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Speech and language delay in Children: Effects of medical and nonmedical Risk Factors

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ABSTRACT

Introduction: Speech and language delayed is defined as a child's speech which is difficult to comprehend and fail to demonstrate language development equal as his/her chronological age. It is characterized by sound patterns productions which are inappropriate for his age. Children with speech delayed have a higher risk of experiencing social, emotional, behavioral, and cognitive problems in adulthood. Previous research has shown that from 2.3% to 19% of children aged 2-7 years, are estimated to have speech delays. The purpose of this study was to know the effect of parents' education level on speech delayed incidence in childern and analyze the risk factors that might affect it.

Methods: The study was a cross sectional design with a total of 95 children aged 2-7 years who came to the Medical Rehabilitation Installation, 51 children with speech delayed and 44 normal speech children as controls.

Results: This study found that there was no statistical relationship between parents' education level and the incident of speech delayed in children according to the father's education level $p = 0.151$ and the mother's education level $p = 0.660$. There was a statistically significant association between history of asphyxia ($p = 0.023$), comorbid presence ($p = < 0.001$), noise exposure ($p = 0.047$) and lack of stimulation ($p = <0.001$) on speech delayed in children.

Conclusion: there is no relationship between parents' education level and speech delayed in children. Some medical factors such as history of asphyxia and presence of comorbidities have a significant influence as mush as non-medical or environmental factors such as noise exposure in household environment and lack of stimulation in communication.

Keywords: Speech delayed, parents' education level, risk factors.

ABSTRAK

Latar Belakang: Keterlambatan bicara dan bahasa didefinisikan sebagai gangguan bicara seorang anak yang sulit dipahami dan kegagalan anak dalam menunjukkan perkembangan bahasa sesuai usia kronologis dan ditandai dengan pola suara bicara yang tidak sesuai untuk anak seusianya. Anak-anak dengan keterlambatan bicara memiliki risiko lebih tinggi mengalami masalah sosial, emosional, perilaku, dan kognitif di masa dewasa. Penelitian sebelumnya telah menunjukkan bahwa antara 2,3% dan 19% anak-anak berusia 2-7 tahun diperkirakan mengalami keterlambatan bicara. Tujuan dari penelitian ini adalah untuk melihat pengaruh antara tingkat pendidikan orang tua terhadap keterlambatan bicara dan bahasa pada anak dan untuk menganalisis faktor risiko yang dapat mempengaruhi keterlambatan bicara dan bahasa pada anak.

Metode: Desain penelitian ini adalah cross sectional dengan total 95 anak usia 2-7 tahun yang datang ke Instalasi Rehabilitasi Medik, 51 anak mengalami keterlambatan bicara dan bahasa dengan 44 anak yang tidak mengalami keterlambatan bicara sebagai kontrol.

Hasil: Hasil penelitian ini menemukan bahwa tidak ada hubungan statistik antara tingkat pendidikan orang tua dengan keterlambatan bicara dan bahasa pada anak, baik tingkat pendidikan ayah p=0,151 maupun tingkat pendidikan ibu p=0,660. Terdapat hubungan yang signifikan secara statistik antara riwayat asfiksia (p=0,023), adanya komorbid (p=< 0,001), paparan kebisingan (p=0,047) dan kurangnya stimulasi (p=<0,001) terhadap keterlambatan bicara dan bahasa pada anak.

Kesimpulan: Tidak ada hubungan antara tingkat pendidikan orang tua dengan keterlambatan bicara dan bahasa pada anak, faktor medis yang berpengaruh adalah riwayat asfiksia dan adanya komorbiditas, sedangkan faktor lingkungan non-medis yang berpengaruh adalah paparan kebisingan di lingkungan tempat tinggal dan kurangnya stimulasi pada anak.

Kata kunci: Speech delay, Tingkat pendidikan orang tua, faktor risiko.

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INTRODUCTION

Language and speaking development are very important skills for preschoolers. Language is a form of symbols that children use to communicate and adapt to their environment. It involves cognitive, emotional, social, and environmental development, which is crucial for children's future.[1]

Speech and language delay is defined as a child's speech that is difficult to comprehend and fails to demonstrate language development equal to his/her chronological age. It is characterized by inappropriate sound pattern productions for

his age.[2] Naturally, children learn their native language through exposure to the spoken languages around them without requiring special instruction or stimulation. Speech and language were developed through their ability to hear, see, understand, remember, and interact with others [3]. Children with speech and language delays have a higher risk of experiencing social, emotional, behavioral, and cognitive problems in adulthood. There is an assumption that speech and language delays happen in the family and are not a severe problem; therefore, intervention for speech and language delays is often delivered too late. Previous research has shown that in the range of 2.3%-9% of children aged 2-7 years are estimated to have speech and language delayed.[3]

There are many risk factors that might affect speech and language delays. Some of them are gender, premature birth, genetic factors, autism, mental disabilities, chromosomal abnormalities, hearing disease, attention deficit disorder, and hyperactivity. Environmental factors, including poverty or disruption of social communication between parents and children, watching TV, and using gadgets, also have been considered to have a role in developing the disorder.[4] It is recommended that children should undergo a developmental screening to determine whether they have speech and language delays and possible hearing loss. The latency in diagnosis and management in children with speech and language delayed might cause impairments in cognitive which leads to low intelligence (IQ), difficulty in communication, and illiteracy.[5]

Parents are the prior role models of their children. The interaction between a child and his parents is very important in language development. This interaction is reciprocal, where both parties initiate and respond to each other in communication. Parents naturally imitate the sounds made by their babies and alternate making cooing (such as "gu-gu") and babbling (such as "ma-ma") sounds. Parents also talk to their babies in a way that helps them learn language. Babies learn language from parents and family members around them through constant exposure and interaction. Parents unconsciously teach and reinforce their children's speech.[6] The learning environment at home is not only shaped by direct interaction between parents and children, but also by facilities and atmosphere at home that encourage children's enthusiasm for learning.[7] Four aspects of language development involving parent-child interaction, the first is the duration of interaction between parents and children, the second is the response to the child's speech and language, the third is the amount and quality of linguistic (language) input provided by parents, and the fourth is the use of language learning strategies by parents. Thus, parental involvement is very important in children's growth and development, including language development.[8]

Higher parents' education level is correlated with improved language skills in children. Previous research has suggested that early childhood development delayed, particularly in language and social skills, are linked to parents' education levels.[9] However, much remains unknown about the mechanisms underlying this relationship. The specific factors in parents' education level that contribute to a child's language development are not yet fully understood. Recognizing

these risk factors as soon as possible is critical to detecting and treating speech and language delays as quickly as possible. Early detection and intervention might reduce the negative impact of speech and language delays on children's activities, including in the social, behavioral, emotional, educational, and occupational areas.[10] In previous research, early intervention by families was shown to be effective. This intervention can improve the language and communication skills of early childhood. Thus, it can be used as a reference for clinical treatment. It was also found that parents' affection for the fetus during the prenatal period reduces problems in preschool children. This explains the strong influence of children's behavior education by the family.[11]

Speech and language delays might influence childhood social, emotional, and academic development. While on the other hand, social-emotional behavior also significantly affects the development of children with speech and language delays. Children with speech and language delays need appropriate intervention programs supported by their families and surrounding environment. The importance of holistic treatment should pay attention to language, social-emotional, and environmental development.[12]

Children with speech and language delays are more likely to have difficulty in school and have problems with social relationships. Previous research has found the way mothers implement literacy practices in preschoolers, as well as the home learning environment, has a major influence on early childhood language and literacy development.[13]

Speech and language delay is one of the most common developmental problems in early childhood. This might have an impact on children's communication skills, social interaction, and learning development. Factors that can cause speech and language delays, as stated before are vary. One of which is parents' education level and some other risk factors in the child himself. This study aims to analyze the effect of parents' education on speech and language delayed in children, identify the risk factors associated with speech and language delayed and develop a risk prediction model based on parents' education and risk factors in children.

METHODS

This research used a quantitative research design with a cross-sectional approach. The population was all pediatric patients aged 2-7 years who were diagnosed by physical medicine and rehabilitation specialists as children with speech and language delays at the Medical Rehabilitation Installation of four hospitals who were willing to be involved in this research with a large sample size using total sampling techniques, the number of children who experience speech and language delays and their number. children without speech and language delays during the period January-March 2024. The research instrument used a questionnaire containing questions about the characteristics of the respondent's data and postnatal risk factors up to the current age (under 7 years). The risk factors analyzed include medical risk factors, including a history of persistent otitis media, history of seizures, history of asphyxia, low birth weight, prematurity, neonatal

jaundice, and other comorbidities (cerebral palsy, ADHD, Down Syndrome), family risk factors include multilingual use. more than two languages, previous history of children with speech and language delay, multiparity of children over 3, divorce of parents, and last education of father and mother. Environmental risk factors include noise of more than 65 dB. There are five noise zones: Zone A with 35-45 dB indicating a quiet environment, Zone B with 45-55 dB representing residential areas, Zone C with 55-65 dB for markets, offices, or continuous noise, and 65-75 dB for continuous machine and factory noise, and lack of stimulation is an environment that stimulates the development of speaking and language skills can mean that the child does not receive enough quality verbal interaction, such as regular conversations, storytelling, or active responses from parents and their surroundings. (parents or caregivers who are quiet and never talk). Data collection techniques include checking weight, height, head circumference, and interviews regarding postpartum risk factors. The risk factors analyzed are Data collection techniques, including checking weight, height, and head circumference, as well as interviews regarding postpartum risk factors. The risk factors analyzed are—data analysis using statistical test correlation of Spearman rank with cross-sectional study design. To examine the relationship between two categorical variables, namely parental education and speech and language delay, to determine the effect of parental education on speech and language delay and risk factors that affect speech and language delay. This research has gone through analysis and review from the Bioethics Commission for Medicine/Health Research, Faculty of Medicine, Sultan Agung Islamic University, Semarang and received approval with number No. 47/I/2024/Bioethics Commission

RESULTS

From a total sample of 95 children aged 2-7 years came to the Medical Rehabilitation Installation during the study who met the inclusion and exclusion criteria, there were 51 children who experienced speech and language delay and 44 children who did not experience speech and language delay.

Table 1. Data demographic

		Speech and language delay (n=51)	Control (n=44)
Age (month)		47.06 ± 15.15	56.84 ± 15.77
Gender	Boys	38 (74.5%)	24 (54.5%)
	Girl	13 (25.5%)	20 (45.5%)
Weight Loss (kg)		15.88 ± 6.32	18.18 ± 5.97
Body Height (cm)		98.66 ± 10.62	106.15 ± 11.62
Head circumference (cm)		48.96 ± 2.73	50.29 ± 2.00

From the group of children with speech and language delay and the control group, data characteristics were obtained that children with speech and language delay who came were, on average, 47.06 months ± 15.15 younger than children who did not experience speech and language delay who were on average 56.84 months ± 15.77. The speech and language delay and control groups were mostly boys. Thus, the weight, height, and head circumference of children with speech and language delays are lower than those who do not have speech and language delays.

Table 2. Comparison of Parents' Education Levels among groups Speech and language delay and Control groups

Education factors		Speech and language delay n=51	Control n=44	p
Father's last education	Elementary School	0 (0%)	2 (4.54%)	p= 0.151
	Junior High School	8 (16.7%)	4 (9.09%)	
	Senior High School	18 (35.3%)	10 (22.7%)	
	Higher Education	25 ((49.01%)	28 (63.6%)	
Mother's last education	Elementary School	1 (1.96%)	0 (0%)	p= 0.660
	Junior High School	5 (9.8%)	5 (11.4%)	
	Senior High School	14 (27.4%)	9 (20.45%)	
	Higher Education	31 (60.7%)	30 (68.15%)	

Data was obtained that the most education of both parents in the study and control groups was Higher Education. The results of the chi-square statistical test with Pearson obtained a value of p = 0.151 and p = 0.660, showing no significant relationship between the father's education and speech and language delay in children. This means that the father's education level has no influence on the likelihood of the child experiencing speech and language delay. Meanwhile, the value of p = 0.660 indicates that there is no significant relationship between maternal education and speech and language delay in children. This means that the mother's education level has no influence on the likelihood of the child experiencing speech and language delay.

Table 3. Comparison of Medical Risk Factors among groups Speech and language delay and Control groups

Faktor		Speech and language delay n=51	Control n=44	p
Otitis media persists		2 (3.9%)	0 (0%)	p= 0.184
History of seizures		15 (29.4%)	6 (13.6%)	p= 0.065
History of Asphyxia		14 (27.5%)	4 (9.1%)	p= 0.023*
Low Birth Weight		16 (31.4%)	7 (15.9%)	p= 0.079
Premature Birth		8 (15.7%)	2 (4.5%)	p= 0.078
Icteric Neonatorum		15 (29.4%)	8 (18.2%)	p= 0.203
Comorbid	Cerebral Palsy	3 (5.9%)	1 (2.3%)	p= <0.001*
	Autism / ADHD	12 (23.5%)	0 (0%)	
	Down Syndrome	2 (3.9%)	0 (0%)	

*p value <0.05 is statistically significant

Data obtained that the history of seizures (p = 0.065) showed a tendency of possible relationships between history of seizures and speech and language delay. Although it does not reach statistical significance (p < 0.05), it needs further investigation. History of Asphyxia (p = 0.023) showed a significant relationship between a history of asphyxia in newborns and the incidence of speech and language delay. Children with a history of asphyxia have a higher risk of speech and language delay. Low Birth Weight (p = 0.079) and Preterm Birth (p = 0.78) Although the results for low birth weight and preterm birth did not show a statistically significant association, there was a potential trend for association. More research may be needed to confirm this with a larger sample. History of persistent otitis media (p = 0.184) and history of neonatal jaundice (p = 0.203) showed no statistically significant association between persistent otitis media and neonatal jaundice and speech and language delay. The table shows that comorbid has a very statistically significant relationship with speech and language delay in children with p values < 0.001. This means that children with Cerebral Palsy, Autism/ADHD, and Down Syndrome have a higher chance of experiencing speech and language delay

Table 4. Comparison of Family Risk Factors among groups Speech and language delay and Control groups

Factors in the family		Speech and language delay n=51	Control n=44	p
Multilingual		15 (29.4%)	9 (20.5%)	p= 0.316
Family History with Speech and language delay		7 (13.7%)	3 (6.8%)	p= 0.275
Number of children in the family	1-2 children	37 (72.5%)	40 (90.9%)	p= 0.053
	3 children	13 (25.5%)	3 (6.5%)	
	>3 children	1 (2.0%)	1 (2.3%)	
Divorce		1 (2.0%)	0 (0.0%)	p= 0.350
Separated from Mother		0 (0.0%)	1 (2.3%)	p= 0. 279
Separated from Father		5 (9.8%)	2 (4.5%)	p= 0.328
Working Moms		20 (39.2%)	20 (52.3%)	p= 0.202

Number of Children in the Family (p = 0.053): These results indicate a possible trend in the relationship between the number of children in the family and speech and language delay. Children in larger families may have a slightly increased risk of experiencing speech and language delays. However, more research is needed.

Multilingualism (p = 0.361) showed no significant association between multilingual use at home and speech delay. Family History with Speech and language delay (p = 0.275) showed that there was no significant association between family history and speech and language delay. Marital Status of Parents with the occurrence of divorce (p = 0.350), separated from the mother (p = 0.279), separated from the father (p = 0.328)) showed no significant relationship between divorce, separation from the mother, separation from the father and speech and language delay in children. Mothers who worked outside the home (p = 0.202) also showed no significant association with speech and language delay in children.

Table 5. Comparison of environmental risk factors in the family among groups Speech and language delay and Control groups

Environmental Factors in the family		Speech and language delay n=51	Control n=44	p
Noise		9 (17.6%)	2 (4.5%)	p= 0.047*
Watch TV/ Gadgets	1-2 hour/day	35 (68.6%)	26 (59.1%)	p= 0.351
	3-6 hour/day	15 (29.4%)	18 (40.9%)	
	>6 hour/day	1 (2.0%)	0 (0%)	
Lack of stimulation		22 (43.1%)	4 (9.1%)	p= <0.001*

*p value <0.05 is statistically significant

Exposure to noise in the household environment (p = 0.047) had a significant relationship with speech and language delay in children. This showed that children who are often exposed to noise at home have a greater likelihood of experiencing speech and language delayed compared to children who are not exposed to noise. Lack of stimulation (p = < 0.001) shows that lack of language stimulation in the family environment has also been shown to have a very significant influence on speech and language delay in children. Lack of language stimulation can be in the form of minimal verbal interaction between parents and children, lack of storybook reading activities, or the absence of educational games that support children's language development. TV and Gadgets (p = 0.351) from the results of the analysis showed that there was no significant relationship between the use of TV and gadgets with speech and language delay in children.

DISCUSSION

In this study, there was no relationship between parents' education level and speech and language delays in children. More or less, the same thing was found in previous research conducted in Denmark, which concluded that parents' education level is less influential than the type of activity. The study concluded that there were differences in the quality of parental language due to parents' education level through storytelling by the parents to their children, especially about parents' childhood. This made children interested and participated in the stimulation process. There was also no difference in the quality of interaction between mother and father.[14] Another study found that although most parents have a higher education and have access to various health resources, there is still a lack of knowledge about children's normal developmental milestones, including speech and language delays. Therefore, national initiatives are needed to encourage the active role of parents in monitoring their children's growth and development.[15]

There are seven medical factors studied in this study. The history of asphyxia and comorbidity are 2 factors that might influence the development of speech and language delays, as well as five factors that are not statistically meaningful, which include otitis media, history of seizures, low birth weight, premature birth, and history of icteric neonatal. Infants with ischemic hypoxia accompanied by electrolyte imbalance due to asphyxia in previous studies had a severe risk factor because it affects long-term neurological disorders. Therefore, asphyxia at birth should be prevented with proper antenatal care and active and timely treatment during delivery. Effective neonatal resuscitation and rapid correction of electrolyte imbalance might also help.[16] cerebral palsy, and developmental delay. This study aims to determine the correlation between dyselectrolytemia and the degree of hypoxic-ischemic encephalopathy (HIE Children with low birth weight and/or asphyxia at birth have a higher risk of promoting developmental disorders (DD). In that case, monitoring of growth and development in children must be carried out by public health officials. This can be done directly or by developing outreach strategies, especially in underserved areas of health facilities.[17] In studies associated with IL6 levels, it was found that it was necessary to propose assessment standards for HIE

(Hypoxic-Ischemic Encephalopathy) levels and IL-6 (Interleukin-6) levels as potential biomarkers of prognosis for mortality and morbidity due to neonatal asphyxia (oxygen deprivation in newborns) that potential to experience growth and development disorders in the future due to asphyxia.[18]

In this study, the correlation between comorbidity and speech and language delay has a very strong relationship with a value of p = <0.001. While in another previous study, it was found that children with comorbid ASD (Autism Spectrum Disorder) have a larger temporopolar volume (area in the brain). In such conditions, a relationship was found between the severity of symptoms and language skills during the pre-language stage. [(19)] Other researchers even found that there were as many as 37 comorbidities associated with speech and language delays in children. The study used a case-control study to analyze comorbidities in speech and language-delayed children. The findings support the existence of speech and language-delayed comorbidities and identify new clinical relationship findings. By recognizing and understanding these comorbidities, we could better understand the processes underlying speech and language delay in children. The study is also expected to raise clinical awareness of other conditions accompanying language disorders in children.[20]

From non-medical aspects, the family influence has no statistically significant correlation with delayed speech and language. Previous research has found that most parents know little about their children's developmental stages. Although mothers generally understand developmental stages more than fathers, parents[21] are still weak in recognizing children's developmental achievements beyond motor development. However, parents rarely look for reliable information about children's development stages. Therefore, increasing parental awareness about the stages of child development is expected to support optimal child growth and development.[22] While other researchers conducted their study about the influence of children's cognition, they stated that a child's cognitive development begins in the first year and continues to develop gradually. Good parenting is important for a child's cognitive maturity and development. Positive parenting helps children regulate emotions in dealing with problems.[21]

The other non-medical factors that influence speech and language delay were 2 influential factors in the family: noise exposure and lack of stimulation from parents or caregivers. It was supported by previous studies that observed that higher noise exposure was associated with reduced cortex thickness in the L IFG **(**left inferior frontal gyrus). Although noise exposure affects brain structure, this study did not find a direct relationship between noise and children's language skills.[23] Other environmental factors in this study showed that there was no relationship between the use of gadgets or watching TV on children's speech development. However, other studies stated that the balance between screen time and other activities, such as face-to-face interaction, is significant. Outdoor play, conversation, book reading, and interactive games are essential to encourage speech development and reduce the negative effects of gadgets. Involving parents or caregivers in co-viewing might lead children to nice, engaging, high-quality, age-appropriate media experiences that support

their language development.[24]

The limitation of the study was that a relatively small sample (51 children with speech and language delays and 44 children as controls) needed to expand the sample and reduce the bias in this study.

CONCLUSION

In this study, it was found that the level of education of parents did not affect speech and language delays in children. The risk factors considered to have influenced the disorder were medical factors and nonmedical factors. The medical factors were a history of asphyxia at birth and the presence of comorbidities (Cerebral Palsy, Autism - ADHD, Down Syndrome), while nonmedical or environmental factors were noise exposure in the household environment and lack of stimulation in children, which were unsuspected to have a high correlation. To manage in time when needed, it is necessary to pay attention to and screen the growth and development of children from newborns and provide adequate stimulation to reduce the occurrence of speech development disorders in children.

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