

Correlation between Cytomegalovirus (CMV) Infection in Children with Cerebral Palsy (CP) and Future Anxiety among Parents

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ABSTRACT

Introduction: One of the causes of Cerebral Palsy (CP) is a viral infection in the mother during pregnancy. The most recorded infections were Cytomegalovirus (CMV) infections. Inappropriate parenting can affect the psychological condition of CP children. Psychological conditions that are not good can cause the child's immune system to decrease and increase the risk of CMV reactivation. This is one factor in the emergence of parental anxiety about the future sustainability of their CP children. **Objectives:** It was to determine the relationship of anti-cytomegalovirus (CMV) Immunoglobulin G in children with CP with future anxiety among parents. **Methods:** The design of this study used a cross-sectional approach that using CP children and their parents. Serological examination used the ELFA (Enzyme-Linked Fluorescent Assay) method for 40 CP children and a questionnaire on the future anxiety of parents of children with special needs were answered directly by the parents of CP children, 40 fathers and 40 mothers. Analysis of the research data used Spearman Rank. **Results:** The results of this study found an anti-CMV IgG seropositive relationship in CP children with future anxiety in fathers (p-value = 0.022; $\alpha < 0.05$) and mothers (p-value = 0.011; $\alpha < 0.05$). **Discussion:** If anxiety in parents has not good treatment, it will impact the care of CP children, the developmental progress of CP children will not optimal.

Keywords: Cytomegalovirus, Cerebral Palsy, IgG, Future Anxiety

ABSTRAK

Pendahuluan: Salah satu faktor penyebab Cerebral Palsy (CP) adalah infeksi virus yang terjadi pada ibu selama kehamilan. Infeksi yang tercatat paling banyak adalah infeksi Cytomegalovirus (CMV). Pengasuhan yang tidak sesuai dapat mempengaruhi kondisi psikis anak CP. Kondisi psikis yang tidak baik dapat menyebabkan sistem imun anak turun dan meningkatkan risiko reaktivasi CMV. Hal ini menjadi salah satu faktor munculnya kecemasan orangtua terhadap keberlangsungan masa depan anak CP mereka. **Tujuan:** Menganalisis hubungan seropositif IgG anti-CMV pada anak CP dengan kecemasan masa depan orangtua. **Metode:** Design penelitian ini menggunakan pendekatan cross sectional yang dilakukan pada anak CP dan orang tua. Pemeriksaan serologi menggunakan metode ELFA (Enzyme Linked Fluorescent Assay) yang dilakukan pada 40 anak CP dan lembar kuesioner kecemasan masa depan orang tua anak berkebutuhan khusus yang dijawab langsung oleh orangtua anak CP yang terdiri dari 40 ayah dan 40 ibu. Analisis data penelitian ini menggunakan Spearman Rank. **Hasil:** Hasil penelitian ini menemukan hubungan seropositif IgG anti-CMV pada anak CP dengan kecemasan masa depan pada ayah (nilai $p=0,022$; $\alpha < 0,05$) dan ibu (nilai $p=0,011$; $\alpha < 0,05$). **Diskusi:** Kecemasan yang tidak dapat ditangani dengan baik akan berdampak pada pengasuhan anak CP sehingga kemajuan perkembangan anak CP tidak optimal.

Kata Kunci: Cytomegalovirus, Cerebral Palsy, IgG, Kecemasan Masa Depan

INTRODUCTION

Cerebral Palsy (CP) is a type of disorder in the nervous system that affects children's motor and postural functions. This disorder is permanent and affects daily activities. Generally, children with CP experience limited movement due to weakened motor skills (Barreto et al., 2019; Cheshire, Barlow, & Powell, 2010). The prevalence of CP in the world averages 190 cases per 100,000 lives. In Australia, every two children in 1000 lives as having CP (Smithers-sheedy, Raynes-greenow, & Badawi, 2014). While in the United States, the ratio is 1.5-3.5 per 1000 children (over seven years old) with varying levels of severity (Barreto et al., 2019). Indonesia in 2018 illustrates that 3.3% of children aged 5-17 years with disabilities include children with CP (Kemenkes RI, 2019).

One of the factors causing CP is a viral infection that occurs in the mother during pregnancy. The most recorded infections were Cytomegalovirus (CMV) infections. This virus can infect the fetus through the placenta during pregnancy and damage the fetus's developing brain. Hayley Smithers and his team recorded as many as 2,265 children with CP, 36 of which caused CMV (Smithers-sheedy et al., 2014). In America, the CDC (Centers for Disease Control and Prevention) estimates that 0.65% of births have congenital infections (Schleiss, 2018). Children with CP are seropositive for anti-CMV IgG (immunoglobulin) since the mother's pregnancy can experience virus reactivation if they experience psychological stress. This statement follows a study conducted by Jerrald L. Rector in 2014 regarding the correlation between psychological stress and IgG titers, which stated that stress in anti-CMV IgG seropositive individuals could cause reactivation of the virus (Rector et al., 2014).

Caring for children with disabilities, including children with CP, requires total effort and support from the family. Inappropriate parenting can affect the psychological condition of CP children. Psychological conditions that are not good can cause the child's immune system to decrease and increase the risk of CMV

reactivation. This reactivation is undoubtedly one factor in the emergence of parental anxiety about the future sustainability of their CP children. Anxiety about children's future with CP can be one factor that increases stress and anxiety. A study conducted by Yilmaz and his team found that data on depression and anxiety scores were statistically significant for parents of children with CP and parents of typical children. This study shows that children with CP have higher scores than parents of typical children (Miloyan, Pachana, & Suddendorf, 2017). Research by Anna Cheshire and team in 2010 found that 59% of parents of CP children experienced anxious mood and 43% experienced depressed mood. The data also showed that parental anxiety and depression were higher than the control group 9 (Cheshire et al., 2010). Based on this, the purpose of this study was to analyze the relationship between anti-CMV IgG seropositive in CP children and their parents' future anxiety.

METHODS

Research Design

This study used a cross-sectional approach. The variables of this study consisted of the characteristics of the respondents, namely the age of the child, the gender of the child, the education of the parents, the type of work of the parents, the income of the parents; the independent variables were anti-CMV IgG seropositive titer; and the dependent variable was the future anxiety score on parents.

Population and Sample

The population in this study were CP children in the Wahana Keluarga Cerebral Palsy community in Yogyakarta. The sample used a total sampling of 40 CP children, has been diagnosed at birth, along with 40 fathers and 40 mothers.

Instrument

The serological examination to detect the presence of anti-CMV IgG using the ELFA (Enzyme-Linked Fluorescent Assay) method at the Cito

Yogyakarta Clinical Laboratory on 40 CP children. In addition, this study also uses a future anxiety instrument for CP parents (39-item), which has been tested for validity and reliability with the results for all statements above the R table value of 0.468 so that the future anxiety questionnaire is declared valid. The reliability test results obtained Cronbach's alpha value of 0.987 so that the future anxiety questionnaire was declared reliable. This instrument was used directly by parents of CP children consisting of 40 fathers and 40 mothers in a personal counseling program conducted by researchers after their child's laboratory results.

Research Procedure

Data collection was carried out in Yogyakarta in collaboration with the Wahana Keluarga Cerebral Palsy community. CP children and their parents participated in this research in a personal counseling program.

Data Analysis

Data analysis in this study used univariate and bivariate analysis. The univariate analysis consisted of respondent characteristics (child's age, child's gender, parent's education, parent's occupation, parent's income) with mean, standard deviation, and frequency distribution, independent variable (anti-Cytomegalovirus IgG seropositive) with frequency distribution, as well as the dependent variable (future anxiety in parents) namely the frequency distribution. Bivariate analysis in this study used the Spearman Rank test.

Ethical Approval

This research has obtained ethical approval from the ethics committee of Stikes Indonesia Maju with the number 197/Sket/Ka-Dept/RE/STIKIM/V/2021.

RESULT

This study analyzed 40 CP children with an average age of 8.5 years with a minimum limit of 2.25 years and a maximum limit of 15 years. Respondents used in the study were CP children and their parents, consisting of 40 CP children, 40 fathers and 40 mothers. Based on gender, CP

children who participated in this study consisted of 20 girls and 20 boys. The majority of mother's and father's education are no college with a total of 26 respondents, 30 respondents (65%, 75%), respectively. The majority of mother's and father's annual incomes are below the minimum wage as many as 31 respondents, 27 respondents (77.5%, 67.5%), respectively. The majority of mothers' and fathers' occupations are unemployed with a total of 31 respondents, 21 respondents (77.5%, 52.5%), respectively. (Table 1).

Table 1. Sociodemographic characteristics of children and parents (parent's gender, children gender, parent's education, employment status, and family annual income) (n=120)

Sociodemographic	Total (n)	Percentage (%)
Parent's gender		
Male	40	100
Female	40	100
Children's gender		
Male	20	50
Female	20	50
Mother's Education		
No College	26	65
College	14	35
Father's Education		
No College	30	75
College	10	25
Mother's annual income		
>Minimum Wage	9	22.5
<Minimum Wage	31	77.5
Father's annual income		
>Minimum Wage	13	32.5
<Minimum Wage	27	67.5
Employment status (Mother)		
Employed	9	22.5
Unemployed	31	77.5
Employment status (Father)		
Employed	19	47.5
Unemployed	21	52.5

In children, the laboratory tests for anti-CMV IgG include low and high categories with 18 children (45%). The majority of mother's future anxiety is in the category of severe anxiety with 20 respondents (50%), while the majority of father's future anxiety is in the category of mild anxiety with 31 respondents (77.5%). After their child's laboratory results, forty fathers and forty mothers get a personal counseling program conducted by researchers. In table 2, the data describe a

correlation between anti-CMV IgG seropositive in CP children with future anxiety in mothers (p-value = 0.011, <0.05). Then there is also a

seropositive relationship of anti-CMV IgG in CP children with future anxiety in fathers (p-value = 0.022; <0.05).

Tabel 2. The correlation between IgG-anti CMV in children and Future Anxiety Scale-Modified Score in parents

Variable	Mother's Future Anxiety Score			Total	Coefficient Correlation	p-value
	Undetection	Mild	Severe			
Children IgG Levels						
Negative	0	3	1	4 (10%)	0.400	0.011
Low IgG	1	11	6	18 (45%)		
High IgG	0	5	13	18 (45%)		
Total	1 (2.5%)	19 (47.5%)	20 (50%)	40 (100%)		
Father's Future Anxiety Score						
	Undetection	Mild	Severe			
Children IgG Levels						
Negative	0	4	0	4 (10%)	0.361	0.022
Low IgG	0	16	2	18 (45%)		
High IgG	0	11	7	18 (45%)		
Total	0 (0%)	31 (77.5%)	9 (22.5%)	40 (100%)		

At the same time, from the test of significance of Spearman Rank relationship, the correlation coefficient level of the anti-CMV IgG seropositive relationship in CP children with future anxiety in the mother is sufficient relationship with a value of 0,400, while the correlation coefficient level of the anti-CMV IgG seropositive relationship in Cerebral Palsy children with future anxiety in the father is sufficient relationship with value 0.361.

DISCUSSION

Cerebral palsy (CP) is a developmental disorder in children that affects posture and the ability to move (Cheshire et al., 2010). The severity of CP based on motor skills is distinguished from levels 1-5 based on the Gross Motor Function Classification System (GMFCS). Children with CP at level 1 can generally walk because the decline in motor function is not too bad, although their walking ability is limited. Meanwhile, children with CP at level 5 generally experience a severe decline in motor function and require wheelchair assistance in daily mobilization (Smithers-sheedy et al., 2016). In this study, the severity of CP was not an indicator to be analyzed. Researchers focused on children with CP who had

cytomegalovirus (CMV) infection history. CMV is a type of virus that can cause a fetus to experience brain damage while in the womb. One of the effects of brain damage is CP. CP children were detected to have a CMV infection divide in the congenital CMV (cCMV) group (Cameron, Gormley, & Deshpande, 2013). In the world, 0.7% of babies were born with cCMV, which causes congenital disabilities, with 10-15% showing severe symptoms at birth, making them at risk for permanent disabilities such as CP (Smithers-sheedy et al., 2016). America, 25,000 newborns each year develop cCMV. The community's lack of knowledge, awareness, and awareness has resulted in cCMV being not detected early and at risk of increasing the prevalence of congenital disabilities in children (Schleiss, 2018).

In this study, from 40 samples of CP children who underwent anti-CMV IgG examination, 90% of children with IgG were positive for CMV. The IgG titers appeared divided into CMV negative, CMV positive with low IgG titers, and CMV positives with high IgG titers. In table 4, the researcher relates these three categories to parents' future anxiety. Feelings of anxiety about the future are stimulated by the brain's perception and cognitive representation of what has yet to

happen. In future anxiety, the role of cognitive is higher than emotional. This causes individuals with Future Anxiety (FA) to assume something excessively easily (Bujnowska, Rodríguez, García, Areces, & Marsh, 2019). That is assumed can be found from the percentage of mothers who experience future anxiety in the mild category of 47.5% and severe category of 50%.

In contrast to the father's future anxiety has the most significant percentage in the mild category of 77.5%, with 22.5% experiencing future anxiety in the severe category. The data of this study shows that mothers of CMV positive CP children have a higher level of future anxiety in the severe category than fathers. The majority of fathers experience future anxiety in the mild category. This is in line with a study that looked at the quality of parents' physical and psychological health as the primary caregivers of CP children (Ribeiro, Sousa, Vandenberghe, & Porto, 2014). This study found that 818 parents of CP children, 36% of whom had very high parental stress than the typical parents of only 5% (Ribeiro, Sousa, Vandenberghe, & Porto, 2014). Mothers who had higher anxiety than fathers seen in this study also follow previous research conducted by Tainara and team in 2019 in Brazil. The study involved 1264 mothers and 105 fathers of CP children. It was found that 1210 people (95.7%) mothers and 87 people (88.3%) fathers had symptoms of depression. This study confirms that the symptoms of major depression are found in the mother of children with CP. One of the triggers of psychological disorders in parents of CP children is the severity of parenting. Mothers are direct caregivers, thus allowing for higher stress events than fathers (Barreto et al., 2019). Other studies have also shown that the severity of anxiety and depressive symptoms that appear in mothers can harm physical and psychosocial well-being (Türkoğlu, Bılgıç, Türkoğlu, & Yılmaz, 2016).

In addition to finding differences between father and mother anxiety, mother's anxiety level is higher than father's anxiety level. This study also found the most critical part that is more specific, namely future anxiety that arises when knowing

their CP child has CMV. Most parents have received information that states that CMV cannot be eliminated by the body so that this type of virus is generally latent in the body and can replicate throughout the host's life (Prince & Lapé-nixon, 2014). The parents were very concerned about their children's condition in the counseling session. In this study, indicators of CMV positive CP in children were detected through serological examination to detect the presence of anti-CMV IgG (immunoglobulin) as an indicator of infection status (Lazzarotto, Blázquez-gamero, Delforge, & Foulon, 2020; Ross, Novak, Pati, & Boppana, 2011). IgG test used in several studies, such as the one conducted in Egypt in 2013 which found that 100% of mothers (546 pregnant women respondents) were reactive for anti-CMV IgG. In line with the research conducted in Iran, 225 respondents experienced reactive IgG anti-CMV (Kamel et al., 2014). Likewise, a study in Sudan noted the prevalence of anti-CMV IgG reactive pregnant women was 98.9% (Altayeb, Mokhtar, Adam, Mohammed, & Musa, 2016).

Anxiety that arises in parents of CMV-positive CP children can occur because CMV can reactivate if it gets stressors from the environment in the form of physical and psychological stress. This is because CMV is latent and persists in the body. Individuals with CMV must consistently maintain the immune system to standby if CMV reactivation occurs (Rector et al., 2014). CP children with CMV are certainly very susceptible to reactivation of the virus if their immune system is compromised. This is very important for parents to pay attention to because their mental health will significantly affect children's physical and psychological health. A study conducted by Guillamon in 2013 showed that parents of children with CP have a low quality of life and are at higher risk of depression than the typical population (Guillamon et al., 2013). This becomes very important to be studied more deeply because it can encourage parents to prepare for the worst possible threats to their psychological health in the future to plan and control important aspects to avoid psychological disorders, such as anxiety disorders

and major depression (Bujnowska et al., 2019; Wang, Huang, & Kong, 2020).

CONCLUSION

IgG-anti-CMV seropositive condition in CP children has a significant positive relationship with their parents' future anxiety. The mother's future anxiety score is higher than the father's future anxiety score. If anxiety in parents has not good treatment, it will impact the care of CP children, the developmental progress of CP children will not be optimal.

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