

Relationship between protein energy malnutrition and social maturity in children aged 1-2 years

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ABSTRACT

Background Protein energy malnutrition (PEM) affects physical, psychological, and social development.

Objective To investigate the relationship between PEM and social maturity in children aged 1-2 years.

Methods We carried out a cross-sectional study at Child Health Outpatient Clinic, Sanglah Hospital, between April-September 2000. We included children living with their parents, with no handicap or chronically ill condition. Data were collected by using structured questionnaires. Nutritional status was determined based on WHO-NCHS standard, while social maturity was measured by Vineland social maturity scale.

Results Of the 200 subjects analyzed, the mean age was 16.9 months (SD 3.8), body weight 10.2 kg (SD 1.7) and social quotient (SQ) score 94.3(SD 10.6). There was a significant correlation between SQ and PEM (B-7.5, CI 95%-10.6;-4.3, p<0.001) parents' occupation (B4.9, CI 95% 2.2;7.7, p<0.001) and mothers' education (B4.2, CI 95% 1.0;7.4, p<0.001).

Conclusion This study revealed that the more severe the PEM, the lower the SQ, while the better the education and occupation, the higher the SQ was [Paediatr Indones 2002;42:261-267].

Keywords: social maturity, social quotient (SQ), protein energy malnutrition (PEM)

Social interaction is essential for healthy social lives. The reaction to social situations depends on the personality of each person; accordingly, social behavior reflects the maturity of a person. The prevalence of social development problems that cover the deviation of behavior and emotion is still high.¹ Ghodsian *et al*² found that social developmental problems were found in 29% of 10-15 month old infants in poorer

Londonboroughs, while Hart *et al*³ found 11% of 2 year old infants had night waking and 5% were hard to manage. Besides the child's factor, affection from parents as well as environment have very important roles in the etiology, prevalence, and prognosis of social development.¹ The state of protein-energy malnutrition (PEM) will influence the child's development physically, psychologically, mentally, as well as socially.⁴⁻⁷ In Indonesia, PEM is one of the main nutrition problems of 0-5 year old children. The incidence of mild PEM increases from 30% to \pm 50% and that of severe PEM from 10% to 35%.⁸⁻⁹ PEM influences the structures and function of organs. Child intellectual is influenced by PEM because of the decrease of DNA synthesis, the number and size of brain cells, myelinization, and synaptogenesis.¹⁰⁻¹² Some studies show that PEM children have low IQ, lack of ability to adjust to the environment, and lack of psychomotor ability.⁴⁻⁶ Previous study discovered that social quotient (SQ) in children with PEM was significantly lower

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than that of without PEM.¹³ The aim of this study was to investigate the relationship between PEM and social maturity/SQ in children aged 1-2 years.

Methods

A cross-sectional study was conducted at Division of Nutrition and Development, Department of Child Health, Sanglah Hospital, Denpasar. Subjects consisted of children aged 1-2 years who visited the outpatient clinic during the period of April 1st – September 30th 2000. The inclusion criteria were children aged 1-2 years who live with both parents and were physically and mentally healthy. We excluded subjects who had chronic diseases, physically and mentally handicapped, or children with abnormalities that could cause developmental problem (genetic or congenital anomaly, premature/low birth weight). We also excluded subjects whose parents refused to participate.

Data were collected by using structured questionnaires consisting of sex, age, body weight, nutritional status, social maturity, mother's education, parents' occupation, family type (nuclear or extended), family interaction, housing environment, psychosocial stimulation (measured by educative toys/APE), exclusive breast feeding, and child rearing. The nutritional status was based on the body weight for age parameter and classified according to the WHO-NCHS standard.¹⁴ They were normal

if ³80%, mild PEM 70- <80%, moderate PEM 60- <70%, and severe PEM <60%. Social maturity level was measured by using modified Vineland Social Maturity Scale,¹⁵ and the result was SQ. The interpretation of SQ scores was performed according to Binet Simon IQ score, i.e., poor social maturity if SQ <50, moderate 50-79, mild 80-89 and normal 90-109. The results were analyzed by variant analysis, Spearman's correlation, linear and multiple regression. Statistical Package for Social Sciences (SPSS) 6.0 was used to analyze the data with 90% confidence interval and the significant level of $p < 0.05$.

Results

Subject characteristics

During the period of April 1st-September 30th 2000, 200 children were analyzed. There were 111 males (55.5%) and 89 females (44.5 %). We excluded 12 subjects because 2 subjects had severe PEM with labiognathoschizis, 8 subjects had low birth weight, and 2 subjects had chronic diseases. Out of 200 subjects, 149 (74.5%) were in normal SQ, 42 were mild (21%), and 9 were moderate (4.5%). The age of the subjects ranged between 12.0-24.0 months with the mean of 16.9 months (SD 3.8), while the body weight ranged between 6.4-14.0 kg with the mean of 10.2 kg (SD 1.7). Range of SQ score lied between 73.0 and 117.0 with the mean of 94.3 (SD 10.6).

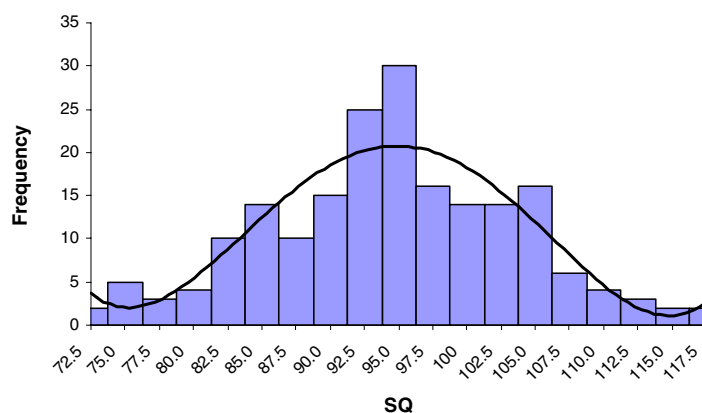


Figure 1. Histogram frequency distribution of SQ

As a parameter, we analyzed normal frequency and normal distribution curve to evaluate the frequency distribution of SQ score. Our data showed that frequency distribution of the SQ had normal curve (Figure 1).

Distribution of SQ score by subject characteristics

When compared to the group with normal nutrition, the group who had PEM had significantly lower SQ score. Similar result was found in groups with uneducated/elementary school graduated mother, unskilled/unemployed parents, without stimulation, and without exclusive breastfeeding (Table 1). On the other hand, there was no significant difference in SQ score for subjects who were grouped by sex,

family type, interaction, housing environment and child rearing (Table 1).

Correlation between SQ score with PEM level and any additional variables

There was strong negative correlation between SQ score and PEM level, on the other hand there was weak correlation with parents' occupation and mothers' education (Table 2).

To find out the association between SQ and PEM, which have numeric scale, simple linier regression was conducted. As the result, there was significant correlation between SQ score and PEM (B 0.5, SEB 0.5, CI 95% 0.37;0.58, p<0.001). The severer the PEM, the lower the SQ (Figure 2).

TABLE 1. DISTRIBUTION OF SQ SCORE AMONG GROUP BY SUBJECT CHARACTERISTICS

Subject Characteristics	SQ		P Value	Total (200)	(%)
	Mean	SD			
Sex					
Male	94.4	8.9	0.871	111	55.5
Female	94.1	12.4		89	44.5
Nutritional status					
Normal	97.1	7.2	0.000	165	82.5
Mild PEM	83.7	5.1		24	12.0
Moderate PEM	74.7	23.0		11	5.5
Mother's education					
Uneducated/elementary	85.8	14.1	0.000	51	25.5
Junior H.S./University	97.1	7.1		149	74.5
Parents occupation					
Unemployed/unskilled	87.4	12.5	0.000	71	35.5
Government/private	98.0	7.1		129	64.5
Family type					
Nuclear	93.7	12.1	0.387	112	56.0
Extended	95.0	8.3		88	44.0
Family interaction					
Good	94.1	10.7	0.310	193	96.5
Bad	98.3	9.8		7	3.5
Housing environment					
Good	94.9	10.8	0.346	181	90.5
Bad	90.4	8.9		19	9.5
Stimulation					
APE +	96.5	7.3	0.000	133	66.5
APE -	89.8	14.3		67	33.5
Breast feeding					
Exclusive	97.1	7.1	0.000	114	57.0
Not exclusive	90.5	13.2		86	43.0
Child Rearing					
Mother	93.3	12.3	0.224	98	49.0
Others	95.1	8.7		102	51.0

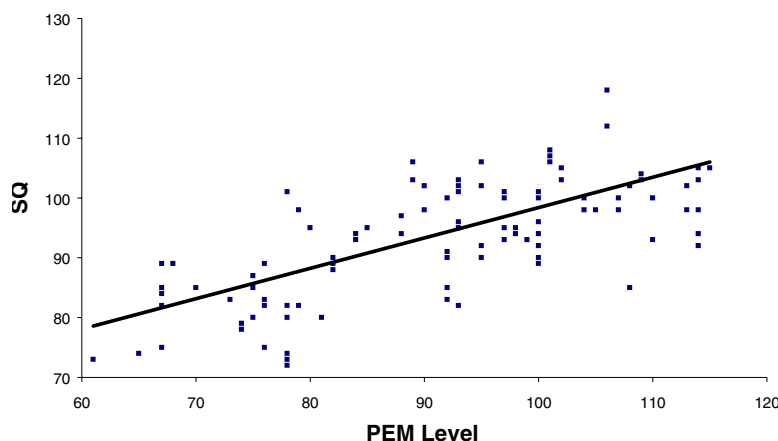


Figure 2. Scattered diagram of SQ score and PEM level

TABLE 2. CORRELATION BETWEEN SQ SCORE, PEM LEVEL AND OTHER ADDITIONAL VARIABLES

Variables	Correlation	P value
PEM	-0.60	0.000
Sex	0.07	0.143
Mother's education	0.46	0.000
Parents' occupation	0.47	0.000
Family type	0.06	0.193
Family interaction	0.07	0.155
Housing and environment	-0.15	0.017
Stimulation	-0.29	0.000
Breast feeding	-0.30	0.000
Child rearing	-0.08	0.112

Correlation between SQ score with PEM level, mother's education, parents' occupation, stimulation and breast feeding.

The regression analysis showed that the SQ score had significant correlation with PEM level, mother's education and parents' occupation, but no significant correlation was found between SQ score with APE and breastfeeding (Table 3). The severer the PEM, the lower the SQ, the better mother's education and parents' occupation, the higher the SQ.

Discussion

The influence of PEM in growth and development stage has been identified from a number of studies.¹⁷ The study was carried out in 228 marasmic infants,

and as a result there were 7% babies who had normal SQ and 24% who had mild retardation. According to Levin *et al*, chronic malnutrition caused chronic and recurrent disease, so that the child lost opportunities to learn and response to environment and had ineffective pattern of social interaction. It influenced mental development and function.^{5,18-19} The SQ score of the PEM child was lower than that of the normal child. There was significant correlation between PEM level and SQ score, the severer the PEM level the lower the SQ score. Children who suffer from PEM experience deprivation of macronutrients and micronutrients, so their organ function and structure will be changed.²⁰⁻²¹ Besides that, growth deprivation can develop. They lose the critical period of acquisition of a variety of concepts as well as ability and reaction that can increase physical, social, and mental maturation. That happens because the developmental aspects in PEM do not develop in accordance with their ages.²²⁻²³

Sex is a genetic factor which influences development.¹ Growth and motor development are obviously different between male and female, but in personal or social parameter, boys are more aggressive than girls.¹ It is said that boys have superior visual acuity, while girls are earlier in walking and talking. Males have increased risk of behavioral disorders and nutritional deficiencies. In this study, the

TABLE 3. CORRELATION BETWEEN SQ SCORE AND PEM LEVEL, MOTHER'S EDUCATION, PARENTS' OCCUPATION, STIMULATION, AND BREAST-FEEDING

Variables	B	SEB	CI 95%		t	P value
PEM	-7.5	1.6	-10.60	-4.29	-4.29	0.000
Mother's education	4.2	1.6	1.04	7.39	7.39	0.009
Parents' occupation	4.9	1.4	2.19	7.76	7.76	0.000
Stimulation (APE)	-0.5	1.5	-3.38	2.44	2.44	0.751
Breast feeding	-1.2	1.3	-3.79	1.42	1.42	0.370
Constanta	81.7	6.6	68.80	94.72	94.72	0.000

SQ score between male and female was not significantly different because sex is a genetic contribution needed to attain mental development. The environment may play a more important role in determining the optimal development.²⁴

Socioeconomic status is an important variable in child's development.¹ Low social class including low education and occupational level is related to many developmental problems such as retardation of language development and low IQ.^{23,25} Our data showed that SQ score had significant positive correlation with parents' occupation and mother's education. The better the education and occupation, the higher the SQ. Mother's education is a very important factor in taking care of children especially for the first 3 years of life. Mothers who live in poverty also have a bigger chance of having malnutrition and low education that can cause the lack of taking care the children.

The good relationship between parents and other family members is an advantageous factor for child's development.²³ Family types also influence child development. It is believed that children who live in extended families tend to have low reading scale.¹ Other studies claimed that in extended families the grandparents act as the parents, frequently give more approval, support, empathy, sympathy, and less discipline. Sometimes the relationship is more relaxed and give more chance for the children to be more creative.^{23,26} In this study SQ score of children based on interaction and family type is not significantly different.

Educative toys (APE), which are adjusted to the age and the level of development, can stimulate and optimize child growth. It is useful for the development of physical, language, cognitive, and social aspect especially in the interaction among mother, children, other family members, and community.²⁴

²⁷ According to Sularyo, the support and enrichment of the environment can also improve social adaptation. Other studies exposed that the intellectual level of the children, about 20%, is influenced by environment in the first year of life.¹⁰ In this study, we found that children with APE had higher SQ score. The correlation between APE and SQ score was very unconvincing. While based on multiple regression, APE was not significantly correlated with SQ level. It may be because the relationship between APE and SQ is through the mother's education.

From various studies, it had already proven that breast feeding is very useful for a child to grow optimally in physical, visual, and emotional contact.^{21,28} The extensive and consistent direct contact for the first 6-8 months of age is the most important factor in mother – infant bonding, and the relationship becomes firmly established by the time the child reached 8 or 9 months.²³ Infants who were breastfed have more neurodevelopmental score than the non-breastfed because DHA and AA are natural constituent of human breast milk and perhaps essential for normal brain function.²⁸ This study showed that child with exclusive breast feeding had significantly higher SQ score.

Conceptually, rearing is the effort of the environment so that the basic needs of the children can be met properly. Many psychologists claimed that every attitude and opinion about values from parents influence the creativity of their children.^{23,25,26} In this study there was no correlation between SQ and the practice of child rearing. In practice, child rearing depends on the emotion state of the family and the opportunity for the interaction between parents and children.^{23,26}

From this study we concluded that social maturity correlates significantly with PEM level,

mother's educational level, and parents' occupation. The severer the PEM, the lower the SQ, the better the educational level and occupation, the higher the SQ.

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