

Family socioeconomic status and weight velocity in children aged 6-24 months

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Abstract

Background Socioeconomic status is one of the external factors that influences weight velocity.

Objective To assess for a correlation between family socioeconomic status and weight velocity.

Method This cross-sectional study was performed from October to December 2014. Subjects were patients at community health centers in Palembang, and included by a consecutive sampling technique. Data were collected by interviewing mothers using questionnaires. We measured the children's weight and compared it to the previous weight measurement on the Child Health Card (*Kartu Menuju Sehat/KMS*). Risk of failure to thrive was determined by plotting increments onto the 2009 *WHO Growth Velocity Standards Chart*. Data were analyzed by Fisher's exact and Chi-square tests.

Results The 97 respondents consisted of 74 children (76%) with good weight velocity and 23 children (24%) with risk of failure to thrive. Using indicators of socioeconomic status, we found a significant correlation between the level of family welfare and weight velocity. (PR=48.000; 95%CI 2.3 to 997.1; P=0.016). However, level of maternal education (P=0.788) and the number of children in the family (P=0.550) had no significant correlation to weight velocity. Caregivers of children (P= 0.560) and duration of exclusive breastfeeding (P=0.390) were not confounding variables for weight velocity in this study.

Conclusion High to moderate level of family welfare is significantly correlated to good weight velocity. However, weight velocity has no significant correlation to either the level of maternal education or the number of children in the family. Caregivers of children and duration of exclusive breastfeeding are not confounding variables for this study. [*Paediatr Indones.* 2016;56:67-72.].

Keywords: growth velocity, socioeconomic status

Growth is a normal process of organisms due to tissue accretion, such as increases in weight, height, and head circumference.¹ Highest growth velocity typically occurs in the first two years of life. The *WHO* used to identify growth status based on the following anthropometric variables: weight, length or height, and head circumference. These variables were compared to attain a size for age.² However, growth velocity is now known to be a more effective quantitative measure that can be used for earlier identification of failure to thrive, excessive weight gain, or responses to treatment, when compared to the attained size for age.² Therefore, the *WHO Multicentre Growth Reference Study* (MGRS) issued new recommendations concerning growth velocity to identify children's growth status. The *WHO Child Growth Standards* were released in 2009.³ The *American Pediatrics Association* has accepted this standard to be a better tool for assessing growth velocity.⁶ Weight is the most commonly used measurement and the most responsive

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to short-term interventions of all anthropometric variables.^{3,4} The 2009 WHO *Child Growth Standards* are still considered to be a new policy issue, and as such, studies using these new standards have been limited, especially with regards to weight velocity.

Weight velocity is influenced by internal and external factors.⁴ One of the external factors is socioeconomic status. Socioeconomic status is determined by the availability of household food, proper sanitation, clean water availability, and social services in various populations. Socioeconomic limitations directly influence child feeding practices, health maintenance practices, and environmental sanitation, which affects purchasing power, food intake, and prevention of infectious diseases, the lack of which result in growth disorders.⁵ At the age of weaning (age >6 months), children need nutrients not only from breast milk, but also from food. Therefore, to assess for the influence of family socioeconomic status on children's weight velocity, we should observe subjects after their exclusive breastfeeding period (aged >6 months).

This study was conducted to assess for a correlation between family socioeconomic status and weight velocity in children aged 6-24 months.

Methods

This was a cross-sectional study conducted at the Maternal and Child Health Center (*Pos Pelayanan Terpadu/Posyandu*) in the working area of the Campus Community Health Center (*Pusat Kesehatan Masyarakat/Puskesmas*), Palembang, from October to December 2014, using a consecutive sampling technique. The site was selected due to the large area, the central location in the city, and the many active community health centers (17 *Posyandu*). Thus, we could find subjects to fill all of the socioeconomic status categories.

The dependent variable was weight velocity in children aged 6-24 months. Weight velocity was the difference between weight now and before in grams, divided into intervals 1, 2, 3, 4, and 6 months. By reading *Kartu Menuju Sehat* (KMS) and analyzing data using the 2009 WHO *Growth Velocity Standards Chart*,⁶ if the percentile <5: risk of failure to thrive and if percentile <5: good weight velocity.

The independent variables were the level of family welfare, the level of maternal education, and the number of children in the family, taken by using questionnaires to the respondents. Level of family welfare was a life order in a family, using a scoring system from *Badan Pusat Statistik* (BPS).⁷ There were 8 indicators, such as income, consumption or outcome of the family, place of residents, facilities, health of the family, access to healthcare, access to education, and access to transportation. Measuring results were high family welfare level (scores 20-24), medium family welfare level (scores 14-19), and low family welfare level (scores 8-13). Level of maternal education was formal education of the mother according to mother's highest diploma. According to the information given to the respondents, it was divided into low education level if mother didn't finish elementary school, middle education level if mother finished junior high or high school, and high education level if mother finished college. Number of children in the family was the children who are family dependents. According to *Badan Koordinasi Keluarga Berencana Nasional* (BKKBN), the ideal number of children in one family was 1-2 children. Measuring results were 1-2 children and >2 children.

Confounding variables tested were caregiver of children and duration of exclusive breastfeeding. Caregiver was individual who take care (care and educate) children. It was divided into family member and baby sitter. While duration of exclusive breastfeeding was the breastfeeding given by the mothers to the babies since born until 6 months old without any other pralacteal food or drink, including sugar water, water, etc. According to WHO, period of time giving exclusive breastfeeding was right if 6 first months of life (6 months \pm 14 days) and not right if less than 6 months (less than 5 months and 14 days) or more than 6 months (more than 6 months and 14 days). Measuring results were right period of time giving exclusive breastfeeding and not right period of time giving exclusive breastfeeding.

Inclusion criteria in this study were children aged 6-24 months who had data on weights during the prior 1, 2, 3, 4, or 6 months. Children with congenital diseases that caused eating difficulty were excluded.

Data were collected through interviews of mothers using questionnaires, measurements of each child's weight, and the previous weight measurements on the KMS. Risk of failure to thrive was determined by plotting increments into the 2009 WHO *Growth*

Velocity Standards Chart. Data were analyzed by Fisher's exact and Chi-square tests. This study was approved by the Research Ethics Committee, Sriwijaya University Medical School, Palembang.

Results

Of 97 subjects, 74 had good weight velocity and 23 had a risk of failure to thrive. The general characteristics of subjects, sex and age distribution, are shown in **Table 1**. The percentage of children who had risk of failure to thrive were similar in boys and girls, 48% and 52%, respectively. Overall, the age groups with the greatest number of subjects were the 8-9-month age group (18 children) and the 12-13-month age group (17 children). However, the risk of failure to thrive was most common in children aged 24 months (6/23 children).

The distribution of the risk of failure to thrive is shown in **Table 2**. The percentage of children who had good weight velocity (76%) was higher than children who had a risk of failure to thrive (24%). Specific subject characteristics in this study consisted of the level of family welfare, based on the criteria from the 2005 Central Bureau of Statistics (*Badan Pusat Statistik 2005*),⁷ the level of maternal education, and the number of children in the family.

Table 2 shows that almost of all subjects had a moderate level of family welfare (78%), and most mothers had graduated from junior or senior high

school or the equivalent (81%). In addition, most children came from families with 1-2 children (81%). We assessed some potential confounding variables as to their effect on weight velocity in children aged 6-24 months, i.e., caregiver identity (family member or babysitter) and duration of exclusive breastfeeding (6 mo. vs. <6 or >6 mo.) Most children (97%) in this study were cared by their own family members, not babysitters. Of all subjects, 77% were exclusively breastfed for 6 months.

The indicators of socioeconomic status used in our study were the level of family welfare, the level of maternal education, and the number of children in the family. In terms of family welfare level, 94% of those in the high category had good weight velocity, while 75% of the moderate category had good weight velocity. However, in the low category of family welfare, 75% had a risk of failure to thrive. hence, high to moderate family welfare had a significant correlation to good weight velocity ($P=0.016$) (**Table 3**).

Table 3 also shows that the majority of children with good weight velocity had mothers who graduated from university (86%). Moreover, the majority of children with a risk of failure to thrive had mothers who graduated from junior/senior high school (25%) or no formal education/elementary school (25%). Fisher's exact test revealed no significant correlation ($P=0.788$) between the level of maternal education

Table 1. Distribution of subjects based on gender and age

Characteristics	Weight velocity		N
	Good (n=74)	Risk of failure to thrive (n=23)	
Gender, n (%)			
Male	34 (46)	11	45
Female	40 (54)	12	52
Age, n (%)			
6-7 mo.	4 (5)	3	7
8-9 mo.	17 (23)	1	18
10-11 mo.	10 (14)	0	10
12-13 mo.	13 (18)	4	17
14-15 mo.	7 (10)	2	9
16-17 mo.	7 (10)	0	7
18-19 mo.	5 (7)	4	9
20-21 mo.	1 (1)	3	4
22-23 mo.	5 (7)	0	5
24 mo.	5 (7)	6	11

Table 2. Characteristics of subjects (N=97)

Characteristics	n	%
Weight velocity		
Good	74	76
Risk of failure to thrive	23	24
Level of family welfare		
High	17	18
Moderate	76	78
Low	4	4
Level of maternal education		
University/equivalent	14	14
Junior/senior high school/eq.	79	81
No formal edu./elementary school	4	4.1
Number of children in family		
1-2	79	81
>2	18	19
Confounding variables		
Caregiver		
Family member	94	97
Babysitter	3	3
Duration of exclusive breastfeeding		
6 months	75	77
<6 or >6 months	22	23

and weight velocity in our subjects. Therefore, the prevalence ratio (PR) and contingency coefficient (r) were also not significant.

With regards to the number of children in the family, the large majority of children in both groups came from families with 1-2 children (79.7% and 87.0%, respectively). As such, there was no significant correlation between the number of children in the family and weight velocity (P=0.550). the prevalence ratio (PR), or the contingency coefficient (r) were similarly not statistically significant.

Caregiver other than a family member and duration of exclusive breastfeeding were potential confounding variables in this study, hence, we assessed their influence weight velocity in our subjects. Again, the vast majority of children in both groups had family members as primary caregivers (97.3% and 95.7%, for good vs. risk of failure to thrive, respectively). The percentage of children with good weight velocity

whose caregivers were their own family members was higher (76%) than that of children cared for by baby sitters (67%), However, the difference was not statistically significant. Likewise, the risk of failure to thrive in children cared for by their own family was lower (24%) than in children cared for by a babysitter (33%), but not significantly different (P=0.560).

Table 4 shows the correlation between the level of family welfare and weight velocity in children aged 6-24 months. Children with a low level of family welfare had 48 times greater risk (PR=48.000; 95%CI 2.3 to 997.1) of risk of failure to thrive than children with high family welfare. The PR was >1 and the lower limit of the 95%CI was also >1, therefore, low level of family welfare was a risk factor for failure to thrive, with a contingency coefficient value of 0.290 (weak correlation).

The percentage of good weight velocity in children who were exclusively breastfed for 6 months

Table 3. Correlation analysis of variables

	Weight velocity		Total (N=97)	P value	r
	Good (n=74)	Risk of failure to thrive (n=23)			
Level of family welfare, n (%)					
High	16 (21.6)	1	17	0.016	0.290
Moderate	57 (77.0)	19	76		
Low	1 (0.0)	3	4		
Level of maternal education, n (%)					
University/equivalent	12 (16.2)	2	14	0.788	0.091
Junior/senior high school/eq.	59 (79.7)	20	79		
No formal edu./elementary school	3 (0.0)	1	4		
Number of children in family, n (%)					
1-2	59 (79.7)	20	79	0.550	0.079
>2	15 (20.3)	3	18		
Caregiver, n (%)					
Family	72 (97.3)	22	94	0.560	0.040
Babysitter	2 (0.0)	1	3		
Duration of exclusive breastfeeding, n (%)					
6 months	59 (79.7)	16	75	0.309	0.103
<6 or >6 months	15 (0.2)	7	22		

Fisher's exact test, Chi-square test

Table 4. Prevalence ratio (PR) and confidence intervals (CI) for the correlation between level of family welfare and weight velocity in children aged 6-24 months

	PR	95% CI	
		Lower	Upper
Between high and low level of family welfare	48.000	2.311	997.176
Between high and moderate level of family welfare	5.333	0.662	42.954
Between moderate and low level of family welfare	9.000	0.833	91.761

was higher (79.7%) than in children who were exclusively breastfed for <6 or >6 months (20.3%). Likewise, the risk of failure to thrive in children who were exclusively breastfed for 6 months was higher (69.6%) than in children who were exclusively breastfed for <6 or >6 months (30.4%). However, there was no significant correlation ($P=0.309$) between duration of exclusive breastfeeding and weight velocity in children aged 6-24 months. Hence, neither the caregiver being a family member nor a 6-month duration of exclusive breastfeeding were confounding factors in our study ($P>0.05$).

Discussion

We used the level of family welfare, the level of maternal education, and the number of children in the family as indicators of socioeconomic status. The level of family welfare was assessed using data from the Central Bureau of Statistics 2005 (*Badan Pusat Statistik* 2005).⁷ Eight indicators, including income, consumption or expenditure, state of residence, residential facilities, health of family members, access to health care, the ease of getting children into education, and the ease of getting transportation facilities were taken into account. The influence of these variables on weight velocity of children aged 6-24 months were analyzed using Fisher's exact test.

Tables 3 and 4 show that the majority of children with high family welfare level had a good weight velocity and the majority of children who had low level of family welfare had a risk of failure to thrive. There was a significant correlation ($P=0.016$) between the high level of family welfare and good weight velocity. Children with low family welfare level had a 48 times greater risk ($PR=48.000$; 95%CI 2.3 to 997.1) of failure to thrive than children with high family welfare level. After it had been known that $PR > 1$ and lower limit of 95% CI > 1 , so the level of family welfare was a risky variable to failure to thrive. $r = 0.290$ meant weak correlation between both variables. A study stated that level of family welfare affects purchasing power, food intake, and prevention of infectious diseases, the lack of which may result in growth disorders.⁵ Another study reported a positive correlation of z-score for height, weight, upper arm muscle, and upper arm circumference to family socioeconomic status, in their

longitudinal study with 1,000 children <7 years old in Honduras.⁸ This result suggested that majority of children with good anthropometric measurements come from high family socioeconomic level.

Table 3 shows that there was no significant correlation ($P=0.788$) between the level of maternal education and weight velocity in children aged 6-24 months. The prevalence ratio (PR) and contingency coefficient (r) were also not statistically significant. Similarly, a previous study concluded that the level of education did not guarantee the level of knowledge, because knowledge is influenced by other factors, such as experience, beliefs, facilities, and socio-cultural influence.⁹ In contrast, another previous study reported a significant association between the level of maternal education and the level of energy consumption ($r=0.331$; $P=0.003$), as well as the level of protein intake ($r=0.383$; $P=0.001$). In addition, energy and protein consumption were associated with nutritional status. Ernowati suggested that education strongly influences the acceptance of information, including information about nutrition. Thus, the level of maternal education indirectly influences growth velocity.¹⁰ Furthermore, a study also showed a correlation between the level of maternal education and her child's growth rate.¹¹ In light of our study's location, in the center of a large city, information on child nutrition should be widely distributed. As such, we would expect no significant correlation between level of maternal education and weight velocity in our study.

We found no significant association between number of children in the family (> 2 vs. 1-2 children) and weight velocity. Similarly, a previous study found no associations between the number of children in the family and the levels of energy consumption ($r=0.029$; $P=0.804$) and protein intake ($r=0.132$; $P=0.256$). Then connected the level of those consumptions with nutritional status.¹⁰ We observed that mothers who had 1-2 children were younger than mothers with more children. This factor may have affected the results of a higher risk of failure to thrive in children from families with 1-2 children.

We combined primary (maternal interviews with questionnaires and child's weight measurements) as well as secondary data (previous weight measurement in the KMS). As the weights were measured at different times and by different people, the methods

and scales for measuring weight may have affected the calculation of weight velocity.

Study location was in Maternal and Child Health Centers, where the majority of patients were from a moderate family socioeconomic level. Based on observation, families of higher socioeconomic level tend to bring their children to the hospital, while families of lower socioeconomic levels tend to avoid bringing their children for health treatment.

In our patient population, the majority of our subjects had good weight velocity and came from families with a moderate level of family welfare. nonetheless, the level of family welfare is significantly associated with weight velocity in children aged 6-24 months. However, neither the level of maternal education nor the number of children in the family is significantly associated with weight velocity. Caregiver (family member *vs.* babysitter) and duration of exclusive breastfeeding (6 mo. *vs.* <6 mo. or >6 mo.) are not confounding variables in this study.

Conflict of interest

None declared.

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