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The Relationship between *Social Quotient* with Global Developmental Delay in Children

I Gusti Ayu Made Dwisri Okadharma Liran[1], I Gusti Ayu Trisna Windiani[2], I Gusti Agung Ngurah Sugitha Adnyana[3], Soetjiningsih[4]

[1]Udayana University, Medical Faculty, Department of Child Health, Sanglah Hospital, Denpasar, Indonesia
dwisri90[at]gmail.com

[2]Udayana University, Medical Faculty, Department of Child Health, Sanglah Hospital, Denpasar, Indonesia
trisnawindianidr[at]yahoo.com

[3]Udayana University, Medical Faculty, Department of Child Health, Sanglah Hospital, Denpasar, Indonesia
sugad168[at]ymail.com

[4]Udayana University, Medical Faculty, Department of Child Health, Sanglah Hospital, Denpasar, Indonesia
prof_soetji[at]yahoo.com

Abstract: ***Background**: Global developmental delay (GDD) is experienced in 1-3% of the population of children aged under 5 years and is one of the main problems in children. The level of social quotient (SQ) is one of the factors that can influence GDD in children. One of the measuring tools for social development is calculating SQ using the Vineland Social Maturity Scale (VSMS). **Objective**: To prove the relationship between SQ level delay and GDD in children aged 1 to 6 years at Sanglah General Hospital. **Methods**: The mean value of SQ in children with GDD was 77,8. The result of bivariate analysis obtained an odds ratio (OR) was 3,1 (p=0,03; IK 95% 0,9-10,1). Breastfeeding was protective variable with the incidence of GDD in children (adjusted RO 0,11; IK 95% 0.01-0.58; p=0,01). **Conclusion**: Low SQ level is a risk factor for GDD in children.*

Keywords: Global developmental delay, social quotient level, risk factors

1. Background

Global developmental delays is experienced in 1-3% of the population of children under 5 years of age and are one of the main problems in children. Global developmental delay in general can be caused by environmental factors, genetics and metabolic diseases [1]. The prevalence of children with GDD is 2.3% at Cipto Mangunkusumo Hospital [2]. Risk factors associated with global developmental delay in children are gestational age, birth weight, breastfeeding and nutritional status in children [3].

Social development is the achievement of maturity in adapting to the social environment. Social development is also interpreted as a learning process to adapt to norms, morals, and traditions, to merge into a unit that communicates and cooperates with each other [4]. Social development at the age of 15 months begins by pointing when you want something, at the age of 18 months you can say the word less. more than 10 words, children are able to ask for help when experiencing difficulties. At the age of 24 months, children are able to feed themselves, help take off their own clothes and listen to stories when shown pictures. At the age of 30 months children are able to play simple toys, then at the age of 4 years children can play with several other children and start simple social interactions [5]. The World Health Organization (WHO) reports that 5-25% of children of preschool age suffer from mental disorders social development [6]. In a study conducted by Grace in 2013 which assessed the development of social maturity in children in daycare, there were 21% of children with normal development who experienced delays in social maturity [7].

Vineland Social Maturity Scale (VSMS) is a non-projective personality measurement scale designed to assist in the assessment of social competence. Vineland Social Maturity Scale is a quality psychometric questionnaire and a good measure of adaptive behaviour. This scale not only provides social age and measures of social intelligence but also indicates social deficits and social assets in a growing child. This test consists of 89 items measuring 8 different social maturity domains, namely Communication skills (COM), General self-help ability (SHG), Locomotion skills (LOC), Occupation skills (OCC), Self-direction (SD), Self-help help eating (SHE), Self-help dressing (SHD), and Socialization skills (SOC). This test will produce a Social quotient value which is calculated by dividing social age by chronological age and multiplying by 100. SQ can be interpreted as a normative IQ value [8]. The reliability of the VSMS is 92% and the validity of the VSMS meets the criteria of construct validity [9].

Social developmental delays can affect global developmental delays. Based on this background, the researchers wanted to find out the relationship between SQ scores and GDD and the factors that influence GDD in children.

2. Methods

This study was conducted with an analytical observational research design with a case-control design to determine the relationship between Global Developmental Delay (Global Developmental Delay) and the Social Quotient (SQ) level in children. This research was conducted at Sanglah Hospital using medical record data and interviews from 2018 to 2019.

The inclusion criteria in the case group were children diagnosed with GDD aged 1 to 6 years at the Pediatric Growth and Development clinic of Sanglah Hospital and in the control group were children with normal development and were willing to participate in research. Exclusion criteria in the case group if incomplete medical record data were obtained and the control group if they refused to be involved in the study. Calculation of sample size using the unpaired case-control formula in one measurement, with a significance level of 0.05 and a power of 80%. In determining the minimum sample size in this study, it is necessary to determine the P2 value, namely the proportion of low SQ levels (late social development) in the group of children with normal development based on the literature, which is 0.217. The OR value that is considered clinically significant is 1.5 based on clinical judgment. After being included in the formula, the total number of samples was 25 samples in each group.

This research has received permission from the ethics committee of the Faculty of Medicine, Udayana University with the ethical clearance number 2019.02.1.0317. The data of this study include data on the characteristics of children with GDD and the results of the analysis of the relationship between SQ and GDD values and the factors that influence GDD.

Global developmental delay is diagnosed according to the DSM-5 criteria, i.e. when an individual under 5 years of age fails to meet developmental stages in some area of intellectual function and has not been able to undergo a systematic assessment of intellectual function or is too young to take standardized testing. Gender is determined based on the appearance of the phenotype, divided into male and female. Premature birth was determined based on gestational age < 37 weeks and not premature if gestational age 37 weeks. Low birth weight (LBW) based on birth weight <2500 grams. Nutritional status is determined based on body weight (BB) according to body length (PB) or height (TB). Determination of nutritional status using the percentage of ideal body weight according to the waterlow criteria. Nutritional status is divided into malnourished and not malnourished, it is said to be malnourished if the waterlow is < 90%. Breastfeeding is defined as having exclusively breastfed for at least 6 months. The level of SQ value is an assessment of children's social development which is calculated based on the Vineland Social Maturity Scale (VSMS). SQ levels were grouped into normal (≥ 90%) and low (< 90%) SQ levels. Cases and controls that meet the inclusion criteria will be included as research samples by consecutive sampling until the number of samples is reached. Data was collected by recording characteristic data and clinical data through medical records. The collected data was then analyzed statistically.

All the appropriate data is then collected and processed using a computer program. Categorical variables are described in number (n). The processed data is presented in the form of tables and narratives. Bivariate analysis using Kai-squared was conducted to determine the relationship between SQ and GDD levels in children and using Kai-squared and Fisher's Exact Test to analyze the factors that influence GDD.

3. Results

In this study, there were 50 subjects who met the inclusion and exclusion criteria consisting of 25 subjects as controls and 25 subjects as cases. From the characteristic data, the mean age in this study was 3.5 years in the case group and 3 years in the control group. Characteristics of research subjects were divided into gender, gestational age, condition at birth, breastfeeding and nutritional status of malnutrition (Table 1).

Table 1: Subject Characteristic

Characteristic	Global Developmental Delay n=25	Normal Development n=25
Age (mean (min-maks))	3,5 (1-5)	3 (1-5)
Sex (n)		
Boy	17	13
Gestational age (n)		
Aterm	20	23
Preterm	5	2
Birth weight (n)		
< 2500 gram	8	2
≥ 2500 gram	17	23
Breatfeeding (n)		
Yes	14	23
No	11	2
Malnutrition (n)		
Yes	2	2
No	23	23
Level SQ (mean (min-maks))	77,8 (45-100)	114,8 (63-162)

The average SQ value measurement using the Vineland Social Maturity Scale was obtained with an average SQ value in the case group of 77.8% with the lowest value of 45% and the highest 100% and 3 subjects with age-appropriate SQ or social development scores and the rest have delayed social development. In the control group, the average value of SQ was 114.8% with the lowest value of 63% and the highest of 165%. There was a significant relationship between a low SQ level and the incidence of GDD in children (p 0.04) with an OR of 3.1 (95% CI 0.9-10.1) (Table 2). In the univariate analysis, it was found that LBW and malnutrition were significant factors influencing the incidence of GDD in children (Table 3.).

Table 2: SQ level relationship with GDD

Variable	GDD		OR	CI 95%	P value
	Yes	No			
SQ level					
Normal	8	15	3,1	0,9-10,1	0,03
Low	17	10			

Table 3: Bivariate analysis of factors influencing GDD

Variabel	RO	IK 95%	nilai p
Low Birth Weight↓	5,4	1,1-28,7	0,034
Premature‡	2,8	0,5-16,4	0,4
Breastmilk↓	0,1	0,02-0,5	0,04
Malnutrition‡	2,1	0,3-12,3	0,67

Note :
↓ Chi square
‡ Fisher's Exact Test

Variables with p value <0.25 were analysed in a multivariate manner, which is described in Table 4.

Table 4: Multivariate analysis of factors influencing GDD

Variable	*Adjusted* OR	CI 95%	P value
Low birth weight	3,72	0,6-23,1	0,15
Low SQ level	3,3	0,93-12,2	0,04
Breastmilk	0,11	0,01-0,58	0,01

4. Discussion

Development is an increase in the ability (skills) of more complex structures and functions in an orderly and predictable pattern. The mechanisms underlying growth and development include the maturity of the nervous system with good function, a conducive environment for each stage of child development and genetics.

In this study, it was found that the average age at first diagnosed with GDD was approximately 3.5 years, this concluded that most parents were late in knowing developmental delays in their children so that the treatment was too late. In GDD group were found to be more boys than girl. Suwarba et al was found that more boys suffered from GDD (55.6%). The same finding in the study of Sour et al, 74% of GDD patients is male [8], but how this can happen until now has not been explained, it is thought to be due to x-linked or x-limited factors.

Moderate and severe malnutrition are often found in GDD cases which may be due to difficulty eating in GDD patients due to oromotor disorders [2]. Certain nutrient deficiencies greatly determine the development of the central and peripheral nervous system and cause neurological disorders. In this study, malnutrition was found to be a risk factor for GDD in children, but it was not statistically significant. The results of a similar study were obtained by Dita in 2013 that nutritional status affects development in toddlers (OR 5.9, CI 95% 1.1-29.1) [12].

Babies born with low birth weight show constraints in fetal nutrition during brain development. Children born with low birth weight have a 2.6 times greater risk for developmental delay [13]. The same study was also conducted in Iran which stated that there was a relationship between low birth weight and developmental delay with a p value of 0.006 [14]. obtained the same thing, namely LBW can increase the risk factors for the incidence of GDD in children (OR 5.4, 95% CI 1.1-28.7; p = 0.034). The same study also found that children with low birth weight have a risk of developmental delays as much as 5 times compared to children with normal birth weight, this is caused by premature babies with low birth weight, born at a critical period of growth and rapid fetal brain maturation.

Breastmilk contains the right composition for babies according to their age. Several nutrients are important to support brain growth and development, including long-chain polyunsaturated fatty acids (LCPUFA) such as AA and DHA, choline, taurine, omega3, omega6, tryptophan, iron and iodine. These nutrients are needed for optimal brain and nerve development [7]. A history of exclusive breastfeeding can affect a child's development at an early age. In this study, breastfeeding can reduce risk factors for the incidence of GDD in children (OR 0.11; 95% CI 0.01-0.58; p=0.01). The results of a similar study were also obtained by Wan-chun in 2011 found that the relationship between breastfeeding duration > 6 months can reduce the incidence of developmental delays in gross motor, fine motor and language aspects in children with p value < 0.001 [16].

In this study, social maturity was measured using VSMS. This study concludes that children with GDD have an average SQ value based on the VSMS examination, which is 77.8 or which means that they have delayed social maturity compared to chronological age. Delays in social development will affect children's ability to interact with the environment and will affect children's development globally.

From birth the baby's experience increases and participates actively in his social development by observing and interacting with the people around him [16]. Normally all children go through several stages of social development at approximately the same age. As in other types of development, intelligent children will experience acceleration, while children who are not intelligent will experience a slowdown [18]. Individual social maturation is influenced by factors that come from within himself and environmental factors. Optimal social maturity requires the support of these factors. In this study, in the case group there were 8 subjects who had an age-appropriate level of social maturity, this was probably due to the fact that although the child experienced delays in 2 aspects, the child did not experience delays in the personal social aspect so that the child could still interact with the surrounding environment so that he had maturity. age-appropriate social. Good environmental factors and good stimulation from the environment also affect the maturity of social development in children.

Global development delay is the failure of children to meet developmental stages in several areas of intellectual function, while intellectual function is not only influenced by the ability to think abstractly, and the ability to act in a directed and rational manner is also influenced by the ability of children to adapt to their environment. The ability of children to adapt to their environment is assessed based on social development [4]. In this study, it was found that the delay in social maturity which was assessed based on a low SQ level was a risk factor for the occurrence of GDD in children (OR 3.3; 95% CI 0.9-10.1; p=0, 04) with the prevalence of GDD children who have a low SQ value of 70%, this is in accordance with research conducted on GDD children, it was found that the prevalence of children with global delays who experienced low social maturity was 80% [19]. Research by Emanuel proves that there is a correlation moderate on the results of intelligence tests with social quotient values (r = 0.413, p <0.05) [19], however, studies linking low SQ scores with GDD in children have never been done.

This study still has several limitations, namely in the form of uncontrolled confounding variables in this study such as parenting patterns, external stimulation from both family and the surrounding environment and the influence of screen time. In future research, it is necessary to control

confounding variables more tightly to provide more accurate research results.ve never been done.

5. Conclusion

Low SQ levels can increase the risk of global developmental delay in children. Evaluation of social development through SQ level assessment needs to be done regularly to reduce the risk of global developmental delays in childrenoutcomes.

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