Factors associated to language disorders in preschool children

Fatores associados a alteração da linguagem em crianças pré-escolares

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ABSTRACT

Purpose: To identify factors related to language disorders among social and nutritional variables in preschoolers. **Methods:** Cross-sectional study carried out with 126 children from the south region of the city of São Paulo, with ages ranging from 6 months to 6 years. The Denver II Developmental Screening Test was administered to detect the risk for language disorders. The test results were compared to the following variables: age, gender, mother's level of education, child nutritional status, number and order of children's birth, and anemia. Results were statistically analyzed. **Results:** According to the Denver II test, 18.3% of the 126 participants were at risk for language disorders, and 9.5% presented anemia. No differences were found between risk and non-risk groups regarding age, nutritional status, gender, and mother's education. Differences were found between groups regarding number of children per family, birth order, and presence of anemia. **Conclusion:** The risk for disorders in language acquisition and development was higher in the group with anemia, in the eldest children, and in the children with less than four siblings. Similar studies are necessary to detect possible deviations in language development and, consequently, in the child's learning process and future social performance.

Keywords: Anemia; Nutritional status; Child; Language; Risk factors

INTRODUCTION

In a chronological point of view, the language acquisition of a normally developing child follows a basically constant order. However, its progression rhythm may vary from child to child[1].

The phonological knowledge maturation is gradual, non-linear, and presents individual variations that occur during the oral language development. There is a critical period for this development that goes from birth to 5 years. As a result of this development, a phonological system consistent with adult's speech is established, also considering the spoken language of the social group to which the child belongs[2,3].

In language abilities, as in other developmental areas, children depend on the opportunities provided by the environment to fully develop their genetic inheritance[3].

Organic, intellectual/cognitive, and emotional (relational family structure) factors are possible causes of language and learning difficulties. These factors are usually interconnected. External influences, such as cultural differences and insufficient or inappropriate education are aggravating factors in these cases[1].

If the occurrence of malnutrition impairs the adequate metabolic functioning during the most crucial period of language development, its negative consequences may be permanent[4].

Both malnutrition and anemia in the first years or months of life result in serious consequences to children, leading to difficulties in the cognitive development, language acquisition, and learning process[4,5]. Several studies have pointed out a relationship between iron deficiency and delays in cognitive and psychomotor development in early childhood. Many researches carried out in the last decade have shown the negative influence of iron deficiency to cognitive acquisitions of scholars and adolescents[4,5].

Considering the magnitude of this issue and the scope of its risk factors, this study had the aim to identify, among the studied variables, the factors that are possibly associated to language disorders, using the Denver II Developmental Screening Tool.

This study was carried out at the University Outpatient Clinic, Universidade de Santo Amaro – UNISA, and at the Creche CEI – Força e Ação, covenant with the Education Department of São Paulo (SP), Brazil.

Conflict of interests: None

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METHODS

This cross-sectional study examined 126 preschoolers with ages ranging from 6 months to 6 years, 42 selected from the Anemia Ambulatory of the University Outpatient Clinic of the Universidade de Santo Amaro – UNISA and 84 from the Daycare CEI – Força e Ação, which is covenant with the Education Department of São Paulo (SP), Brazil. The study was approved by the Ethics Committee of the UNISA, under protocol number 097/2008.

All children from both the daycare and the ambulatory were eligible to take part in this study. Parents or legal guardians were provided with information about the voluntary character of participating in this research, as well as its benefits and aftereffects. The free and informed consent term was signed, and parents or legal guardians were also requested to fulfill a questionnaire with subject's identification and socio-demographic data.

Children with history of prematurity, infections or other perinatal intercurrences, cognitive disorders, motor speech disorders, significant emotional impairments or neurological diseases were excluded from the study.

Children who, on the occasion of data collection, presented some manifestation of an acute disease (e.g. fever, vomit, diarrhea) that could potentially affect their hemoglobin levels, or any other transitory exclusion condition, such as fear, fatigue or excessive sleepiness, were also excluded from the study.

Since all the subjects of the present research presented a very similar biological and environmental history, they were studied as a single group of 126 children.

It was used the Denver II Developmental Screening Test, which has the aim to early detect any possible deviation in the global development of children between 0 and 6 years of age. It is not a test for the diagnosis of developmental impairments, but it is used to follow up children's development, whether they are considered at risk or not[6].

The test was administered by a well-trained researcher in rooms individually set for each child, at the daycare or at the ambulatory. However, when necessary, the parent or caregiver was asked to inform whether the child was or was not able to perform the required task.

The Denver II tasks are divided into four groups: personal-social, fine motor-adaptive, language, and gross motor. For the purposes of this study, only the language domain was administered. After the analysis of each item or behavior, the global test were classified as: normal (when there was no developmental delays or up to one caution); at risk (suspicion of delay – when there were two or more cautions and/or more delays), and questionable or not tested (when the child refused to perform the task in one or more items related to age)[6]. Children with questionable and/or not tested results were excluded from the study.

Children's height and weight measures were taken following the World Health Organization (WHO) International Protocol[7]. To weigh the children, we used a Seca® digital weighing scale, with a 150 kg weight capacity. The height of the children up to 2 years of age was measured using Sanny® anthropometers, belt model, with 20 to 105-cm scale and 0.5-cm precision, while the height of the older children was measured using a portable standiometer with maximum length of two meters.

The weight for age reference was the anthropometric indicator used. The nutritional status was assessed by calculating the z scores of the anthropometric indicator for the mean and standard deviations found for the reference population, according to the National Center of Health Statistics (NCHS)[8]. Nutritional status was classified as: overweight and/or obesity (z-score≥+2); eutrophic (z-score>-2 and <+2); and malnutrition (z-score<-2).

Hemoglobin concentration was verified using a HemoCue® portable hemoglobinometer for a direct reading of the blood sample, which was collected by puncturing a finger. For diagnosis of iron-deficiency anemia we adopted the cutoff of 11 g/dL, as suggested by the WHO for the respective age range[9].

Participants were divided into two main groups (children with anemia and children without anemia), which were also subdivided according to age, in order to facilitate data analysis. Hence, the groups were composed of subgroups of children with ages ranging from 6 months to 3 years incomplete and children with ages ranging from 3 years to 6 years complete, who were later compared concerning whether they were at risk for language disorders or not, according to Denver II Test.

For the second analysis, children were rearranged into groups according to their risk for language disorders (risk and no risk), which were compared for the following variables: maternal education (years of study), number of children per family, gender, birth order, presence of anemia and/or malnutrition.

For statistical analysis, the Chi-square test and the Fischer's Exact test were used in order to verify the associations among the studied variables. The significance level adopted was 0.05 or 5%.

RESULTS

According to the Denver II test, 18.3% of the 126 participants of the study were at risk for language disorders, and 9.5% presented anemia, according to the cutoff established by the WHO (Table 1). Although no significant differences were found for the comparisons regarding age, presence of anemia, and risk for language disorders, there was a higher percentage of children at risk for language disorders among the anemic children younger than 3 years.

The comparison between children at risk and not at risk for language disorders is presented in Table 2. No differences were found for the variables gender, nutritional status, and maternal education.

Regarding the variables number of children per family, birth order, and anemia, the results showed that being the eldest children, having less than four brothers and sisters, and presenting anemia were the greatest risk factors for language disorders.

DISCUSSION

In the literature, there is some evidence that anemia is associated to several socioeconomic issues that can, alone,

Table 1. Children with and without anemia, according to age group (AG) and risk for developmental language disorders

Anemia in children between 6 months and 3 years of age	Language	n	%	Statistics
Yes (n=5)	Risk	3	6.1	
	Normal	2	4.1	
No (n=44)	Risk	8	16.3	p=0.0647*
	Normal	36	73.5	
Total		49	100	
Anemia in children between 3.1 and 6 years of age	Language	n	%	Statistics
Yes (n=5)	Risk	1	1.3	
	Normal	4	5.2	
No (n=72)	Risk	11	14.3	p=0.9752*
	Normal	61	79.2	
Total		77	100	
Age group	Language	n	%	Statistics
6 months – 3 years (n=49)	Risk	11	8.7	
	Normal	38	30.2	X^2=0.905
3.1 – 6 years (n=77)	Risk	12	9.5	p=0.3415**
	Normal	65	51.6	
Total		126	100	
Anemia	Age group	n	%	Statistics
Yes (n=10)	6 months – 3 years	5	4.0	
	3.1 – 6 years	5	4.0	X^2=0.5642
No (n=116)	6 months – 3 years	44	34.9	p=0.453**
	3.1 – 6 years	72	57.1	
Total		126	100	

* Fisher's Exact test

** Chi-Square test

Table 2. Children at risk and not at risk for developmental language disorders and the studied variables

Language	Number of children per family		Total		Statistics
	<5 n (%)	≥5 n (%)	n	<5/Total %	
Risk	7 (38.9)	16 (14.8)	23	30.4	
No risk	11 (61.1)	92 (85.2)	103	10.4	p=0.023*#
Total	18	108	126	14.4	
Language	Birth order		Total		Statistics
	<5	≥5	n	<5/Total	
Risk	6 (42.9)	17 (15.2)	23	26.0	
No risk	8 (57.1)	95 (84.8)	103	7.8	p=0.022*#
Total	14	112	126	11.2	
Language	Anemia		Total		Statistics
	Presence	Absence	n	presence/Total	
Risk	4 (40)	19 (16.4)	23	17.3	
No risk	6 (60)	97 (83.6)	103	5.82	p=0.021*#
Total	10	116	126	7.93	
Language	Malnutrition		Total		Statistics
	Presence	Absence	n	presence/Total	
Risk	2 (33.3)	21 (17.5)	23	8.7	
No risk	4 (66.7)	99 (82.5)	103	3.9	p=0.304*
Total	6	120	126	4.8	
Language	Education		Total		Statistics
	≤4 years	>4 years	n	≤4/Total	
Risk	10 (18.5)	13 (18)	23	43.4	
No risk	44 (81.5)	59 (82)	103	43.1	X^2=0.04
Total	54	72	126	43.2	p=0.9469**
Language	Gender		Total		Statistics
	Male	Female	n	male/Total	
Risk	15 (22.7)	8 (13.3)	23	65.2	
No risk	51 (77.3)	52 (86.7)	103	49.5	X^2=2.303
Total	66	60	126	52.4	p=0.1291**

* Fischer's Exact test

** Chi-square test

Significant values (p<0.05)

affect the child's development[10-13]. The incidence of anemia will be as higher as the need of iron in the body. The population groups at greater risk are infants and preschoolers, due to their fast growth[14].

The results of the present study suggest that children younger than 2 years with iron-deficiency anemia are more likely to present delays in language acquisition, when compared to their non-anemic pairs. In many studies, the mere presence of anemia is enough for the manifestation of language delays; however, the more severe the anemia, the greater the neuropsychomotor development deficit. The most affected areas are language and balance[15].

Language has a huge importance in both the organization of conduct and the global development of the child. Concerning the language domain, it is possible to identify the following functions: affective, playful, practical, representative, and dialectic[10].

Studies have suggested that anemia acts reducing brain oxygenation, therefore altering the neurotransmission and myelination processes. Significant differences were observed between anemic and non-anemic children concerning language development, especially on those younger than 24 months[16-18]. In view of the fact that anemia has long-term, hard to reverse consequences, the prevention of iron deficiency becomes even more important[19].

The prevalence of anemia in this study was 9.5%, a lower value than the mean value found in the other regions of São Paulo, as well as in other locations in Brazil. In the language assessment, a higher percentage of anemic children were considered at risk for language disorders, when compared to the children without anemia, although no statistical significance was found, suggesting that the presence of anemia may affect the development process of verbal and/or written expressive and receptive language. The poorer performances were observed among children under 3 years of age (Table 1). These results are explained, among other factors, by these children's neurophysiological immaturity for language acquisition and domain, and by social stimuli that are essential for the development of linguistic patterns[20].

Independently of age range, we found that anemic children presented higher risk for language disorders than non-anemic children. Similar results are reported in literature[16-18].

Another factor that can influence language development is nutritional status. The occurrence of malnutrition in the first months and years of a child's life might have important consequences, such as impairments in cognitive development, evidencing a significant delay in language acquisition. The combination of malnutrition and poor stimulation will possibly lead to greater difficulties in language acquisition and to an increase in the rates of academic failure[12].

In the present study, we did not find significant correlations between nutritional status and risk for language disorders. Nevertheless, the lack of statistically significant correlation does not necessarily imply that these variables are not related to each other.

Literature data are still controversial regarding the influence of gender on language development. Several studies have shown that language development is not influenced by the child's gender, while other studies conducted with preschoolers have suggested that male children are at higher risk for language disorders[3,21]. In the present study, no difference was found between genders concerning the risk for language disorders.

A study carried out in the metropolitan region of São Paulo showed that the higher the maternal level of education, the greater the mother's knowledge about child language development[22,23]. In the present study, there was no association between maternal education and risk for language disorder.

The child's development depends, basically, on two factors: individual characteristics of the child, and environmental characteristics. The interaction between the child's own characteristics and the characteristics of the surrounding environment will be determinant for his/her global development (linguistic, cognitive, emotional). The organic and affective conditions act directly on the individual level, whereas socio-familiar aspects and learning opportunities are the most considered aspects on the environmental level[24,25].

In the present study, significant differences were found regarding number of children per family and birth order. Thus, elder children with less than four siblings were found to be at higher risk for language disorders. Therefore, it is important to provide the children with a favorable and stimulating environment for language development, and not only an environment with a greater number of people.

Besides appropriate nutrition, adequate social and cognitive stimulation are fundamental to children's development. Longitudinal studies have shown that children who received early social and cognitive stimulation present better psychosocial, cognitive and educational abilities in adolescence than those lacking this stimulation[4].

CONCLUSION

The factors associated to language development are centered in nutritional and social aspects. Prospective similar studies are necessary to identify possible risk factors for developmental language disorders and, consequently, for learning disabilities and disorders in the child's future social performance.

The administration of the Denver II Developmental Screening Test facilitates monitoring the possible failures found in children's development, allowing the establishment of intervention programs with the aim to prevent impairments. When the "at risk" result is persistent, the possibility of referring the child to specialized professionals should be considered.

RESUMO

Objetivo: Identificar fatores associados à alteração da linguagem entre variáveis sociais e nutricionais de pré-escolares. **Métodos:** Estudo transversal realizado com 126 crianças com idade entre 6 meses a 6 anos da região sul do município de São Paulo. Utilizou-se o Teste de Triagem de Desenvolvimento de Denver II para detectar risco de linguagem. O resultado do teste foi comparado com as seguintes variáveis: idade, gênero, escolaridade da mãe, estado nutricional da criança, número e ordem de nascimento dos filhos e anemia. Os resultados receberam análise estatística. **Resultados:** Segundo o teste de Denver II, dos 126 sujeitos da pesquisa 18,3% apresentaram risco para linguagem e 9,5% anemia. Não houve diferença entre os grupos risco e não risco para as variáveis idade, estado nutricional, escolaridade da mãe e gênero. Para as variáveis número de filhos, ordem de nascimento e presença de anemia, ao contrário, houve diferença entre os grupos risco e não risco. **Conclusão:** O maior risco para aquisição e desenvolvimento de linguagem centrou-se no grupo de anêmicos, filhos mais velhos e com menos de quatro irmãos. Estudos semelhantes são fundamentais para detectar possíveis alterações no desenvolvimento da linguagem e, consequentemente, na aprendizagem e futuro desempenho social da criança.

Descritores: Anemia; Estado nutricional; Linguagem; Criança; Fatores de risco

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