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Prevalence of speech disorders in schoolchildren and its associated factors

ABSTRACT

OBJECTIVE: To assess prevalence of speech disorders in schoolchildren and its associated factors.

METHODS: Cross-sectional study comprising a random sample of 1,810 schoolchildren attending the first grade in public schools in a city of Southern Brazil, in 2001. Schoolchildren aged between five and 11 years were evaluated using a previously validated speech screening test for phonetic and/or phonologic disorders. Data on school failure, gender, age and maternal and paternal schooling were collected to test associations. Associations between variables were analyzed using the Chi-square test.

RESULTS: The prevalence of speech disorders in the children studied was 24.6% and they were more prevalent in younger children aged five and six compared to children aged ten or more. Speech disorders prevalence around five years old was 57% and between eight and ten years old was 42%. Speech disorders frequency was similar in both sexes. The prevalence of disorders was associated to maternal and paternal schooling, 79.5% and 78.6%, respectively, when parents had less than one year of study.

CONCLUSIONS: The prevalence of speech disorders among schoolchildren studied was higher than that described in the literature. Parental schooling was a major factor associated to these disorders.

KEY WORDS: Child. Speech disorders, epidemiology. Risk factors. Socioeconomic factors. Cross-sectional studies.

INTRODUCTION

There is a pattern of human verbal communication development that is modified according to people's linguistic skills and speech acquisition in all different languages. However, some people will have deviations or abnormalities in their verbal communication development due to several factors, either isolated or combined.

One should bear in mind that human communication has many other dimensions than the biological one. They comprise a complex system involving body expression, writing, and verbal communication.

The assessment of communication disorders impacts of may have on individuals and their family is complex. But clinical experience has shown these conditions affect individuals' interactions with their surroundings and self-image as well as their formal and informal learning abilities.

In a globalized world, information flows in many ways and human interrelationship has become increasingly complex. Effective communication is a key

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determinant for collective health promotion and maintenance. Besides, fast and effective communication has been more and more demanded.

Numerous studies pointed out social inadequacies increase vulnerability to the development of specific health conditions and directly affect school performance of children and adolescents. School is a conducive environment for health promotion and education actions.¹⁹

In regard to verbal communication, the focus of the present study, it could be translated into adequate speech intelligibility. Also, the premise that, in the age of globalization, verbal communication disorders can have an effect on individuals' social inclusion and ascent is concerning.

Some predisposing factors for speech disorders can be preventable.^{3,6,20,21} Thus, thorough knowledge on the development of these disorders and their associated factors is needed to enable the implementation of effective prevention actions or to minimize comorbidities associated to phonetic and/or phonological deviations. Furthermore, population-based epidemiological surveys investigating human communication and its disorders are scarce in the literature, especially in Brazil.

Based on modern health concepts and health promotion, the knowledge of factors associated to phonetic and/or phonological deviations identified in a representative sample of children can also provide insight for the development of public policies for schoolchildren health care.

The objective of the present study was to assess developmental speech disorders in schoolchildren and their associated factors.

METHODS

The study was carried out in the municipality of Canoas, State of Rio Grande do Sul, Southern Brazil, comprising 4,950 children who attended local public schools in 2001. Of first graders of elementary school, 53.5% were males, a proportion similar to the study sample.

A simple random cluster sampling approach was applied where clusters were 161 first-grade classes of 39 local regular schools. A total of 2,245 children were drawn.

Inclusion criteria were: parents' authorization and child's willingness to participate in the study as well as child's attendance at school on the date of data collection. Exclusion criteria were: mental disability, severe hearing and/or visual impairment, and psychiatric disorders.

All subjects went through the Screening Test for Speech Articulation Disorders (TERDAF),² which was previously validated for the study Brazilian schoolchildren.

This is a validated Brazilian test comprising 20 pictures that represent all Brazilian Portuguese phones (speech sounds) and requires children to voice the test picture's name. Data are transcribed in an assessment form and answers are rated as "correct," "inadequate," or "did not identify the picture".

Data on age, gender, and parental schooling were also collected from school records at each school registrar's office. They were analyzed using EpiInfo program, version 3.3.2. Statistical analysis of variable frequency and distribution in the population studied and measures of association included chi-square test and prevalence rates and their 95% confidence intervals.

The study followed the National Health Council Resolution 196/96 guidelines and was reviewed and approved by a Research Ethics Committee.

RESULTS

Of 2,245 children drawn in the sampling, 218 were lost (9.7%). Among 2,027 children assessed through TERDAF, 217 (10.7%) did not show any detectable speech abnormality but were not able to identify some pictures showed to them in the test and were classified as "non-respondents". The study sample comprised 1,810 schoolchildren aged between 5 and 12 years, of which 980 (54.1%) were males.

Of all children assessed, 1,167 had abnormal speech, a prevalence of 64.5% (95% CI: 62.2;66.7). Among them, 721 (61.8%) exclusively had abnormal speech articulation following social and cultural patterns (e.g., "fósfo," "fósfro," "frósfo," "frósfuo" or "frósfí," ins-

Table 1. Age distribution of cases with speech disorders. Canoas, Southern Brazil, 2001.

Age	Sample N	Positive TERDAF* N	PR (95% CI) %
≤5 years	7	4	57.1 1.5 (0.8;2.9)
6 years	503	191	38.0 1.0
7 years	862	333	38.6 1.0 (0.9;1.2)
8 years	262	109	41.6 1.1 (0.9;1.3)
9 years	96	40	41.7 1.1 (0.8;1.4)
≥10 years	64	28	43.8 1.2 (0.9;1.6)
Unknown**	16	-	-
Total	1,810	705	-

TERDAF: Screening Test for Speech Articulation Disorders

* Excluded cases with sociolinguistic variations

** Unknown age for 16 subjects (0.8%) in the sample studied

tead of “fósforo” [in Portuguese, match]) but they were not considered disorders. The remaining 446 positive results were considered children with speech disorders. The prevalence of phonetic and/or phonological deviations was 24.6% in the sample studied.

The relationship between age and abnormal speech was assessed through prevalence rates and their 95% confidence intervals, as shown in Table 1. The highest prevalence was found among children ≤ 5 years (PR=1.5; 95% CI 0.8;2.9) and the lowest rates were seen in those aged seven (PR=1.0; 95% CI 0.9;1.2).

Among subjects screened for speech disorders, the corrected TERDAF (after excluding sociolinguistic variations) was positive in 405 (41.3%) boys and 319 (38.4%) girls, as shown in Table 2.

When abnormal speech was associated with gender, it was found a ratio of 1.08 boys for each girl (95% CI 1.00;1.15) with abnormal speech detected.

In the study sample, mean paternal schooling (N=1,239) was 6.65 years (SD=3.26) and mean maternal schooling (N=1,401) was 6.52 years (SD=3.09). There was seen an inversely proportional relation between paternal schooling and abnormal speech in children (Table 3) with a linear association of 26.9 ($p=0.03$). The same was seen for maternal schooling, with a linear association of 28.7 ($p=0.02$) (Table 4).

DISCUSSION

A quick easy-to-use screening test should be used for surveying relatively large populations with no complaints. However, this tool needs to be validated for the population to be studied, as in the present study.²

Thus, in the present study, a representative sample of first-grade children from local public elementary schools provided knowledge on the associations between speech disorders and family background, such as parental schooling.

The 24.6% prevalence of speech disorders estimated for this population corroborates other study.¹⁴

Yet a number of population-based studies in schoolchildren reported lower prevalences of speech disorders, ranging between 3.8% and 7.5%.¹⁶⁻¹⁸

Considering that phonological processes are innate and universal, the early development of phonological systems is similar for all children. Hence, the analysis of prevalence of phonetic and/or phonological deviations can include a comparison of studies conducted in different language speakers.^{5,11} Nevertheless, studies with Brazilian Portuguese speakers or those conducted in the United States and Argentine show inconsistent

Table 2. Schoolchildren distribution according to TERDAF results by sex. Canoas, Southern Brazil, 2001.

TERDAF	Male		Female		Total	
	N	%	N	%	N	%
Abnormal*	405	41.3	319	38.4	724	40
Normal	575	58.7	511	61.6	1,086	60
Total	980	100.0	830	100.0	1810	100.0

* Excluded cases with sociolinguistic variations.

Table 3. Relationship between paternal schooling and speech disorders in schoolchildren studied. Canoas, Southern Brazil, 2001.

Paternal schooling (full years)	N	TERDAF +		TERDAF -	
		N	%	N	%
0	44	9	20.4	35	75.0
1-4 years	255	88	34.5	167	65.4
5-8 years	682	269	39.4	413	60.6
9-11 years	229	94	41.0	135	58.9
12 years or +	29	16	55.1	13	44.8
Total*	1,239	476	38.4	763	61.6

* Excluded 571 fathers due to missing data.

Table 4. Relationship between maternal schooling and speech disorders in schoolchildren studied. Canoas, Southern Brazil, 2001.

Maternal schooling (full years)	N	TERDAF +		TERDAF -	
		N	%	N	%
0	28	6	21.4	22	78.6
1-4 years	318	114	35.8	204	64.2
5-8 years	793	290	36.6	503	63.4
9-11 years	231	108	46.8	123	53.2
12 years or +	31	17	54.8	14	45.2
Total*	1,401	535	38.1	866	61.8

* Excluded 409 mothers due to missing data.

results on the prevalence of speech disorders in children. Such differences can be attributable to different classification criteria and/or diagnostic approaches for speech disorders and phonetic-phonological deviations and different sample selection as well.^{15,18}

Children under five are more likely to have speech disorders than those over eight. When organic factors are ruled out, these disorders can be caused by many factors such as maturation of metalinguistic abilities.¹⁶

Most children easily perform linguistically conscious functions and, around the age of five, they are already able to produce language sounds effectively following

proper sequences. However, some children have great difficulty in acquiring the language sound system.¹²

In the present study, all children under five showed positive results in the TERDAF indicating abnormal speech but this could be explained by the fact they are in the final stage of phonological acquisition.^{4,10} There is a consensus that linguistic consciousness is achieved through biological child development and maturation resulting from a continuous exchange process with their environment or background. Children undergo an ongoing process of knowledge acquisition characterized by increasingly complex management, and processing.

The prevalence of speech disorders was similar in all ages of elementary first-graders studied and a significantly increased prevalence was found among those over ten years of age (Table 1). This finding could be attributable to sample selection criteria (first-grade children of elementary school) so older children with abnormal speech could have other learning difficulties and impaired mastery of oral and/or written language. But further studies are needed to provide stronger evidence on this association.

Cohort studies showed untreated phonological deviations can be traced and detected during adolescence and adult life.^{6,7} Early diagnosis of these deviations is essential for providing specialized treatment and reducing comorbidities.^{17,18,20,21}

The ratio of positive TERDAF results between boys and girls was around 1:1, which corroborates other study findings.^{6,14,17} However, population-based studies and studies with representative samples of school-age

children reported speech delays, phono-articulation disorders and other similar conditions are approximately 1.5 times more prevailing in boys than girls.^{3,17} Other studies^{4,22} investigating patients attending outpatient speech therapy services reported most children with phonological disorders were boys aged between five and seven years.

Language acquisition and development in boys and girls seem different especially because they have different upbringings and interactions with their environment.⁵ These findings corroborate theories of multicausality proposed in collective health studies where the environment is a determinant of health conditions.

While some authors claim language development is a hereditary process, others argue it is associated to the linguistic patterns children are exposed to.^{5,11} Deprived life conditions many Brazilian families live in favor poorly constructive and inadequately stimulating environments for child development.¹⁴ Soares et al¹⁴ have also concluded family environment favors the development of learning, organization, and life experience structuring abilities. Motivational factors exert an effect on cognitive development as well.

Population-based research can provide input for the analysis and comparison of other factors potentially affecting the association between school performance and verbal communication disorders in children.

In conclusion, the use of more consistent terminology to designate communication disorders would be valuable, in Brazil, to improve diagnostic accuracy and would allow comparisons between data from different Brazilian regions.

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