Paediatrica Indonesiana

VOLUME 55 July • 2015 NUMBER 4

Original Article

Developmental performance in small for gestational age children with and without catch-up growth

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Abstract

Background Infants born small for gestational age (SGA) have an increased risk of developmental delay. The influence of catch-up growth on developmental function remains unknown.

Objective To compare the development of SGA children with and without catch-up growth.

Methods We conducted a cross-sectional study in Manado from March to July 2013. Subjects were children aged 2-3 years, that born SGA from March 2010 to June 2011 in Prof. Dr. R.D. Kandou Hospital. Catch-up growth was defined as height-for-age more than -2SD on the 2006 WHO growth chart, and subjects were classified into the with and without catch-up growth groups. Developmental status was assessed using the *Ages and Stages Questionnaire* (ASQ) 3rd edition, through interviews with parents. We compared the developmental status between the with and without catch-up growth groups used Mann-Whitney test with a significance level of $P < 0.05$.

Results Of the 112 SGA children, 66 (58.9%) had catch-up growth and 46 (41.1%) did not. The SGA children with catch up growth had significant better development performances of gross motor, fine motor, and problem solving. The mean ASQ centiles of the with and without catch-up groups were 55.15 (SD 7.843) [95%CI 53.52 to 57.08] and 48.80 (SD 11.264) [95%CI 45.46 to 52.15] in gross motor, respectively; 42.5 (SD 13.163) [95%CI 39.26 to 45.74] and 32.93 (SD 14.475) [95%CI 28.64 to 37.23] in fine motor, respectively; 46.74 (SD 13.112) [95%CI 43.52 to 49.97] and 40.98 (SD 11.480) [95%CI 37.57 to 44.39] in problem solving, respectively.

Conclusion Small for gestational age children with catch-up growth have significantly better gross motor, fine motor, and problem-solving performance than those without catch-up growth. **[Paediatr Indones. 2015;55:199-202]**.

Keywords: *small for gestational age, catch-up growth, development*

The identification of fetuses and babies that are small for gestational age (SGA) is essential for antenatal as well as postnatal care.[1] These infants may experience a different pattern of physical growth to those born with appropriate birth weight. Ideally, they should exhibit increased growth velocity which will allow them to reach the weight and height values adequate for their age that has been termed as catch-up growth. Most SGA infants catch up in growth, although some failed to manifest spontaneous catch-up growth.[2-4] Lack of linear catch-up growth could be a sign of severe growth restriction.

Undernutrition during 'critical' or 'sensitive' periods, predominantly during pregnancy and the early life period, may have profound effects on cognition, development and behavior throughout life.[5] Several studies indicate that SGA infants have a higher risk of minimal neurologic dysfunction later in life, reduced mental development potential, and increased risk of

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subnormal intellectual and psychological performance, compared to infants born appropriate for gestational age.[6,7] However, the influence of catch-up growth in SGA children on developmental function remains unknown. The aim of this study was to compare the development of SGA children with and without catch-up growth.

Methods

We conducted a cross-sectional study from March to July 2013. Subjects were children aged 2-3 years, born SGA from March 2010 to June 2011 in Kandou Hospital, and with a complete residential address in Manado. We made home visits or contacted parents by phone. All children were asked to come to the hospital for growth and development examinations. We excluded children with major congenital malformations, history of seizures or severe infection in the newborn period, or chronic diseases. Small for gestational age was defined as term infants with birth weight less than the 10th percentile on the Lubchenko graph,[8] based on data from medical records. Body height was measured using a microtoise scale, without shoes. Subjects were divided into two groups, with and without catch-up growth. Catch-up growth was defined as the height-for-age more than -2SD on the 2006 WHO growth chart.[9]

Development status was performed using the ASQ (3rd edition),[10] through interviews with parents. We used questionnaires for 24, 27, 30, 33, or 36 months of age, according to the age of the subjects. Each questionnaire was composed of 30 questions about the child's development, in order to assess the five different domains equally (communication, gross motor, fine motor, problem-solving, and personal/social). The parents were asked to base their responses on their observations and previous experiences with their child. The choice of responses for each item was "yes", "sometimes", or "not yet," which were scored as 10, 5, or 0, respectively. The test was graded according to the domain tested and compared with an empirically-derived screening cutoff score. Scores below the cutoff were considered to be delayed for each developmental domain. Informed consent was obtained from parents. This study was approved by the Ethics Committee for Research at Sam Ratulangi University.

We compared the developmental status between the catch-up and without catch-up growth groups. Mann-Whitney test was used for statistical analysis, with a significance level of $P < 0.05$.

Results

During March 2010 to June 2011, a total of 7.008 lifebirth were delivered in Kandou Hospital, and among them there were 306 SGA infants. There were 120 children with complete addresses in Manado, but 8 children did not come for their examinations. Therefore, a total of 112 children fulfilled the inclusion criteria, of whom 66 (58.9%) and 46 (41.1%) were with and without catch-up growth, respectively.

Table 1. Characteristics of the study subjects

Characteristics	Catch-up growth	
	With (n= 66)	Without (n= 46)
Median age (range), months	31 (24-36)	27.5 (24-35)
Gender, n (%)		
Male	35 (53.0)	21 (45.7)
Female	31 (47.0)	25 (54.3)
Median weight (range), kg	11 (7.9-16)	9 (7-12.7)
Median height (range), cm	88.25 (79.5-99.5)	81 (74-87)
Birth weight, n (%)		
2000 - 2499 gr	64 (97.0)	40 (87.0)
1500 - 1999 gr	2 (3.0)	6 (13.0)
Exclusively breastfed, n (%)		
Yes	28 (42.4)	9 (19.6)
No	38 (57.6)	37 (80.4)

Table 2. Mean ASQ centiles of the study subjects

ASQ developmental area (centiles)	Catch-up growth				P value
	With (n= 66)	95% CI	Without (n= 46)	95% CI	
Mean communication (SD)	52.58 (10.534)	49.99 to 55.17	49.57 (11.587)	46.12 to 53.01	0.114
Mean gross motor (SD)	55.15 (7.843)	53.52 to 57.08	48.80 (11.264)	45.46 to 52.15	0.001
Mean fine motor (SD)	42.5 (13.163)	39.26 to 45.74	32.93 (14.475)	28.64 to 37.23	0.001
Mean problem-solving (SD)	46.74 (13.112)	43.52 to 49.97	40.98 (11.480)	37.57 to 44.39	0.005
Mean personal-social (SD)	46.52 (10.339)	43.97 to 49.06	43.15 (10.185)	40.13 to 46.18	0.055

Anthropometric and demographic characteristics of the two groups are shown in **Table 1**. A comparison of the developmental status of each group is shown in **Table 2**. The SGA children with catch-up growth had significantly better development performances in domain of gross motor, fine motor, and problem solving, while there were no significant differences in communication and personal-social area.

Discussion

The results of this study showed that SGA children with catch-up growth, defined to have attained normal height at the time of the study, scored better in all developmental domains than those without catch-up growth. However, significant diferences between the groups were only present in the gross motor, fine motor and problem-solving domains. A previous study reported similar findings and concluded that postnatal catch-up growth is crucial for development in low birth weight children, especially for their cognitive function and schooling outcomes.[11-13] However, the beneficial effect of catch-up growth in this study was not robust, in that we did not adjust for confounders, including family socioeconomic status (SES) and maternal IQ, which may be an alternative reasons underlying this association. For example, better family SES and higher maternal IQ may improve both postnatal catch-up growth and cognitive development for SGA children. Socioeconomic factors are known to influence final height and morbidity, although SES cannot explain all of the associations.[14]

The findings in this study on the relative importance of postnatal growth among SGA children were primarily based on children who had an average birth weight of 2,400 g and showed successful postnatal catch-up growth in terms of height at ages 2–3 years. Whether these findings are applicable to children with weight catch-up growth or with lower birth weights merit further research.

Inequality between and within populations has origins in adverse early experiences. Inadequate cognitive stimulation, stunting, iodine deficiency, and iron-deficiency anemia are key risks that prevent millions of young children from attaining their developmental potential.[15] Our results suggest that SGA children without catch-up in height have lower developmental performance. It is important to note that developmental progress can change for better or worse, especially in the early years, thus, repeated screening is essential to monitor children's development.[16] In particular, children who fell below cutoffs in one domain in the ASQ should be monitored in successive assessments. Follow-up studies are also necessary to identify those children who are later found to have developmental problems, as well as those children who are later found to outgrow their problems.

The present study has certain limitations. First, SGA data was based on medical records. Nevertheless, all data were recorded by pediatric residents, indicating the trustworthy nature of the records. Another limitation was that we did not assess education and SES level of the families. These factors could be confounders in the study. Needless to say, further studies with a longitudinal design, especially with nutritional intake records, are needed to confirm the present findings.

In conclusion, children born SGA with catch-up growth have better gross motor, fine motor, and problem-solving performance than those without catch-up growth.

Conflict of interest

None declared.

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