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Original Article

Vocabulary Size in Very Preterm and Extremely Preterm Infants: A Cross-Sectional Study

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ABSTRACT

Research shows that a significant number of children born preterm (before 37 weeks of gestation) have developmental difficulties, among them disturbances in language development. Studies indicate that some biomedical complications such as intraventricular hemorrhage (grades III and IV), periventricular leukomalacia, and bronchopulmonary dysplasia increase the probability of cognitive and/or language development disorders. Therefore, there is a need to conduct more studies that provide information that allows anticipating possible consequences in the learning process of children born prematurely. The aims of this study were to measure the early vocabulary size in very preterm and extremely preterm children (with and without biomedical complications) at 24 months of corrected age and to determine the association between the number of biomedical complications and vocabulary size. To that effect, we worked with 108 children divided into three groups: 39 high-risk preterm children (with biomedical complications), 36 low-risk preterm children (without biomedical complications associated with language and/or cognitive disturbances), and 33 full-term children. All children were evaluated using the MacArthur-Bates Communicative Development Inventory II. The results show that the vocabulary size of full-term children is significantly larger than that of preterm children and that no differences exist between the group of high-risk versus low-risk preterm children. On the other hand, vocabulary size does not correlate with biomedical complications.

Keywords:
Preterm; Lexical Development; Intraventricular Hemorrhage; Bronchopulmonary Dysplasia; Periventricular Leukomalacia

Tamaño del léxico en niños(as) muy prematuros y prematuros extremos de 24 meses: un estudio transversal

RESUMEN

Las investigaciones muestran que un número importante de niños nacidos prematuros (antes de las 37 semanas de gestación) presentan dificultades en su desarrollo, entre ellas el desarrollo lingüístico. Las investigaciones previas indican que algunas complicaciones biomédicas, como la hemorragia intraventricular (los grados III y IV), la leucomalacia periventricular y la displasia broncopulmonar, incrementan la probabilidad de presentar alteraciones en el desarrollo de la cognición y/o del lenguaje, por lo que se hace necesario realizar investigaciones que proporcionen más información y con ello poder anticiparse a posibles consecuencias en los aprendizajes futuros de estos niños nacidos bajo la condición de prematuridad. Es así, que los objetivos de este estudio fueron medir el tamaño del léxico temprano en niños muy prematuros y prematuros extremos (con y sin complicaciones biomédicas) a los 24 meses de edad corregida, así como también determinar la asociación entre número de complicaciones biomédicas presentes y el tamaño del léxico. Para ello, se trabajó con 108 niños divididos en tres grupos: 39 niños prematuros de alto riesgo (con complicaciones biomédicas), 36 niños prematuros de bajo riesgo (sin complicaciones biomédicas asociadas a alteraciones del lenguaje y /o cognición) y 33 niños nacidos de término. Todos fueron evaluados con el Inventario II de Desarrollo de Habilidades Comunicativas MacArthur-Bates. Los resultados muestran que los niños nacidos de término tienen significativamente mayor tamaño del léxico que los prematuros, no existiendo diferencias en los resultados entre prematuros de bajo riesgo y los prematuros de alto riesgo. Por otra parte, el tamaño del léxico no presenta correlación con las complicaciones biomédicas.

Palabras clave:
Prematuros; Tamaño del Léxico; Hemorragia Intraventricular; Displasia Broncopulmonar; Leucomalacia Periventricular

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INTRODUCTION

Prematurity is defined by the World Health Organization (WHO) as birth occurring before 37 weeks of gestation (Howson et al., 2013). Based on gestational age, preterm infants can be subcategorized into; a) extremely preterm (born before 28 weeks of gestation), b) very preterm (born between weeks 28 and 31), c) moderately preterm (born between weeks 32 and 33), and d) late preterm (born between weeks 34 and 36) (Blencowe et al., 2013). In Chile, 7.1% of newborns are preterm, making it one of the 20 countries with the highest number of preterm births in Latin America (Mendoza Tascón et al., 2016).

Among the population of children born very preterm, extremely preterm, and with low birth weight, we can find a group that exhibits evident damage which is diagnosed through medical examinations and procedures, thus being considered high-risk and, therefore, being susceptible to a developmental delay. On the other hand, those who present few associated pathologies are considered low-risk (Ribeiro et al., 2017).

Concerning language development, the evidence suggests that preterm children are at greater risk of showing signs of difficulties in this area than full-term children. In this regard, previous findings indicate that infants born with fewer weeks of gestation (especially very preterm and extremely preterm children) and weighing less than 1700 grams at birth, who are evaluated between 24 and 30 months of corrected age, obtain the lowest scores in assessments, which means there is a delay in language development (Fasolo et al., 2010; Foster-Cohen et al., 2007; Gayraud & Kern, 2007; Jansson-Verkasalo et al., 2004).

Evidence shows that language difficulties arise and can be detected early and that they tend to be persistent over time (Aylward, 2002; Jansson-Verkasalo et al., 2004). In this regard, a study carried out on a population of very preterm children (born under 32 weeks of gestation) with extremely low birth weight (under 1500 grams) showed a delay in receptive and expressive language, ranging from mild to severe, at 30 months of age (Adams-Chapman et al., 2015). On the other hand, research carried out in Chile found that, within the population of very preterm and extremely preterm children, 77.3% of the sample had difficulties with expressive-receptive language that persisted throughout the preschool stage (Maggiolo et al., 2014).

Regarding vocabulary development, specifically expressive vocabulary, significant differences can be observed when comparing preterm and full-term children. Particularly, both the rate of acquisition and development are slower in preterm infants than in full-term infants (Foster-Cohen et al., 2007; Gayraud & Kern, 2007). This has been associated with a lack of precursors during the prelexical stage and difficulties paying attention to, processing, and categorizing complex information. This deficit becomes more apparent around 18 months of corrected age (Bosch et al., 2011). Marston et al. (2007) found that preterm infants produced an average of 42 words at age 2 (compared to the 214 words that are expected at age 2 by a typically developing child in the 50th percentile, according to the Mac Arthur-Bates CDI II norms). Moreover, it has been observed that preterm children between 24 and 41 months of age have a simpler vocabulary, using a greater number of nouns than functional words when compared with their full-term peers (Bróssch-Fohraheim et al., 2019; Capobianco & Cerniglia, 2017; Charkaluk et al., 2019; Stolt et al., 2009). At the grammar level, preterm children tend to utter shorter sentences than their full-term peers, thus showing an early delay (Kunnari et al., 2012). It should be noted that, although vocabulary difficulties emerge at early stages, they persist throughout the school stage. For instance, a lexical production deficit has been observed among schoolers who were born preterm. In addition, disturbances in grammar comprehension and phonemic synthesis can be found (Guarini et al., 2010).

With respect to biomedical complications, the literature shows that risk factors such as intraventricular hemorrhage (IVH), bronchopulmonary dysplasia (BPD), maternal age under 18 years, a birth weight lower than 1000 grams, and prolonged hospitalization (15-30 days minimum) are linked to greater difficulties in language development (Stipdonk et al., 2020). Furthermore, it is known that the biomedical complications that significantly impact the cognitive and linguistic development of very preterm and extremely preterm infants are intraventricular hemorrhage grades III and IV, bronchopulmonary dysplasia, and/or periventricular leukomalacia (PVL) (Anderson & Doyle, 2006; Bendersky & Lewis, 1990; Landry et al., 1993; Luu et al., 2009; Reidy et al., 2013; Resić et al., 2008).

IVH is the presence of bleeding in the germinal matrix and periventricular regions of the brain (Ayala Mendoza et al., 2005). Very preterm and extremely preterm infants with IVH grade III or IV, periventricular leukomalacia, or mild to moderate ventriculomegaly (which are considered severe brain injuries) are at greater risk for impaired vocabulary development, particularly when raised within socioeconomically disadvantaged contexts (Luu et al., 2009). Moreover, it has been observed that language difficulties increase the higher the grade of IVH, rising from 25% in grade I to 78% in grade IV (Fernández-Carrocera & González-Mora, 2004). Since grade II or IV IVH is a risk factor for delayed language development, early care becomes necessary for children

who display these biological risks (Bendersky & Lewis, 1990; Janowsky & Nass, 1987).

BPD, on the other hand, is the most common chronic lung disease, provoking high respiratory morbidity in the first 2 to 3 years of life of preterm infants (Pérez & Navarro, 2010). Lewis et al. (2002) carried out a prospective follow-up in two groups of preterm infants with very low birth weight, with and without BPD. When evaluated at 8 years of age, the group of children with BPD obtained the lowest scores, showing a significant difference in speech, motor skills, and receptive language development when compared with the group of children without BPD. In a similar study, when assessing preterm infants with a very low birth weight with and without BPD, the authors found that the children with BPD were at a higher risk of delayed receptive language development due to a general decrease in intelligence. In this regard, the authors noted that other biomedical complications and sociodemographic factors should be considered since these represent additional risks for language disorders (Singer et al., 2001).

PVL is a hypoxic ischemic lesion of the white matter, resulting from an infarction in the periventricular regions of the brain (Mulas et al., 2000). The study by Reidy et al. (2013) found that very preterm and/or low birth weight children who were born with PVL exhibited difficulties in language development. The results of the evaluations showed that linguistic abilities such as speech and contextual language comprehension, except for pragmatics (which was not significantly correlated) were decreased in the preterm group compared to the group of full-term children (born after 37 weeks of gestation). The authors consider that the presence of PVL as a biological variable, as well as some environmental factors, can impair language development. It is crucial to clarify that not all preterm infants with PVL obtain the same results in motor skills, hearing, or linguistic evaluations (Avecilla-Ramírez et al., 2011).

Given what has been exposed above, and to contribute to the understanding of how biomedical complications (BPD, PVL, and IVH) could impact the development of vocabulary, the objectives of this research are to measure the vocabulary size in a population of Spanish-speaking very preterm and extremely preterm infants born in Chile, who present biomedical complications or not, as well as to determine the association between the number of biomedical complications and vocabulary size.

METHOD

Design

This was a cross-sectional, non-experimental, descriptive-comparative, ex post facto study.

It was approved by the Ethics Committee for Research in Human Beings of the Faculty of Medicine of Universidad de Chile (project N°071-2019, record N°058. Exempt resolution N°1026, authorizing research in clinical centers).

Participants

A total of 108 children from Santiago, Chile, participated in the study. The participants were divided into three groups: A group of 33 full-term infants (18 girls and 15 boys), a group of 36 preterm infants who were low-risk or did not present serious biomedical complications (20 girls and 16 boys), and 39 preterm infants who were high-risk or had serious biomedical complications that can cause disturbances in cognitive and/or language development (19 girls and 20 boys). The preterm infants were selected from two polyclinics where preterm follow-ups are carried out, and the full-term infants were from a preschool in the city of Santiago. It should be noted that only very preterm and extremely preterm infants (born under 32 weeks of gestation and/or weighing less than 1500 grams at birth) are cared for in the follow-up polyclinics. All children were evaluated at 24 months of chronological age (in the case of full-term children) and corrected age (preterm children).

The type of sampling performed in this research was non-probabilistic. The inclusion criteria for preterm infants were the following: Spanish-speaking children, born before 32 weeks of gestation, belonging to two polyclinics that monitor preterm infants in the city of Santiago, Chile. In the case of the low-risk preterm infants, the inclusion criterion was not to present serious biomedical complications (neither neurological nor respiratory). On the other hand, for the group of high-risk preterm infants, the clinical record had to include one or more of the biomedical complications that the literature associates with language and/or cognitive disturbances (IVH grades III and IV, BPD, PVL). It should be noted that these children presented additional biomedical complications related to other systems (endocrine and renal, among others) for which they required monitoring for several years.

The inclusion criteria for the group of full-term children were: Spanish-speaking children, born between weeks 37 and 40 of gestation, without a history of prolonged hospitalization (more

than 30 days) during their first year of life, nor presenting any biomedical complication.

The exclusion criteria for all the children participating in this study were: having any diagnosed neurological, sensory, or metabolic pathology, or genetic diseases, and whose native language was any other than Spanish.

All the children included in this study (full-term, as well as high- and low-risk preterm infants) had been previously evaluated and were included in a database created using Excel. This database contained information extracted from clinical and school records, as well as sociodemographic data of the children's families. When analyzing these data, no significant differences were observed between the 3 groups (chi-square test p-value > 0.05 for the variables 'educational level of the mother' and 'socioeconomic level of the family').

Instruments

All children participating in this study were assessed at 24 months of chronological (full-term) and corrected (preterm) age, using the vocabulary subtest of the MacArthur-Bates Communicative Development Inventory II (CDI II, for children aged 16 to 30 months of age) created by Fenson et al. (1994) and adapted to Mexican Spanish by Jackson-Maldonado et al. (2003). This parent-report instrument assesses both grammatical aspects (average sentence length and sentence complexity) as well as early vocabulary. The subtest applied to determine the vocabulary size consists of a list of 680 words in which the parents must indicate those that the child can produce.

The words are grouped into 23 items or word classes. Among the content words classes, there are nouns (animals, vehicles, people) and verbs (jump, run). Function words can also be found, such as pronouns (she, this), prepositions (in, with), and articles (one, the). According to MacArthur-Bates CDI II, the number of words expected for children aged 2 (Mexican Spanish speakers) who are in the 50th percentile is 214 words (Jackson-Maldonado et al., 2003).

Additionally, a structured interview was conducted with all the children's mothers and/or caregivers. This interview, adapted from the original version in Galician (Pérez-Pereira et al., 2013), inquires into the medical history of both parents, the history of the pregnancy and delivery, socioeconomic indicators of the family, and the child's medical history.

Procedures

The group selection and instrument application for both preterm and full-term infants were carried out as follows: First, the participant selection was completed. For the preterm group, subject data were identified, recorded, and collected from the two previously selected clinical centers. Both centers perform follow-ups of the preterm population in the city of Santiago, Chile. For the control or full-term group, the search for candidates was carried out by reviewing the enrollment records of a preschool in the northern area of Santiago. This information was then used to select the sample. Subsequently, between the years 2019 and 2020, the evaluation instruments were applied. These instruments (informed consent, the interview prepared for this research, and the evaluation instrument) were applied in person during the second semester of 2019. Starting in 2020 and due to the global COVID-19 pandemic, it became necessary to apply these instruments remotely. Once the caregivers (mother or father) received these documents, they were contacted via video call, during which they completed the instrument previously received and reviewed via mail, and the interview was carried out. It is important to mention that while the remote evaluations were completed, most of the children were not attending preschool (64.46% of preterm and control infants) or their treatments in health centers (72.89% of preterm infants).

Data Analysis

The statistical analysis was performed using the R (R Core Team, 2021) and SPSS (IBM Corp., 2017) softwares. Figure 1 was generated using GraphPad Prism (GraphPad, 2018).

First, the coded data of the biomedical histories extracted from the epicrises were analyzed descriptively. Subsequently, an inferential analysis was carried out using the size of the vocabulary (number of words or early vocabulary produced by the child, obtained from the application of the instrument) and the presence of the three selected biomedical complications. In order to determine whether there was a difference in vocabulary size according to risk classification (between the full-term, high-risk preterm, and low-risk preterm groups), a one-way ANOVA was applied. Additionally, a one-way ANOVA was used to establish the differences in vocabulary size between the groups of preterm infants when associated with the number of biomedical complications (IVH, PVL, and BPD). After applying the ANOVA models, and where significant differences were detected, a post hoc analysis was carried out by comparing the means for each model, using paired t-tests with a Bonferroni correction. Finally, the non-parametric Spearman correlation measure was applied to

determine the strength and direction of the association between the number of biomedical complications found in preterm infants and their vocabulary size. An alpha level of .05 was adopted.

RESULTS

The results corresponding to the descriptive analysis of the biomedical complications found in the high-risk preterm group are presented first. Next, the comparison of vocabulary size between groups according to risk classification (full-term infants, low-risk preterm infants, and high-risk preterm infants) can be found. Lastly, we present the vocabulary size differences according to the number of biomedical complications.

The average gestation time for full-term children in this study was 38.96 weeks, with an average birth weight of 3.402 grams. In the preterm groups, the average gestation time was 29.3 weeks and the average birth weight was 1.365 grams. High-risk preterm infants presented one or more biomedical complications (IVH grades II, III, PVL, and/or BPD) (see Table 1). The descriptive analysis of the dependent variable 'vocabulary size' for the different groups is shown in Table 2.

Table 1. Presence of Biomedical Complications in the High-Risk Preterm Children sample.

Biomedical Complications (IVH, BPD, PVL)	No. of Complications
Children with three complications	11 children with IVH+PVL+BPD
Children with two complications	21 children 9 BPD + PVL 5 BPD + IVH 7 PVL + IVH
Children with one complication	7 children 4 children with BPD 1 child with IVH III 2 children with PVL

IVH= Intraventricular Hemorrhage (grades I and II); PVL= Periventricular Leukomalacy; BPD= Bronchopulmonary Dysplasia.

Table 2. Descriptive analysis of Vocabulary Size according to Risk Classification.

	Group 1	Group 2	Group 3
N = 108	33	36	39
Mean	226.97	82.78[a]	70.64
Standard Deviation	167.502[b]	68.341	68.120[b]

Group 1: Full-term children; Group 2: Low-risk preterm children; Group 3: High-risk preterm children.
Note: Number of words expected at 2 years of age in the 50th percentile (Mac Arthur -Bates CDI II) = 214 words.

A significant difference was found between groups when comparing the mean vocabulary size ($F(2;105) = 22.137$, $p < 0.001$, $\eta 2 = 0.414$). Post hoc analysis using t-tests with Bonferroni correction showed there is a significant difference in vocabulary size between the full-term infants (Group 1) and the low-risk preterm infants (Group 2) groups ($t = 4.6062$ $p< 0.001$), as well as between the group of full-term infants (Group 1) and the group of high-risk preterm infants (Group 3) ($t = 5.0215$, $p< 0.001$). No significant differences were found between the high- and low-risk groups of preterm infants. In other words, both preterm groups have similar vocabulary sizes. Table 3 shows the vocabulary size comparison between the groups and the post-hoc analysis used to determine the differences between groups.

Table 3. Post hoc analysis for the comparison of means between different risk classifications regarding vocabulary size.

Risk Classification	Group with which it is compared	Difference between means	Standard Error	P-value	CI at 95% Lower Limit	CI at 95% Upper Limit
Group 1	2	144.193	26.165	< .001***	80.53	207.85
	3	156.329	25.679	< .001***	93.85	218.80
Group 2	1	-144.192	26.165	< .001***	-207.85	-80.53
	3	12.137	25.093	1.000	-48.91	73.19
Group 3	1	-156.329	25.679	< .001***	-218.80	-93.85
	2	-12.137	25.093	1.000	-73.19	48.91

Group 1: Full-term children; Group 2: Low-risk preterm children; Group 3: High-risk preterm children.
***: $p < 0.001$

Subsequently, the vocabulary size was compared according to the number of biomedical complications (0, 1, 2, or 3 complications) found in preterm infants in the high-risk and low-risk groups. A one-factor ANOVA was used to determine the presence of differences in vocabulary size according to the number of biomedical complications, with no significant differences being found ($F(3;71) = 0.716$, $\eta 2 = 0.029$, $p = 0.546$) (Table 4).

Table 4. Descriptive analysis of the number of biomedical complications in relation to vocabulary size, only in the group of preterm children (high- and low-risk).

No. of Biomedical Complications	No. of Participants	Vocabulary size: Mean	Vocabulary Size: Standard Deviation
0	36	82.78	68.341
1	7	95.86	85.927
2	21	70.67	68.627
3	11	54.55	55.262
Total	75	76.47	68.038

Note: The number of words expected at 2 years of age in the 50th percentile (Mac Arthur -Bates CDI II) = 214 words.

Finally, the possible association between the cumulative number of biomedical complications in an individual and their vocabulary size was analyzed. To determine the direction and strength of this association, a Spearman correlation test was performed. The analysis shows that there is no significant correlation ($p > 0.05$) between vocabulary size and the number of biomedical complications. In other words, biomedical complications (IVH, PVL, and BPD) were not significant predictors of vocabulary size in this study. Figure 1 shows a visual representation of the relationship between the number of biomedical complications and the average vocabulary size.

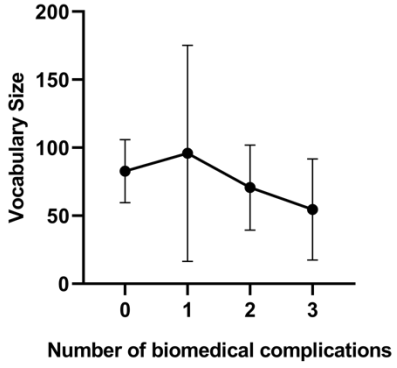

Figure 1. Relationship between the number of biomedical complications (IVH, PVL, and BPD) and vocabulary size.
Note: The data represent a mean ± confidence interval at 95%. Results of the Spearman correlation: r: -0.1610; CI at 95%: [-0.3802, -0.07523]; p = 0.1675

DISCUSSION

The main objective of this study was to compare the vocabulary size in three groups of Spanish-speaking children born in Chile: (1) 2-year-old children born full-term, (2) 2-year-old (corrected age) children who were born very preterm and extremely preterm, and who did not have serious biomedical complications usually associated with cognitive and/or language development disturbances, and (3) 2-year old (corrected age) very preterm and extremely preterm children with biomedical complications. The second objective was to determine the existence of a relationship between the number of biomedical complications and vocabulary size.

The results show that there are significant differences between the vocabulary size of children born full-term and the groups of children born preterm. That is, children born before 32 weeks of gestation produce fewer words at 2 years of corrected age than their full-term peers at the same age. These results confirm previous evidence showing differences in vocabulary size between full-term and preterm infants at 24 months of corrected age (Foster-Cohen et al., 2007; Gayraud & Kern, 2007; Jansson-Verkasalo et al., 2004; Vohr et al., 1988). They are also in line with the results of Sansavini et al. (2011), showing that 2-year-old preterm children (without overt brain injuries) presented lower lexical and grammatical skills, that is, a lower number of produced words, as well as a lack of word combination at 2 years of corrected age, compared with full-term infants. It should be noted that these differences have also been observed before 24 months of age. A review by Jiménez Benítez (2019) shows evidence of disturbances in pre-linguistic development and slower development of vocabulary in preterm children from their first year of life.

It is noteworthy that no difference was found in vocabulary size when comparing the high-risk and low-risk groups of preterm infants, despite the biomedical complications present in the high-risk group. This contradicts what has been observed in previous studies (Luu et al., 2009; Singer et al., 2001; Vohr, 2016; Wolke et al., 2008). This could indicate that prematurity has a greater impact on early language development than the presence of biomedical complications. On the other hand, it could be possible that preterm infants have improved health conditions after hospital discharge, which would allow for better neurocognitive development despite the biomedical complications they experience at birth. This could be explained by advances in perinatal medicine, the creation of neonatal intensive care units, the introduction and development of mechanical ventilation, and the incorporation of non-invasive monitoring techniques to reduce the effects of biomedical complications (Hübner & Ramírez, 2002). In this regard, in the past few decades, research has shown the impact of using prenatal corticosteroids to accelerate lung maturation, as well as the introduction of exogenous surfactant as one of the factors that have increased the survival rate of preterm infants (Hübner & Ramírez, 2002). Furthermore, measures that could impact neurodevelopment such as prolonged respiratory support (mechanical ventilation) have been restricted, thus reducing the risk of BPD, possible neurodevelopmental disorders, or even child death (Vliegenthart et al., 2017). For its part, intraventricular hemorrhage can currently be prevented thanks to the development of protection protocols and strategies (Bauer et al., 2020). Thus, advances in neonatal intensive care not only increase survival but could also have a positive effect on the neurological conditions of preterm infants (GuangXi Cooperative Research Group for Extremely Preterm Infants et al., 2019), reducing the probability of morbidities that impact neurological development (Martínez-Lemus, 2018).

We should also highlight that the preterm infants included in the sample were born in two highly complex hospitals in Santiago, Chile, which have clinical practice guidelines for neonatology that clearly indicate which types of care are to be provided for development, as well as prevention protocols and strategies that provide action plans involving not only the preterm and very low birth weight children but also their families (Mühlhausen & González, 2022; Salvo et al., 2022). This is why the results of this study could suggest that the cognitive development of preterm newborns is also related to the care given to them after birth (Als et al., 2004), which includes the family, health professionals, and health and rehabilitation centers (GuangXi Cooperative Research Group for Extremely Preterm Infants et al., 2019). Nonetheless, further research is needed to confirm this possibility.

A third possible explanation for the similar vocabulary size found in this study between preterm children with and without biomedical disorders could be the influence of social and environmental variables. In this regard, several authors have asserted that speech and language disturbances in preterm infants are not only the consequence of severe biomedical complications, but also of social, environmental, and psychological aspects, and of prematurity itself, which is considered a risk factor for linguistic and cognitive development issues, especially in those born before 32 weeks of gestation (Belgin et al., 2017; Bosch et al., 2019; Lean et al., 2018; Pérez-Pereira, 2021; Woodward et al., 2009). Furthermore, it is suggested that immaturity and biomedical complications would have a greater impact on development during the first year of life, with their predictive value being reduced after this period. Accordingly, it is stated that from then on, factors related to family and social environment acquire greater relevance (Miceli et al., 2000). Once again, we believe that further research involving social and family factors is necessary to determine the influence of each of these variables on the linguistic development of high- and low-risk preterm infants.

It is important to mention that the results found in this study confirm what is proposed by Bosch et al. (2019), who indicate that it is essential to identify neurocognitive and linguistic risk indicators and to monitor preterm infants with both low and high biomedical risk (especially very preterm and extremely preterm infants) during the first 6 years of life (through the application of protocols, screenings, evaluations, and periodic controls). This is

because both groups of preterm infants that were assessed for our study showed delays in language development. According to Bosch et al. (2019), early assessment would allow for detecting language difficulties, thus making it possible to establish early care programs to address the disturbances that could impact development. In turn, this would allow reducing the gaps in linguistic and cognitive development between children born prematurely and those born full-term. Similarly, it would be necessary to include support for parents and/or caregivers, since the linguistic skills of preterm children are partly dependent on their family environment, which can favor their neurocognitive development and enrich their learning (Nascimento et al., 2013; Rico Vales et al., 2010; Valle-Trapero et al., 2012). In Chile, there is currently the *Chile Crece Contigo* program, which is part of the Social Protection System coordinated and administered by the Ministry of Social Development and Family [*Ministerio de Desarrollo Social y Familia*]. This program contributes to the social inclusion of and equal opportunities for children and their families, making early detection, care, and prevention possible, to avoid the negative impact that developmental delays may have on the future learning process of children (Ministerio de Desarrollo Social y Familia, 2022).

One of the limitations of this study is that the preterm infants were selected only from two polyclinics in Santiago, Chile, which hinders the generalization of the results to other populations of preterm children. Given the above, the findings of this research should be used with caution. It should be noted that studies carried out in this child population are still scarce; therefore, it is crucial to develop further studies that allow obtaining larger samples of infants that have been evaluated early, using development scales or standardized instruments such as the one used in this research. This would have the purpose of showing the difficulties that impact these children in the areas of cognition, communication, and language, and of shedding a light on the need for early care, thus valuing the work of the professionals that are part of the interdisciplinary teams working with this child population.

CONCLUSION

The high- and low-risk very preterm and extremely preterm infants who participated in this research, evaluated at 2 years of corrected age, showed a smaller vocabulary size than their full-term peers. Contrary to what has been previously reported in the literature, no relationship was observed between biomedical complications and disturbances in early language development.

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