged 18 months visiting the Growth & Development clinic of the Child Health Department, Medical Faculty of the University of Padjadjaran, Hasan Sadikin Hospital Bandung. The criteria for "healthy" infants in this study were: body weight at birth >2500 grams; singleton with vertex presentation and born spontaneously without evidence of prenatal complication, and had no major congenital anomaly. They should have no history of seizures; never been hospitalized within the last six months, never had treatment except for acute illness without complications; not suffering from acute illness; Hb content > 110 g/L, body weight, body length, ratio of body weight to body length and head circumference between the 5th and 95th NCHS standard (The National Center for Health Statistics, 1977). The parents who were willing to allow their children to participate in the study gave their consent by signing an "informed consent".

After their general data were registered, subjects who fulfilled the criteria made an agreement to undergo a development study by a psychologist, expert in infant development. Study on development was carried out using the Bayley Scale for infant development comprising mental development presented in the form of a mental development index (IPM) and psychomotor development presented in the form of a psychomotor development index (IPP).[12] After informed consent was given, home visits were carried out to evaluate the HOME (home observation for measurement of the environment) inventory. HOME inventory is a measurement to gauge the quality of

envir- onmental stimulation that incite mental and psychomotoric development of infants, consisting of 45 points of questions and statements grouped into 6 groups.[13] The validity of this tool has never been carried out in Indonesia and in this study HOME Inventory was only used to compare the quality of stimulation among subjects.

Results and Discussion

From May 2 until July 28, 1995, thirty infants who fulfilled the inclusion criteria were enrolled in the study. Subjects consisted of 19 (63%) male and 11 (37%) female infants, born with an average body weight of 3,080 (SD 304) grams with a range between 2,550-3,640 grams. The average body weight of the subjects at the time of study was 10,195 (SD 836) grams with a range between 9,000-11,500 grams. The average body length was 80.23 (SD 2.43) cm with a range between 78-85 cm. The average head circumference was 47.58 (SD 0.862) cm with a range between 46-50 cm. The average level of hemoglobin was 125.9 (9)g/L with a range between 112.8-145 g/L (Table 1). The average score of body weight at birth, body weight at the time of study and body length were respectively within the 25th percentile NCHS standard, whereas the head circumference was at the 50th percentile NCHS standard.

In Table 1 there appeared no significant difference between groups of male and female infants in terms of body weight at birth, head circumference, body length and hemoglobin level at the time of study. A significant difference was only apparent in the group of "body weight at the time study" with an average weight of 10.65 (SD 0.67) kg for males and average weight for females of 9.41 (SD 0.40) kg. This illustration matched the NCHS standard.

The result of the study on development performed on thirty healthy infants in this study was an average mental development index (IPM) score of 124.2 (SD 6.94) with a range between 109-138. This average score was higher compared to the average score IPM in the Bayley study[13] performed in America on a group of 18-month-old infants i.e. 100.0 (SD 16) Table 2. The average psychomotor development index (IPP) in this study was 110.7 (SD 6.18) with a range between 100-124. This IPP score was also higher compared to the average IPP score obtained in the Bayley study i.e. 100.1 (SD 5.9). See Table 2. The high average IPM and IPP scores in this study were probably due to several factors, among others are the followings.

1. Absence of some biological risk factors

a. Prenatal period

There was an exclusion of prenatal risk factors such as prematurity, low body weight, asphyxia and twins. These factors are predisposition to the emergence of neurological

Table 1. The mean of body weight at birth, body weight at the time of study, head circumference, body length and the degree of hemoglobin by sex

	Sex		X (SD) Total	p* (t-test)
	Male (n=19)	Female (n=11)		
Body weight birth (kg)	3.05 (0.27)	3.13 (0.37)	3.08 (0.381)	0.840
Body weight study (kg)	10.65 (0.67)	9.41 (9.40)	10.19 (0.836)	<0.010
Head circumference (cm)	47.74 (0.89)	47.31 (0.78)	47.58 (0.86)	0.803
Body length (cm)	80.47 (1.74)	79.82 (3.37)	80.23 (2.43)	0.486
Hemoglobin	127.3 (7.0)	123.4 (10.0)	125.9 (9.0)	0.250

X (SD) = mean (standard deviation); n = number of subjects

Table 2. Mean rate of equation (X) IPM and IPP result of this study and the study by Bayley

Development Index	Study result X (SD)	Bayley X (SD)	p*
	n=30	n=89	
IPM	124.2 (6.94)	100 (16)	z=8.284
			p<0.0001
IPP	110.7 (6.18)	100.1 (15.9)	z=3.6518
			p<0.0001

X (SD) = average (standard deviation)
p* = test z score

deviation that could disturb the infant's development. Prematurity and birth body weight appeared to be two interrelated conditions and a predisposition to the occurrence of disturbances in development.[14] A study by Van de Bor[15] on 33 premature babies (less than 30 weeks of pregnancy) disclosed that 40% suffered intraventricular hemorrhage. Whereas the study by Resnick[24] performed on 114 babies with a very low birth body weight (<1500 grams) showed that 50% suffered intraventricular hemorrhage. The outcome of a study on development using the Bayley scale of 2-year-old infants showed a delay in the mental and the average IPP was 91.0 (SD 33.7).

The presence of asphyxia in a mature baby can also influence development. It is said that 15% of mature babies with severe asphyxia will suffer permanent disturbed brain function that can develop into cerebral palsy or become mentally retarded and

38% of this population died before one year old. The cause of this is "hypoxic-ischemic encephalopathy" (HIE) as a result of asphyxia.[17] Study carried out by Robertson[18] on mature babies (gestation period 37 weeks) with severe asphyxia (Apgar 1 minute and 5 minute <5) showed that there was a difference in the level of development at the age of 3.5 years according to the severity of HIE. A study on the intellectual development performed on 3.5-year old infants using the Bennet IQ test resulted in an outcome of 101.5 (SD 14.0) in light HIE, 92.3 (SD 23.2) in medium HIE, and 37.1 (SD 26.7) in severe HIE.

b. Postnatal period

To avoid the presence of postnatal biological factors that may influence the brain organic development from the moment of birth until now, an effort had been made not to include 18-month-old infants whose records showed that they had ever been hospitalized, has suffered convulsion seizures, had nutrition disturbances and had anemia. Studies performed in several developing countries showed that iron deficiency anemia could cause a deficit in mental and motoric development.[19] The results of the study of Idjradinata[20] in Bandung showed the existence of a significant difference in the motoric and mental development index of infants of 12-18 months old between those who were anemic and those who weren't. The IPM and IPP of subjects with anemia were 90.2 (SEM 1.4) and 103.3 (SEM 1.8), respectively, whereas for subjects free from anemia the average IPM and IPP of 105.0 (SEM 1.4) and 105.6 (SEM 1.4), respectively. A study in Chili on 16 infants of less than 2 years old who were treated for malnutrition, showed a delayed level of development. Using the Psychomotor Development Scale (mean 1; SD 0.15), the average level of development of the infant was 0.68 (SD 0.15) at the moment of treatment and rose to 0.81 (SD 0.11) after discharged. It is apparent that, although there was an increase in the level of development, it still had not reached the normal.[21]

2. Sufficiently good environment around the infant

Using the HOME Inventory, observation on home visits yielded the value of quality of environmental stimulation and the degree of interaction between parents and their child of 30.5 (SD 3.72) with a range between 21-36. This result showed that the condition of the environment of the child was during the study and it was sufficiently good.[12] Besides, there was a positive correlation between the IPM value and the HOME value ($p=0.029$) indicated that the influence of environment that support the child development needed to be taken into consideration. This corresponded to the result of study by Bayley[13] who found out that there was a relationship between the HOME value and the intellectual degree of the child, i.e. the higher the HOME value, the higher the intellectual degree of the child. The influence of mother's and father's education, mother's job, child's order in the family on IPM and IPP.

Father's education was mostly secondary education, i.e., fathers with formal education between 9-12 years were 22 (70%), while those who had education between >12-15 years were 4 (13%) and those who had more than 15 years of education were 4 (13%). The duration of education of the subjects' mothers, mostly secondary education, was between >9-12 years, i.e., 15 (50%), those who had primary education of 9 years, 12-15 years, and more than 15 years were 5 (17%), 6 (20%, and 4 (13%), respectively.

Most (18 or 60%) of the subjects' mothers were housewives, whereas the number of government employees was 9 (30%) and private employees 3 (10%). The results of the study showed that there was no significant difference in the average value of IPM and IPP based on the categories: father's education, mothers' education, mothers' job and the child's order in the family (Table 3). These were slightly different from the others. Kaplan[22] stated that the level of parents' education had a significant influence on the child's cognitive ability which among others was caused by the parents' reading habit and the large number of books that were possessed by parents with higher education. On the other hand, children whose mothers were employed, especially those who belong to the middle economic classes.[23] They stated that firstborns were inclined to have better motoric ability compared to children born later.[3,24] This could be due to the fact that first-borns received more attention than the second-borns or those who were born later. This could be because attention lessened as the number of member of the family increased. There is still no explanation about factors in the study that caused lack of difference in the average score of IPM and IPP based on the categories: parents' job, mothers' employment or unemployment, and the child's order in the family. There is a possibility that the cause was a difference in the pattern of the child's upbringing in Indonesia, particularly in the Sunda region where this study was carried out.

A Sundanese proverb says "bengkung ngariung bongkok ngaronyok," that means "it is better to live together as one big family, even if it will have to do without the necessities of life," brought about the forming of an nuclear family, that is besides husband, wife and children, there also other members of the family such as parents-in-law, parents, nephews or nieces from both sides. In this form of family there is usually a very strong bond and cooperation.[25,26] A similar condition was also found in this study i.e. the result of the observation of the home visits showed that part of the subjects were brought up in the environment of a nuclear family (80% of the subjects). This could mean that even though the parents were away at work, there were still other membersof the family who took care of them and gave them enough attention, love and affection. The old public opinion that says that a housewife should be responsible for the care and education of the child cause the working mother to be able to take up her major function of bringing up her child.[27] This may also be one of the causes that although the mothers go to work, the level of the development in the child is still good.

Table 3. Average value of IPM and IPP based on some characteristics

Variable	n	IPM	p	IPP	p
Fathers' education					
▪ Secondary	22	124.19 (6.83)	NS	110.57 (5.56)	NS
▪ Higher	8	124.25 (8.13)		110.75 (8.31)	
Mothers' education					
▪ Primary	5	125.60 (6.18)		107.21 (3.89)	
▪ Secondary	15	123.46 (6.51)	NS	110.46 (6.25)	NS
▪ Higher	10	124.60 (8.38)		110.53 (6.88)	
Mothers' job					
▪ Employed	12	125.00 (6.18)	NS	109.17 (6.72)	NS
▪ Unemployed	18	123.00 (8.13)		110.75 (8.31)	
Childs' order of birth					
▪ First	16	124.87 (5.18)	NS	112.92 (6.17)	NS
▪ Second and further	14	123.42 (8.67)		108.25 (5.67)	

NS = not significant

The conclusion in this study is that the average IPM and IPP score obtained in this study are still higher than the average IPM and IPP score in the Bayley study and further study is necessary using subjects that represent the characteristics of the population of the Indonesian child.

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