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Prematurity and language development of 9-18 months child: a correlation study

Nurul Hidayati Hariningtyas[1], Yuni Kusmiyati[2], Nur Djanah[3], Serap Ejder Apay[4]
[1]Midwifery Department, Poltekkes Kesehatan Yogyakarta, Indonesia, hariningtyas9@gmail.com
[2]Midwifery Department, Poltekkes Kesehatan Yogyakarta, Indonesia, Indonesia, yuni_kusmiyati@yahoo.co.id
[3]Midwifery Department, Poltekkes Kesehatan Yogyakarta, Indonesia, nurdjanah.fendi@gmail.com
[4]Faculty Midwifery Department, Ataturk University Health Science, Erzurum, Turkey, sejder@hotmail.com

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ABSTRACT

Premature birth (gestational age <37 weeks) can cause a variety of health problems premature birth are prone for experiencing impaired children's language development in the future. This study was to know the correlation between prematurity and language development of children aged 9-18 months. This research was an observational analytic study with a retrospective cohort design (historical cohort), conducted in August 2019-April 2020. The population was all infants born at Wates General Regional Hospital (RSUD) Wates in Kulon Progo Regency in October 2018-July 2019. The sample was 96 children who were divided into 48 children in the exposed group and 48 children in the non-exposed group. The sampling technique used simple random sampling. The variables in this study were prematurity, smoking parents, maternal education, maternal occupation, and socioeconomics. The data were obtained using Google Form and Denver II forms. Data analysis used chi-square test and logistic regression. There was a correlation between the variables of prematurity with language development. After controlling for smoking parents and mother education variable have significance (p=0.015) on the dependent variable. Developmental language disorders are 3,57 times higher in children born prematurely (OR=3,571). There was no statistically significant correlation between maternal occupation and socioeconomics on language development (p=0.525; 0.277). The chance of language development disorder if the child is born prematurely and has parents who's smoking and low maternal education is 62%. Prematurity is a risk factor for children's developmental language disorder.

Corresponding Author:

Nurul Hidayati Hariningtyas
Poltekkes Kemenkes Yogyakarta
Mangkuyudan Street, MJIII/304, Yogyakarta 55143, Indonesia. Telp/Fax (0274) 374331
Email: harininingtyas9@hmail.com

INTRODUCTION

The degree of child health is a reflection of the health status of a nation because children are the nation's next generation, one of the indicators of the Developmental Development Goals (SDGs) as outlined in the goal of sustainable development 3 (UNICEF) suggests to accelerate the realization of the SDGs goals with prioritized development investment in children.(1) One of the determinants of a children's future quality is optimal development which includes several aspects of functional abilities, namely cognitive, motor, emotional,

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social, and language. The first five years is a “golden period” “window of opportunity” or “critical period” for the optimization of growth and it also clarifies that the age below the first five years of life is an important period in preventing developmental deviations as well in optimizing development.(2)

Research in the United States of America children detected developmental disorders before school age by 20-30% and in Indonesia about 45.12%. A study in Indonesia showed that 20-30% of children under five had developmental disorders, and most of them experienced delays in the gross motor and language aspects or speech, most of which were due to lack of stimulation. According to WHO, 2 to 5 percent of children suffer from Minimal Brain Dysfunction (M.B.D) including fine motor disorders. Children are born with the ability to develop speech and language skills. Language development is the child's ability to respond to sounds, follow commands and speak politely. The role of language in early childhood includes thinking, speaking, and being able to read and write. Children can convey their desires and opinions to others through language.(3–5)

Some data show that the incidence of children who experience speech delay is quite high. Research in the United States reports the prevalence of a combination of speech and language delays in children aged 0 to 5 years is between 3% to 10%. Children under five in Indonesia who experience speech and language delays reach 23% to 24.6%, and risk of learning, reading, and writing difficulties. If intervention is not carried out, children can experience reading impairment, verbal ability, behavior problems, and psychosocial adjustments. The most rapid language development occurs at the age of 6 to 18 months. Factors that affect children's language development are internal factors including perception, cognition, and prematurity, and external factors including maternal education, parenting, and socioeconomics.(6)

The development process is the result of the interaction of genetic factors and environmental factors. Genetic factors are factors related to genes that come from the father and mother, while environmental factors include biological, physical, psychological, and social. Growth problems will be more common in babies who are at high risk at the time of delivery. Babies can experience growth and development disorders such as preterm or premature neonates, low birth weight, intraventricular hemorrhage, and others.(7) Every year, the incidence rate of preterm labor is quite high. There are around 15 million babies are born prematurely, which is 1 in 6 preterm births. That means, of the 100 babies born as many as 15.5 of them have premature births. The prevalence of premature events, in Wates Hospital, reaches 12.30% in 2018. Prematurity is a major health problem because it can cause a high risk of disruption in children’s development. Premature babies (gestational age <37 weeks) are born with low birth weight (<2500 grams). This condition can increase the risk of developmental disorders.(8)

Premature babies have a high risk of disorders that need to be cautious about. Long-term complications that may occur in premature babies such as chronic lung disease, vision problems, hearing loss, cerebral palsy, and other growth and development disorders. Efforts to foster children's language development are still very little, even though the problem needs to be handled properly so that children can develop normally.(9) Denver II is an instrument for early finding problems with potential developmental deviations in children aged 0-<6 years consisting of 125 items arranged in a form into four sectors, namely: the personal social sector, the fine-motor-adaptive sector, the language sector, and the gross motor sector.(10)

This study aims to determine the correlation between prematurity and language development of children aged 9 to 18 months. This research refers to the scope of the implementation of maternal and child services that are expected to develop midwifery empirically for health workers in general as well as midwifery students in particular. In addition, it is also information to cope with premature births that are at risk of experiencing

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developmental language disorder and can be one source of knowledge to increase awareness to provide stimulation at every stage of the children's age.

METHOD

This type of research was an analytic observational with a retrospective cohort design. This research was conducted from March to April 2020. The Subject was all babies born on October 2018 to July 2019 at Wates Hospital, with a simple random sampling technique. Samples were selected from 716 births using the random method so 96 respondents were obtained.(11)

The independent variable in this study was prematurity. The dependent variables were children's language development, and external variables were smoking parents, maternal education, maternal occupation, and socio-economics. Prematurity was seen from the medical record at Wates Hospital with the gestational age of premature birth <37 weeks and gestational age of normal birth ≥37 weeks, the parameter with nominal scale. Measuring language development was obtained by comparing the children's behavior during the test or asking items to the mother which was then assessed by Denver II. The parameter used was a nominal scale examination test score. The results of examinations of children's language development tests were obtained with Denver II in the form of 10 test items with two results, namely disorder and normal.(12,13)

The procedure of study was conducted door-to-door in Kulon Progo for two weeks. Then, 25 respondents were obtained. Due to the impact of the COVID-19 pandemic, the method was changed by contacting the respondents one by one via sms / WhatsApp / telephone and distributing the questionnaires in the form of Google form which contained data and questions examination of children's language development tests according to Denver II. This was conducted for four weeks to get 71 respondents. Therefore, 48 premature groups and 48 non-premature groups were obtained. To determine the correlation between two variables, chi-square test data analysis was used. Then, it was continued to find out the effect of risk on language development with a logistic regression test. This research has obtained permission from the research ethics committee.(14)

RESULT

The total subjects in this study were 96 respondents who were divided into two groups: the exposed group and the unexposed group. Based on the examination results, the following results are obtained:

Table 1. Characteristics of The Research Subjects with Prematurity

Variable	Prematurity				p-value
	Premature		No premature		
	n	%	n	%	
Smoking Parents					
Yes	32	66.7%	27	56.3%	0.294
No	16	33.3%	21	43.8%	
Maternal Education Level					
Low	20	41.7%	18	37.5%	0.676
High	28	58.3%	30	62.5%	
Maternal Occupation					
Unemployed	32	66.7%	32	66.7%	1.000
Employed	16	33.3%	16	33.3%	
Socio-economy					
Low	26	54.2%	24	50.0%	0.683
High	22	45.0%	24	50.0%	

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Based on Table 1, respondents with smoking parents have a risk of preterm birth at 66.7%, the proportion of respondents with educated mothers in the category of premature children born at 41.7%, respondents with mothers not working have a risk of giving birth prematurely by 66, 7%, and respondents born prematurely with socio-economic disadvantages of 54.2%. From this table, the characteristics of smoking parents, maternal education, maternal occupation, and socio-economic respondents obtained p-value> 0.05 which means that the two groups have similar or comparable characteristics so that it will not affect the results of the study.

Table 2. The Correlation between Prematurity and External Variables with Language Development in Children Aged 9 to 18 Months

Variable	Children's Language Development				p-*value*	OR	95% CI
	Disorders		Normal				
	n	%	n	%			
Prematurity							
Yes	20	71.4%	28	41.2%	0.007	3.571	1.379-9.249
No	8	28.6%	40	58.8%			
Smoking Parents							
Yes	22	78.6%	37	54.4%	0.027	3.072	1.107-8.529
No	6	21.4%	31	45.6%			
Maternal Education							
Low	15	53.6%	23	33.8%	0.072	2.258	0.921-5.534
High	13	46.4%	45	66.2%			
Maternal Occupation							
Unemployed	20	71.4%	23	33.8%	0.525	1.364	0.523-3.558
Employed	8	28.6%	24	35.3%			
Socioeconomic							
Low	17	60.7%	33	48.5%	0.277	1.639	0.670-4.012
High	11	39.3%	35	51.5%			

The statistical test used was chi-square with strength if the value of p> 0.05, which indicates that there was a statistically significant correlation. The results of the analysis of the variable prematurity with language development disorders of children aged 9 to 18 months were more in children with premature birth (71.4%) than children with normal birth (28.6%). Based on statistical tests, there was a significant correlation between prematurity and language development (p-value 0.007).

Based on the results of the variable analysis, children with parents who smoke have a greater risk of language developmental disorders (78.6%), while children with parents who do not smoke (21.4%). Based on statistical tests, there was a significant correlation between smoking parents and language development with a p-value of 0.05 <0.027.

The table explains that the results of the analysis of low maternal education variables have a risk of children experiencing language development disorders as much as 53.6% compared to children who have mothers with high maternal education as much as 46.4%. Based on the results of statistical tests, there was a significant correlation between maternal education and language development (p-value 0.072).

The table explains that children with unemployed mothers experience language development disorders as much as 71.4%, while children with working mothers as much as 28.6%. Both variables have a p-value of 0.525 and it can be concluded that the variable did not affect language development.

The table explains that children from families with low socioeconomic status are more likely to experience language development disorders as much as 60.7% compared to children from families with high socioeconomic status as much as 39.3%. The p-value of

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0.277 was obtained from the two variables which means it does not affect language development.

Table 3. The Correlation between Prematurity and Children's Language Development Aged 9 - 18 Months

Variable	B	p-*value*	Exp(B)	95% CI	
				Lower	*Upper*
Prematurity	1.235	0.015	3.439	1.277	9.265
Smoking parents	1.125	0.041	3.080	1.050	9.035
Maternal Education	0.895	0.069	2.447	0.931	6.428
Constanta	-3.774	0.005	0.023		

The statistical test used was a logistic regression test with the provision that only variables that had p <0.25 in the bivariate analysis performed a logistic regression test. Based on the multivariate analysis, the variable prematurity was more influential on language development compared to the smoking parents' variable. Judging from the p-value of 0.015 <0.05, it showed that prematurity was very significant in affecting language development, so does the smoking parent variable have a p-value of 0.041 <0.05 affecting language development, while the mother education variable has a p-value of 0.069> 0.05 which means that statistically has no significant effect on language development.

Prematurity increases the risk of language impairment by 3.43 times (OR = 3.439). The probability of an individual experiencing developmental language disorder based on predictor values is calculated by the equation: children born prematurely, smoking parents, and maternal education in the low category are at risk of experiencing language development disorders in children aged 9-18 months by 62%.

DISCUSSION

This research examines the correlation between prematurity and language development of children aged 9-18 months with external variables smoking parents, maternal education, maternal occupation, and socioeconomics of the 96 respondents. Based on the results of the study, it is known that most of the respondents have parents who smoke, have high maternal education, unemployed mothers, and have low socioeconomic status. Developmental language disorder in children is found in the group of children with premature birth, children with smoking parents, children from mothers with low education, children from unemployed mothers, and children who come from families with low socioeconomic status.

The results of the analysis with the chi-square test aim to test the correlation of each independent variable to the outcome variable. It showed that the incidence of prematurity had a statistically significant correlation to the language development variables of children aged 9-18 months. The results of p-value <0.05 (p = 0.007; OR: 3.439; 95% CI: 1.277-9.265).

Thus, Ho is rejected, and Ha is accepted. It means prematurity correlates with children's language development. The OR results on this variable also mean that children with premature birth are 3.43 times more likely to experience developmental language disorder in children aged 9-18 months than children with normal birth. The risk of developmental language disorder will be more likely to be experienced in children with premature birth, children with smoking parents, and children with low-educated mothers is 62%.

In theory, premature birth is a birth with a gestational age between 20 weeks to no more than 37 weeks. Premature is a major cause of neurodevelopmental disabilities in children and can give an effect throughout life because of disruption of nerve development functions. Disorders of language development are included in more subtle forms of

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neurodevelopmental disorders. In theory, premature birth is defined as the birth of a baby between 20 weeks and less than 37 weeks of gestation. Prematurity is a major cause of neurodevelopmental disabilities in children and can have lifelong effects due to impaired neurodevelopmental function. Language development disorders are included in neurodevelopmental disorders in a more subtle form.(15)

Children with a history of preterm birth are at greater risk of experiencing disorders because significant brain development occurs in the last 4-6 weeks of pregnancy. The risk of experiencing the disorder will increase in babies born at a young gestational age. According to neuro psycholinguistic theory, language involves complex elements, namely: brain function (cerebral cortex), semantics and pragmatics, phonology, grammar, and organs that reproduce language because these systems are interconnected. (16,17)

This study is following research conducted by Ana Claudia et.al., (2017), conducted in premature children (gestational age <37 weeks) which shows that prematurity significantly affects the occurrence of children's language developmental disorders (p <0.01). This is because, at the 6-18 months stage, a critical period of brain development occurs when neurogenesis, gliogenesis, neuron migration, and myelination process take place rapidly.(18)

A systematic review by Arpi and Ferrari (2013) shows that the relationship of prematurity with the disorder that occurs is not always significant. Even so, the prevalence of disorders in premature children is greater than in children born at term.(19)

The relationship between parents smoking statistically has a relationship with language development. This study is following research conducted by Nadine F. et al., (2014), which states that parents who smoke or mothers who are exposed to cigarette smoke during pregnancy cause the child to be born prematurely and will affect the child's language development (p-value 0.041). Smoking parents will be at risk of having placental abscess, low infant weight, infant mortality, and causing premature rupture of membranes resulting in earlier labor. Cigarettes harm the child to adulthood because it affects the child's development from the womb until outside the womb.(20)

Maternal education factors indicate that this factor is related to children's language development and is a risk factor. This study is in line with the study conducted by Yenny (2016) which stated that there is a statistically significant correlation between children's language development and maternal education (p-value 0,000). Even though the maternal education level affects the child's language development, stimulation can still be obtained outside the maternal education as the primary caregiver, so it is not an absolute factor.(21)

Developmental language disorder is more common in children who are born prematurely to unemployed mothers than employed mothers. Relevant research conducted by Jeane, et.al (2012) stated that the employment status of mothers with child language development is statistically unrelated (p-value 0.317). According to the research of Buehler and O'Brien (2012), children born prematurely to mothers who work part-time have well-spoken language. Figures show that children born prematurely to part-time working mothers compared to mothers who do not work have 3.32 times doing a higher proportion of childcare and domestic work than mothers who work all day long.(22) This study is relevant to the results of the chi-square analysis with a p-value of 0.525 > 0.05 can experience a risk of 1.36 times (95% CI 0.523-3.558) of language development disorders in children born prematurely with mothers who do not work compared to working mothers.(23)

The results of this study indicate that socioeconomic status is not statistically related to developmental language disorder. The results are also supported by the study conducted by Yenny (2016), which stated that there is no significant correlation between socioeconomic and children's language development (p-value 0.517) According to Sania, et.al (2018), the status of the socioeconomic family can affect language development in children because socio-economic role in fulfilling nutritional status, needs and affect the development process.(24) Based on the results of research and theory, socio-economic

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factors here do not affect the development of children's language. This is due to the strong factors of the family environment and social environment which further affect children's language development.

CONCLUSION

Based on the results of data analysis and discussion in this study can be conclude that there is a statistically significant correlation between prematurity, smoking parents, maternal education, and language development; there is no statistically significant correlation between maternal employment and socioeconomic on language development; the risk of developmental language disorder for children born prematurely, smoking parents, and having a mother with low education is 62%; prematurity increases the risk of children's developmental language disorder by 3.43 times; and developmental language disorder are 3.57 times higher in children with premature birth.

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