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Original Article

Characterization of children with neuropsychomotor delay in a Premature Follow-up Program

Caracterização de crianças com atraso neuropsicomotor em Programa de Seguimento de Prematuros

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ABSTRACT

Introduction: Prematurity, low birth weight, and the need for intensive care are risk factors for the development of children discharged from a Neonatal Intensive Care Unit. **Objective:** To characterize a group of children identified with developmental delays in a Premature Infant Follow-up Program at a university hospital in the interior of Rio Grande do Sul, and to verify the importance of the multidisciplinary team in the neuropsychomotor assessment and longitudinal follow-up of these children. **Method:** This is a quantitative, documentary, longitudinal, descriptive study. All premature infants with their first consultation between 2018 and 2022, identified with neuropsychomotor delay during longitudinal follow-up with the multidisciplinary team, were included. Children who already had a diagnosis of atypical development and those without complete information records were excluded. Data were tabulated in a Microsoft Excel® spreadsheet and analyzed using the Statistical Package for the Social Sciences (SPSS®) program through descriptive statistics. **Results:** 138 children with neuropsychomotor delay were identified. There was a predominance of boys (63%), born via cesarean section (64.5%), moderately premature (37.7%), with similar classifications for low birth weight and prolonged hospital stays (mean of 63.38 days). In the overall distribution of delays, there is a predominance of psychic risk (63%), followed by motor delay (37.7%), language delay (32.6%), cognitive and global delay (25.4% each), and socio-emotional delay (15.2%). **Conclusion:** The multidisciplinary team played a decisive role in the early identification of neuropsychomotor delays, expanding the possibilities for team interventions and, consequently, reducing complications for children at risk.

Keywords: Premature, Aftercare, Developmental Delay.

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RESUMO

Introdução: A prematuridade, baixo peso no nascimento e necessidade de suporte intensivo são fatores de risco para o desenvolvimento da criança egressa de Unidade de Terapia Intensiva Neonatal. **Objetivo:** Caracterizar um grupo de crianças identificadas com atraso no DNPM em um Programa de Seguimento de Prematuros (PSP) de um hospital universitário do interior do Rio Grande do Sul, Brasil, e verificar a importância da equipe multiprofissional na avaliação neuropsicomotora e no acompanhamento longitudinal das crianças. **Método:** Trata-se de uma pesquisa de abordagem quantitativa, documental, longitudinal, com caráter descritivo. Incluíram-se todas as crianças prematuras com primeira consulta entre 2018 e 2022, identificadas com atraso neuropsicomotor durante acompanhamento longitudinal com a equipe multiprofissional. Foram excluídas crianças que já possuíam diagnóstico de desenvolvimento atípico e sem registro completo de informações. Os dados foram tabulados em planilha do Microsoft Excel® e analisados no programa Statistical Package for the Social Sciences (SPSS®) por meio de estatística descritiva. **Resultados:** Foram identificadas 138 crianças com atraso neuropsicomotor. Verificou-se predominância de meninos (63%), nascidos de parto cesárea (64,5%), prematuros moderados (37,7%), com semelhança nas classificações de baixo peso e internações prolongadas (média de 63,38 dias). Na distribuição geral de atrasos, há predomínio de risco psíquico (63%), seguido pelo atraso motor (37,7%), linguagem (32,6%), cognitivo e global (25,4% cada) e socioemocional (15,2%). **Conclusão:** A equipe multiprofissional teve papel decisivo na identificação precoce de atrasos neuropsicomotores, ampliando as possibilidades de condutas da equipe e, consequentemente, diminuindo as complicações para as crianças em risco.

Palavras-chave: Prematuro, Assistência ao Seguimento, Atraso no Desenvolvimento.

Introduction

Prematurity is defined by the World Health Organization (WHO) as the birth of babies with less than 37 weeks of gestational age. According to data from the Ministry of Health, in Brazil, there are approximately 340,000 premature births per year, corresponding to 12% of the total births annually (Brasil, 2020).

Premature children have a history of biological vulnerability and a higher risk of developmental problems (Gontijo et al, 2018) evidenced by delays and deficits in skills expected for each age group, and therefore, their post-discharge follow-up becomes increasingly important. From this perspective, specialized outpatient clinics have been created to care for premature infants discharged from Neonatal Intensive Care Units (NICUs), also called Follow-up Clinics, which aim to offer differentiated follow-up to premature babies and prevent complications resulting from or related to prematurity (Rio Grande do Sul, 2011). These services detect delays in neuropsychomotor development (NPMD) and refer the baby and their family for treatment early. Many premature babies are identified as having delays and referred, but there is little research discussing who these children are and how they are assessed.

The aim of this study is to characterize a group of children identified with developmental delays in a Premature Infant Follow-up Program (NFP) at a university hospital in the interior of Rio Grande do Sul, and to verify the importance of the multidisciplinary team in the neuropsychomotor assessment and longitudinal follow-up of these children.

Method

This is a quantitative research study, with retrospective data collection recorded by the hospital staff. It has a longitudinal and descriptive character. Quantitative research was chosen because it allows the description of a specific population based on measurable or observable data (Marconi & Lakatos, 2017). It is characterized as documentary research due to the data collection carried out through access to the patient's electronic medical record, involving documents prepared for a specific purpose (Gil, 2017), with the material consulted being internal to the institution.

Data collection was carried out from October to December 2023, on computers at the university hospital, the field of this study. This is a general, tertiary-level, teaching hospital, public and exclusively providing services through the Unified Health System (SUS), a reference center for high-complexity care in the central-west region of Rio Grande do Sul. The data collected included information about the child and their birth: sex, race/color, type of gestation, mode of delivery, gestational age, birth weight, length of stay in the NICU, and municipality of residence; as well as data from assessments performed by the multidisciplinary team: date of care, corrected and chronological age on the day of the consultation, which professional category participated in the care, record of developmental assessments, and types of developmental delay(s) identified by the team.

The target audience of the research were all premature children who had their first consultation with the multidisciplinary team between January 1, 2018, and December 31, 2022. However, the consultations of these children were followed longitudinally until October 31, 2023, the final date of this research. All children identified with developmental delay by the multidisciplinary team at any time during the longitudinal follow-up during the proposed period were included. Children who did not have complete information records in their electronic medical records and children who already had a diagnosis of atypical development due to neurological pathology, inborn error of metabolism, congenital malformation, syndromes, etc., made by a pediatrician or neurologist, were excluded, as they had already been referred for early intervention treatment.

After applying the inclusion and exclusion criteria, all consultations in the medical records of the participating children were analyzed. A higher adherence was identified in the first five consultations, in 85% of the children. In these first five consultations, the average age of the children was 15 months, comprising the research sample. It should be noted that, being documentary research, the focus was on the analysis of retrospective records of the care provided by the multidisciplinary team during the aforementioned time interval.

Quantitative data were tabulated in a Microsoft Excel® spreadsheet and analyzed using the Statistical Package for the Social Sciences (SPSS®) program, version 19.0 for Windows®, through descriptive statistics. Frequency and percentage analyses of the data variables were performed, obtaining a descriptive analysis of the characteristics of this sample.

All ethical aspects were guaranteed through the approval of the research under number CAEE 73715923.0.0000.5346, being carried out in accordance with Resolutions No. 466/12 and No. 510/16.

About the field of study: the Premature Infant Follow-up Program (NFP)

The NFP of this study accommodates children from zero to seven years of age who have been discharged from the NICU of the same hospital, in periodic follow-ups according to the child's age and need for clinical monitoring, also subject to the availability of a service slot. Currently, it is composed of a nursing team affiliated with the hospital; two pediatricians and an occupational therapist, faculty member of the university undergraduate courses; an occupational therapist Administrative Technical in Education (ATE) affiliated with the university's occupational therapy program; pediatric, occupational therapy (OT), physiotherapy (PT), and speech-language pathology (SLP) residents; and undergraduate students from the OT and medicine programs.

NFP appointments take place during one weekly shift, with an average of 15 to 20 infants/children scheduled for the team each week. The medical core evaluates all scheduled children. The multiprofessional team, however, selects on average seven to ten patients from the schedule for evaluation, as this assessment is longer and it is not possible to see all children. The priorities for care defined by the multiprofessional team at the first consultation involve criteria such as lower gestational age and birth weight, longer hospital stay, and other developmental risk factors, including clinical, social, and relational risk issues. For subsequent follow-up consultations, priority is given to children who have already shown some delay in previous evaluations or who have gone some time without assessment. Children suspected by the medical team of having a probable alteration are also evaluated.

The definition of which members of the multiprofessional team will perform the evaluation takes into account the family's and/or medical team's concerns, as well as previous evaluations already conducted. In this context, an evaluation may be conducted jointly with the entire multiprofessional team (OT, PT, and SLP), in pairs, or by just one professional category. There are common themes to be evaluated by all professionals, such as: feeding quality, child's and mother's sleep quality, and quality of family care. In addition, each professional has resources for a more specific evaluation.

For OT, the child and parents' clinical occupational therapy assessment is produced based on a protocol that includes elements for evaluating family daily routines and the child's psychomotor and cognitive aspects (Peruzzolo, 2016). Relational aspects are evaluated using the Indicators of Risk for Child Development (IRDI) instrument (Froehlich et al., 2020), which identifies the possibility of psychic risk. When there is uncertainty regarding the child's cognitive and/or socioemotional development, the Bayley III protocol is applied using the specific subscales.

PT evaluates motor development in three main areas: physical integrity, the motor repertoire itself, and the quality of demonstrated motor skills. For this, the team uses the Alberta Infant Motor Scale (AIMS) as an assessment instrument.

SLP focuses on monitoring infants' feeding, identifying dysfunctions in oral motor skills and signs of dysphagia; in addition, it also monitors the language development of preterm infants based on language development milestones.

After evaluating the child, the medical and multiprofessional team discusses the case together to define the management plan and guidance to be provided to the family. All these data are recorded in electronic medical records using a progress note template developed by the hospital, which includes information reported by the family, evaluation findings, and test results, as well as the assessment diagnosis with records of "appropriate development," "psychic risk," or "delay in NPMD," specifying the specific areas that are delayed and the team's management recommendations.

Results

Between January 1, 2018, and October 31, 2023, 631 children were seen by the multidisciplinary team, totaling 1,808 consultations. During the longitudinal follow-up of these 631 children, considering the inclusion and exclusion criteria of this study, 138 presented some type of delay in neurodevelopmental progress, comprising the final study population. For these 138 children, 642 consultations with the multidisciplinary team were analyzed, verifying the record of the child's NPMD assessment at each consultation and the need for guidance to parents or referrals to medical specialties and early intervention.

In the analysis of the data collected from the medical records, it was identified that the assessments were recorded as "NPMD assessment," with six categories of delay recorded: motor delay, cognitive delay, language delay, global delay (when the baby/child had all other categories of delay), psychic risk (identified using the IRDI instrument, covering from zero to 18 months) and socio-emotional delay (associated with children over 18 months, in whom little ability to manage their own emotions and relate to the environment was assessed).

Main characteristics of children with delayed development

Table 1 presents data regarding the main characteristics of children identified with developmental delays by the multidisciplinary team.

In the 138 children sample, there was a predominance of males (63%), whites (95.7%), cesarean deliveries (64.5%), and children residing in the city where the university hospital in this study is located (53.6%).

Regarding gestational age, where the youngest age was 23 weeks and six days and the oldest was 36 weeks and five days, the largest percentage (37.7%) was of moderately premature children, that is, born between 32 and 36 weeks and six days (Blencowe et al., 2013). If these data are analyzed considering the level of risk (i.e., the lower the gestational age, the greater the chance of developmental delay), the percentage of children at higher risk could be the sum of the number of children with extreme prematurity (up to 27 weeks and six days) and very extreme prematurity (between 28 weeks and 31 weeks and six days) (Blencowe et al., 2013), which would correspond to 62.3% of the sample. Regarding the categorization of birth weight, the percentage remained similar for the three categories, with the lowest weight being 500g and the highest weight being 3,260g.

The average length of hospital stay after birth was 63.38 days (SD = 39.64), with the shortest stay being 4 days and the longest being 181 days (six months).

Regarding the children's age at the time of their first consultation with the multidisciplinary team, the overall corrected average age was two months and 27 days, ranging from -25 days to one year, eight months and 14 days. This data recorded as negative days refers to eleven babies who were still at gestational age at the first consultation, with the youngest age being 36 weeks and three days (i.e., -25 days).

Regarding consultations by the multidisciplinary team in monitoring children with developmental delays

The 138 children identified with developmental delays continued to be evaluated by the multidisciplinary team in periodic follow-up visits, totaling 642 consultations. Thus, 85% of the children included in this study had up to five consultations with the multidisciplinary team.

Table 1. Children's Profile.

VARIABLES	Frequency	Percentage
Sex		
Female	**51**	**37%**
Male	**87**	**63%**
Municipality of residence		
Municipality of the university hospital	**74**	**53.6%**
Other municipalities	**64**	**46.4%**
Race/Color		
White	132	95.7%
Black, brown, or indigenous	6	4.3%
Type of pregnancy		
Singleton	111	80.4%
Twins	27	19.6%
Delivery method		
Vaginal	49	35.5%
Cesarean section	89	64.5%
Classification of prematurity		
Extremely premature	42	30.4%
Very premature	44	31.9%
Moderately premature	52	37.7%
Birth weight		
Extremely low weight	46	33.4%
Very low weight	43	31.2%
Low weight	45	32.6%
Appropriate weight	4	2.8%

Source: Authors.

The composition of the team for each consultation varied according to the identification, via medical record or medical indication, of the needs of the patient and their family. In the analysis of the consultations included in this research, the participation of each professional group was as follows: occupational therapy was the professional category that participated most in the consultations (n= 549, or 86%), followed by physiotherapy (n= 333, or 52%) and speech therapy (n= 252, or 39%).

The delays identified in NPMD

The 138 children included in this study had a record of delay in one or more areas of the neurodevelopmental progress (NPPM). Figure 1 shows the distribution of recorded NPPM delays in the longitudinal follow-up of the children, according to categories identified in their medical records.

In the analysis of Figure 1, it is observed that there was a predominance of psychological risk (63%). Among the other categories of delay, motor delay was the most frequent (37%), followed by language delay (32.6%), which begins to show higher percentages from the third consultation onwards.

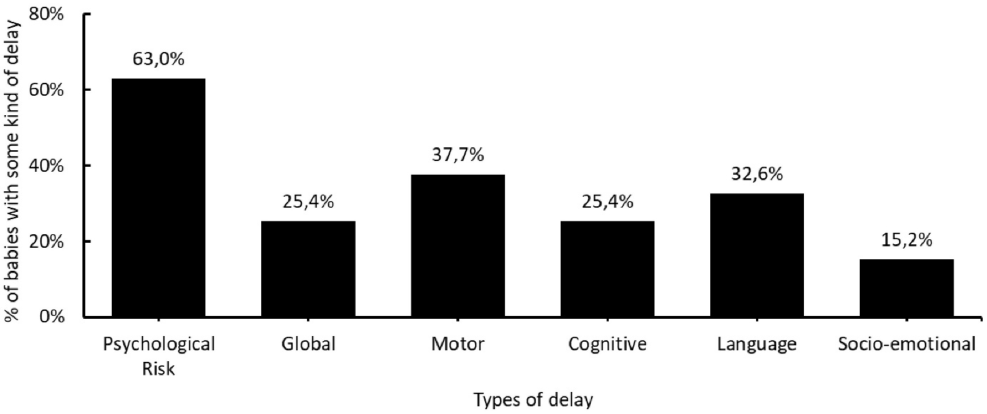

Figure 1. Percentage of types of delays in longitudinal follow-up.

Figure 2, below, shows the distribution of types of delay in the first five consultations.

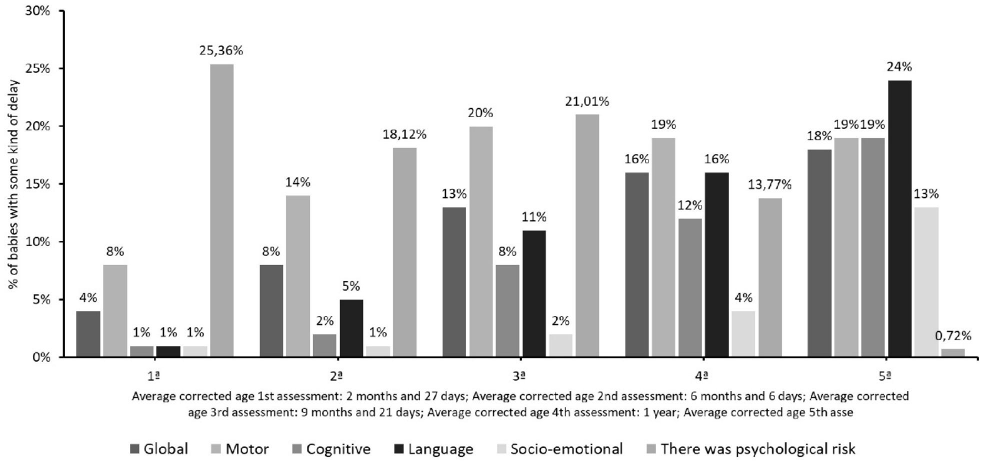

Figure 2. Distribution of types of delays in relation to the first five assessments.

Considering the data presented, what stands out in the first two assessments is the delay in the Motor and Psychological Risk categories compared to the others. It is also important to highlight that in this NFP there are two occupational therapists with expertise in the early detection of psychological risk using the IRDI protocol as a reference, which certainly influences its identification. It is observed that the number of motor delay records increases progressively until the fourth consultation. As for psychological risk, this fluctuates from one consultation to another (from the first to the fourth consultation: 25.36%; 18.12%; 21.01%; 13.77%), becoming almost zero in the fifth, at which point, due to the age of the children, there is an increase in socio-emotional delay. This indicates that the children continue to present psychological risk, with the nomenclature changing due to the use of different instruments (there is a shift from IRDI to Bayley III).

As babies grow, they are expected to acquire new skills. Since this population is impacted by prematurity, some delays are identified throughout the baby's life. Therefore, there is an increase in categories of delays, such as language and cognitive delays.

Language delays begin to show higher percentages from the third consultation onwards, becoming the third most identified category of delay across the five consultations. Cognitive delays, also more frequent from the third consultation onwards, reach second place among the most identified delays by the fifth consultation. The high percentages of identified global developmental delays, especially from the third consultation onwards, are also noteworthy.

Discussion

Profile of children at risk

Unlike studies that profile children followed up in preterm infant care (Froehlich et al., 2020; Ramos et al., 2022; Camargos et al., 2023), this study specifically included children identified with developmental delays. This means that, within a high-risk population (premature infants), children were selected who, a priori, did not have other diagnoses, and whose repercussions of prematurity appeared as developmental delays and/or psychological risk during their follow-up in the Premature Infant Follow-up program. In this sense, care was taken in comparing the data from this study with other research, which outlines general profiles of groups of premature children.

The profile of children identified with developmental delays by the multidisciplinary team was predominantly male (63%), as identified in a study conducted in Minas Gerais, with 53.9% (Ramos et al., 2022), while another study presented similar percentages between females and males (49.8% and 50.2%, respectively) (Teixeira et al., 2022). In another study conducted in the same Primary Health Care Unit as this study, between 2013 and 2015, the overall profile of the population served was predominantly female, with 58.7% (Froehlich et al., 2020).

However, in research studying risk conditions such as prematurity and low birth weight, the findings indicate that boys are more likely to experience developmental repercussions compared to girls, although it is necessary to consider the association with other risk factors, as well as possible environmental variables, as attenuators or minimizers of the effects of these risk conditions (Martins et al., 2025).

Regarding race/color or ethnicity, it is noteworthy that only 4.3% of the children in this study have their electronic records identified as Black, Brown, or Indigenous, while the identification of Yellow has no occurrences, with White being the most prevalent color (95.7%). As the authors of this study worked in the field of research, it was possible to compare what is recorded in the records with the color of the family and the child during some of the analyzed consultations, in which a significant number of children, sons and daughters of Black parents, were recorded as White in their records. Since the medical record is filled out by the teams, it is possible that it may be done without asking the parents how they self-declare or without checking the baby's birth certificate. Bombarda & Joaquim (2022, p. 269) state that, among the nonconformities in the records studied in research on the quality of records in medical records, the "absence of patient and professional identification data and incomplete data" are two of the most recurrent aspects.

In addition, analyzing the studies already cited in this article, which outline the profile of premature babies, it is observed that they do not discuss ethnic and racial aspects, nor do they even mention this factor among the variables. An American study, which aimed to investigate the implications of ethno-racial inequalities on perinatal health, long-term neurodevelopment, and the use of health services for premature children, points out that, despite the limited data on the impact of these associations, existing inequalities in the perinatal period may persist or worsen throughout childhood, considering the continuous exposure to aspects such as material deprivation, prejudice, and institutional and systemic racism (Fraiman et al., 2022). Even knowing that 56.5% of the Brazilian population self-identifies as Black, Brown, Indigenous, or Asian, and that 71% of Brazilians depend on the public system for access to health (Instituto Brasileiro de Geografia e Estatística, 2022), in Brazil, the agenda for monitoring premature infants still does not produce different actions regarding ethno-racial aspects.

Regarding the mode of delivery, there was a higher occurrence of cesarean deliveries (64.5%), which is consistent with other studies (Ramos et al., 2022; Teixeira et al., 2022; Almeida et al., 2021). In this research, 19.6% of babies were born from multiple pregnancies, a percentage higher than other studies, with 10.9% and 6.5%, respectively (Froehlich et al., 2020; Penha et al., 2019). When investigating the prevalence and temporal trend of prematurity in Brazil between 2011 and 2021, an increase in the average prematurity rate was identified in twin pregnancies, highlighting that "twin pregnancy" is the variable that has the greatest association with prematurity compared to all other maternal characteristics (Alberton et al., 2023). The increase in cesarean sections, as a necessary delivery method in some cases, is related both to intrinsic risks of preterm labor and to other conditions that trigger the interruption of pregnancy, either spontaneously or even as indicated by healthcare professionals (Alberton et al., 2023). However, it is important to note that, in a scoping review of risk and protective factors for early childhood development (Martins et al., 2025), results show that both cesarean section and vaginal delivery can be risk factors for child development.

Regarding the categorization of birth weight, similar percentages were observed among the three low birth weight categories, with a slight predominance of children born with extremely low birth weight (below 1,000g). Other studies showed a predominance of children born with very low birth weight (between 1,000 and 1,500g) (Teixeira et al., 2022; Almeida et al., 2021; Trubian et al., 2022), while a study in Rio Grande do Sul showed a higher number of children in the low birth weight classification (between 1,500g and 2,500g) (Froehlich et al., 2020). Low birth weight is already identified as a risk factor for child development, with evident impacts on cognitive and behavioral aspects (Martins et al., 2025).

Regarding gestational age, this study observed a higher concentration of babies in the moderately premature classification (37.7%), as was the case in other studies (Froehlich et al., 2020; Teixeira et al., 2022). Despite this, there were also similar percentages of extremely premature children (30.4%), that is, those born at up to 27 weeks and 6 days of gestational age, and very premature children (31.9%), born between 28 and 31 weeks and 6 days. It is important to consider that the lower the gestational age at birth, the greater the risk of developmental problems, with associated complications and comorbidities (Freire et al., 2018). However, the moderately to late premature and very premature classifications have the same risk of developing morbidities (Freire et al., 2018), thus highlighting the importance of monitoring the child development of all premature children discharged from NICUs.

Concerning the length of stay in the NICU, the average in this study was 63.38 days, a result higher than other research (Froehlich et al., 2020; Almeida et al., 2021; Trubian et al., 2022; Miatello et al., 2019), with the closest average being 50.55 days (Trubian et al., 2022). It is worth noting that prolonged hospital stays, associated with the use of mechanical ventilation, exposure to stressful procedures, and separation from parents are related to motor and cognitive deficits (Stelmach et al., 2019).

From the above, it is possible to highlight that this sample (children identified, in the assessments of the multidisciplinary team, with delays in neurodevelopmental progress) has higher percentages of characteristics already announced in the literature as those that increase the risk of neurodevelopmental progress, when compared with research that identifies general characteristics of premature babies. In this sample, the babies were mostly boys, born via cesarean section, classified as moderately premature and low birth weight, with a high percentage of twin pregnancies and prolonged hospital stays. This serves as a warning about the events the baby experienced, which accumulate in the face of prematurity, thus increasing the risk of delays in neuropsychomotor development.

Multiprofessional support in NFP

In this research, 85% of the children included had up to five appointments, and at the fifth appointment, the average corrected age of the babies was 15 months. As previously described, based on the criteria established by the multidisciplinary team, the child was not necessarily evaluated by the multidisciplinary team at each return visit with the medical team. Since some developmental changes only occur in the long term, specialized monitoring of premature infants should continue even with children with adequate development, as professionals can identify small signs of delay as soon as they appear (Silva et al., 2022), providing appropriate guidance.

Regarding professional categories, it is noticeable that occupational therapy was the profession that participated most in the appointments, which may be related to the fact that there is a greater number of occupational therapists in the team composition. The point worth highlighting is that the first signs of delay (motor and psychological risk) are not signs whose knowledge is held by a single professional – in fact, the motor and psychological fields are fields that, traditionally, did not interact. However, important studies have confirmed that motor symptoms (Kaur et al., 2018) and psychological distress (Laznik, 2025) are among the first identifiable impairments observed in babies who may develop ASD (Autism Spectrum Disorder). Along with this, another issue is that, as babies grow, they present other signs, such as in areas of language and cognition, characteristic of other fields that are evaluated in this team by specific professionals.

The interdisciplinary assistance and interprofessional action established by the NFP team qualifies the performance in the monitoring and early detection of children who are not developing well. The diverse knowledge and experiences of different professional groups are utilized during the assessment, case discussion, and development of each therapeutic plan. The involvement of these professional groups enhances the possibility of early diagnosis of developmental delays and broadens the team's approach. Among these, the most important aspect is welcoming and guiding parents when their children show signs of delay, educating them about the unique developmental needs of premature babies and helping them develop ways to stimulate their child. Another possible approach involves referring the baby/child for early treatment in occupational therapy, physiotherapy, speech therapy, and psychology, as well as for evaluations by medical specialists such as neurologists, pediatric gastroenterologists, and otolaryngologists, among others.

Delays in NPMD

From the first days of life, babies are expected to acquire a sequence of skills in each area of neurodevelopmental milestones (NDM), named as developmental milestones (Brasil, 2023). When the emergence of one or more skills does not occur at the expected time, gaps in the child's development begin (Marco et al., 2021). When analyzing the morbidity profile in the first year of life of babies followed up in a high-risk newborn follow-up clinic, a study identified that NDM delay was the main condition recorded, followed by upper respiratory tract infections, neurological disorders, and chronic respiratory conditions (Teixeira et al., 2022).

In early human life, the structural aspects (biological, cognitive, and psychic apparatus) of the baby, which are innate, are reorganized by experiences with the environment, offering them resources to learn to use their body as a relational field (Peruzzolo, 2016). In other words, the more the baby develops organically, the more self-awareness it gains and the more it uses its resources to explore the environment. Although child development is studied from broad areas of knowledge, it occurs simultaneously and interconnectedly. This means that, at certain stages, one area may be more prominent than the others, with greater skills expected at that moment (Brasil, 2023). The issue that has arisen, especially in the last two decades, is that most studies focus on understanding the repercussions of prematurity on the development of specific skills and competencies in child development, with little emphasis on psychological aspects and the quality of interactions between the child-parent-environment triad (Frantz et al., 2021).

In the researched NFP, these two aspects are considered fundamental. It is observed that psychological risk was the most frequently identified delay in the overall analysis throughout the study period, with a higher prevalence compared to other categories of delay at the first consultation. The use of the IRDI instrument contributes to the early detection of the impact of maternal (or other primary caregiver) knowledge and investment on their child, even in the first months of life. The issue is that, since the baby is very young, having just left the NICU, many mothers still have difficulty understanding the baby's potential needs (Piber et al., 2020), which may justify the absence of IRDI indicators in the early stages (Phase I up to 4 months and Phase II up to 8 months). This puts the team on alert to broaden their understanding of daily family life, and can guide the mother regarding specific care and investments for such a young baby.

In this research, the psychic risk becomes very evident during the first four consultations (corrected average age between two months and 27 days and twelve months), and afterwards, there is an increase in the socio-emotional category. This finding is justified by the very structure of the assessment. The IRDI instrument is used until 18 months, with the corrected average age of the babies at the fifth consultation being 15 months (understanding that, at this point, many children were already older than the age for using the IRDI). After 18 months, the team remains attentive to psychic issues with an emphasis on relational aspects through observation of the child and reports from parents/caregivers, naming this characteristic socio-emotional.

Regardless of the form of assessment or naming used (psychic risk or socio-emotional delay), it is noteworthy that the signs and symptoms identified by the team announce an important warning sign for a series of implications for the development of emotional and behavioral skills associated with prematurity. Premature children have a higher prevalence of diagnoses of anxiety disorders, social phobias, ASD, Attention Deficit Hyperactivity Disorder (ADHD), and sociocommunicative problems (Frantz et al., 2021), verified, for example, through impulsivity, irritability, greater expression of anger, less responsiveness to fear, among others (Camargos et al., 2023). This information highlights the importance of assessments that also consider psychological aspects, detecting early on babies who are at risk or in psychological distress.

Among the delays in neurodevelopmental progress identified in this research, it is observed that motor delay was the second most prevalent in longitudinal follow-up, as well as from the first to the fourth consultation, at which point the average corrected age of the babies was twelve months. This result is consistent with that observed in another study, where most babies between six and twelve months presented evident motor delays, in addition to presenting a high risk for motor delays up to 18 months (Lawlor et al., 2018), which justifies the importance of following up premature babies even after their first year of life. It is worth remembering that motor delay is the easiest delay to detect early in life, since there are many assessment tools and information on the first expected motor milestones is easily accessible and part of the learning of all health professionals.

It is also observed that the identification of all types of delays increased from the first to the fifth consultation, with emphasis on language delay, which occupies the third position in longitudinal follow-up. A study carried out in São Paulo showed that 36% of its sample (small and appropriate premature children for gestational age, with adequate or altered auditory development) presented alterations in language development between 18 and 36 months (Gouveia et al., 2020). Among other disadvantages, delayed language acquisition in preterm children generally results in greater academic difficulties, especially in reading and writing (Camargos et al., 2023).

In this research, at the fifth consultation (with a corrected average age of 15 months), cognitive delay occupies the second position alongside motor delay, among the most prevalent delays, observing its gradual growth percentage, especially from the second consultation onwards. Thus, the NFP studied here already identifies cognitive impairment or risk for it in the first months of the baby's life. An American study showed that cognitive delay is the most common impairment in premature children between 18 and 30 months of age (Duncan & Matthews, 2018), in parallel with other studies that usually show cognitive delay only at school age (Camargos et al., 2023). This points to the importance of qualifying cognitive assessment from the first months of the baby's life, especially from the fourth month onwards, when it is already possible to detect delays from the first learning and skills, either through clinical assessment, using Piagetian theoretical contributions, for example, or through the use of specific protocols, such as the Bayley III.

Finally, it is also observed that the identification of global delay in this study has been increasing since the first consultation, and that, in longitudinal follow-up, the percentage of global delay is equivalent to cognitive delay, with a significant prevalence rate in the studied population. It is noteworthy that global delay corresponds to delay in all areas of the baby's neurodevelopmental progress. This result is important because it qualifies the necessary organization of teams in primary care that contemplate a more global view of the baby's development. Many of the studies presented in this article discuss the results of delays related to motor skills. The identification of global delay in neurodevelopmental progress is more associated with screening results using the Denver II instrument, for example (Souza et al., 2020). Global delay in neurodevelopmental progress is characterized as a significant risk situation for referral to early intervention, compared to the isolated identification of delays in specific areas where babies are referred for treatment.

In conclusion, it is understood that neurodevelopmental delay is established in a complex and dynamic way, being influenced by several factors, among which we can mention genetic and environmental aspects, as well as the quality of human relationships to which the child is exposed (Martins et al., 2025; Laznik, 2025; Peruzzolo & Souza, 2017).

In this sense, a delay in neurodevelopmental delay may be a temporary situation (Brasil, 2023), which reinforces the importance of providing adequate guidance to the family and/or referring the baby/child for appropriate treatment as strategies to intervene early, avoiding greater complications in the child's development.

Conclusion

It is concluded that outpatient follow-up with the multidisciplinary team of the children included in this study played a decisive role in the early identification of delays in neurodevelopmental progress. The identification of delays from the first months and the emergence of new categories of delay, as the corrected average age of the children increases, point to the importance of the NFP, thus expanding the possibilities of team conduct, and potentially reducing complications for children at risk. Furthermore, the composition of the multidisciplinary team enhances the performance of the NFP, since the knowledge and experiences of different professional groups are brought to each assessment, case discussion, and articulation of a therapeutic plan.

Although this study presents specific characteristics of a focal and regional sample, it is hoped that it will encourage other researchers to become interested in studies that discuss, more broadly, the characteristics of premature children who present with delays in neurodevelopmental progress. The results presented here can contribute to the support of preventive policies for such a large population in Brazil, ensuring the improvement of services and the structuring of increasingly qualified and humanized care.

References

Alberton, M., Rosa, V. M., & Iser, B. P. M. (2023). Prevalência e tendência temporal da prematuridade no Brasil antes e durante a pandemia de COVID-19: análise da série histórica 2011–2021. *Epidemiologia e Serviços de Saúde : Revista do Sistema Unico de Saúde do Brasil*, *32*(2), 1-14.

Almeida, N., Silva, D. A., Silva, L. R. V., Vojciechowski, A. S., Motter, A. A., & Zotz, T. G. G. (2021). Análise do desenvolvimento neuropsicomotor de pré-termos em ambulatório multidisciplinar: um olhar da fisioterapia. *Revista Pesquisa em Fisioterapia*, *11*(1), 106-115.

Blencowe, H., Cousens, S., Chou, D., Oestergaard, M., Say, L., Moller, A. B., Kinney, M., & Lawn, J., and the BORN TOO SOON PRETERM BIRTH ACTION GROUP (2013). Born too soon: the global epidemiology of 15 million preterm births. *Reproductive Health*, *10*(Suppl. 1), 1-14.

Bombarda, T. B., & Joaquim, R. H. V. T. (2022). Registro em prontuário hospitalar: historicidade e tensionamentos atuais. *Cadernos Saúde Coletiva*, *30*(2), 265-273.

BRASIL. Ministério da Saúde. (2023). *Desenvolvimento neuropsicomotor, sinais de alerta e estimulação precoce: um guia para pais e cuidadores primários.* Brasília: Ministério da Saúde. Recuperado em 5 de julho de 2024, de https://bvsms.saude.gov.br/bvs/publicacoes/desenvolvimento_neuropsicomotor_estimulacao_guia_pais.pdf.

BRASIL. Ministério da Saúde. Secretaria de Atenção Primária à Saúde. (2020). *Semana da prematuridade movimenta profissionais de saúde e população pela prevenção de nascimentos prematuros.* Brasília: Ministério da Saúde. Recuperado em 5 de julho de 2024, de https://aps.saude.gov.br/noticia/10356

Camargos, G. L. N., Amâncio, N. F. G., Araujo, L. M. B., & Araujo, G. M. B. (2023). O desenvolvimento cognitivo e motor em crianças prematuras quando comparado a seus pares a termo. *Brazilian Journal of Health Review*, *6*(1), 1661-1677.

Duncan, A. J., & Matthews, M. A. (2018). Neurodevelopmental outcomes in early childhood. *Clinics in Perinatology*, *45*(3), 377-392.

Fraiman, Y. S., Barrero-Castillero, Y., & Litta, J. S. (2022). Implications of racial/ethnic perinatal health inequities on long-term neurodevelopmental outcomes and health services utilization. *Seminars in Perinatology*, *46*(8), 1-19.

Frantz, M. F., Schaefer, M. P., & Donelli, T. M. S. (2021). Follow-up de nascidos prematuros: uma revisão sistemática da literatura. *Psicologia: Teoria e Pesquisa (Brasília)*, *37*, 1-13.

Freire, L. M., Camponêz, P. S. P., Maciel, I. V. L., Vieira, C. S., Bueno, M., & Duarte, E. D. (2018). Fatores associados à não adesão ao seguimento ambulatorial de egressos de terapia intensiva neonatal. *Revista da Escola de Enfermagem da USP*, *52*, 1-8.

Froehlich, L. T. C., Nascimento, N. C., Peruzzolo, D. L., Beltrame, V. H., & Moraes, A. B. (2020). Perfil do bebê e familiares assistidos em um ambulatório de seguimento de prematuros. *Revista Saúde*, *46*(2), 1-13.

Gil, A. C. (2017). *Como elaborar projetos de pesquisa* (6. ed.). São Paulo: Atlas.

Gontijo, M. L., Cardoso, A. A., Dittz, É. da S., & Magalhães, L. de C. (2018). Evasão em ambulatório de seguimento do desenvolvimento de pré-termos: taxas e causas. *Cadernos Brasileiros de Terapia Ocupacional*, *26*(1), 73-83.

Gouveia, A. S., Oliveira, M. M. D., Goulart, A. L., Azevedo, M. F., & Perissinoto, J. (2020). Desenvolvimento de linguagem e das habilidades auditivas em prematuros adequados e pequenos para a idade gestacional: idade cronológica entre 18 e 36 meses. *CoDAS*, *32*(4), 1-4.

INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA – IBGE. (2022). *Censo brasileiro de 2022.* Recuperado em 5 de julho de 2024, de https://censo2022.ibge.gov.br/panorama

Kaur, M., Srinivasan, S. M., & Bhat, A. N. (2018). Comparing motor performance, praxis, coordination, and interpersonal synchrony between children with and without Autism Spectrum Disorder (ASD). *Research in Developmental Disabilities*, *72*, 79-95.

Lawlor, G. C. O., Righi, N. C., Kurtz, F. M., Porto, B. S. S., & Trevisan, C. M. (2018). Caracterização de variáveis clínicas e do desenvolvimento motor de recém-nascidos prematuros. *Revista de APS*, *21*(2), 177-181.

Laznik, M. C. (2025). *Psicanálise e Genética: clínica de bebês com risco de autismo.* São Paulo: Editora Instituto Langage.

Marco, R. L., Daniel, M. B. N., Calvo, E. N., & Araldi, B. L. (2021). TEA e neuroplasticidade: identificação e intervenção precoce. *Brazilian Journal of Development*, *7*(11), 104534-104552.

Marconi, M., & Lakatos, E. M. (2017). *Metodologia científica*. São Paulo: Atlas.

Martins, I. M., Perazzo, M. F., Corrêa-Faria, P., Santos, I. G., Mateus, A. C., Fernandez, A. M., Tavares, N. O., & Costa, L. R. (2025). Fatores de risco e proteção ao desenvolvimento na primeira infância: revisão de escopo. *Revista Brasileira de Saúde Materno Infantil*, *25*, 1-17.

Miatello, I., Pellarin, L. A., Nascimento, M. I. S., Boque, M. R., Galbetti, V. H., & Elias, L. S. D. T. (2019). Seguimento ambulatorial dos recém-nascidos de alto risco de um hospital-escola do noroeste paulista. *CuidArte Enfermagem*, *13*(2), 106-110.

Penha, S. C., Rebouças, N. P., Meireles, A. V. P., Carioca, A. A. F., Pinto, M. S., & Carvalho, N. S. (2019). Fatores de risco maternos associados à prematuridade em uma maternidade-escola. *Sanare Sobral*, *18*(2), 43-51.

Peruzzolo, D. L. (2016). *Uma hipótese de funcionamento psicomotor para a clínica de intervenção precoce* (Tese de doutorado). Universidade Federal de Santa Maria, Santa Maria.

Peruzzolo, D. L., & Souza, A. P. R. (2017). Uma hipótese de funcionamento psicomotor como estratégia clínica para o tratamento de bebês em intervenção precoce. *Cadernos Brasileiros de Terapia Ocupacional*, *25*(2), 427-434.

Piber, V., Sampson, K. C., & Peruzzolo, D. L. (2020). Indicadores de referência para o desenvolvimento infantil, prematuridade e aleitamento materno. *Revisbrato*, *5*(1), 76-90.

Ramos, A. C. R., Souza, R. G., Carneiro, J. A., Pinho, L., & Caldeira, A. P. (2022). Perfil de morbidade no primeiro ano de vida entre recém-nascidos de alto risco. *Revista de la Sociedad Latinoamericana de Nutrición*, *72*(4), 235-242.

RIO GRANDE DO SUL. Secretaria Estadual da Saúde. (2011, 12 de maio). Resolução nº 105/11 – Comissão Intergestores Bipartite/RS. *Diário Oficial do Rio Grande do Sul*, Porto Alegre. Recuperado em 5 de julho de 2024, de https://saude.rs.gov.br/upload/arquivos/carga20170217/23101759-1339528527-cibr105-11.pdf

Silva, R. M. M., Zilly, A., Fonseca, L. M. M., & Mello, D. F. (2022). Elementos qualificadores do seguimento de prematuros no campo da atenção primária à saúde. *Revista de Enfermagem da UERJ*, *30*, 1-11.

Souza, R. G., Menezes, M. S. D., Castro, P. S., Carneiro, J. A., Pinho, L., & Caldeira, A. P. (2020). Atraso do desenvolvimento neuropsicomotor entre recém-nascidos de alto risco acompanhados em um ambulatório de seguimento. *Revista Renome*, *9*(1), 57-66.

Stelmach, I., Kwarta, P., Jerzyńska, J., Stelmach, W., Krakowiak, J., Karbownik, M., Podlecka, D., Hanke, W., & Polańska, K. (2019). Duration of breastfeeding and psychomotor development in 1-year-old children - Polish Mother and Child Cohort Study. *International Journal of Occupational Medicine and Environmental Health*, *32*(2), 175-184.

Teixeira, M. A., Britto, D. B. O., Escarce, A. G., Paula, D. D., & Lemos, S. M. A. (2022). Perfil de prematuros em atendimento fonoaudiológico em um ambulatório de follow-up. *Audiology - Communication Research*, *27*, 1-9.

Trubian, F., Zimmermann, M., Sangali, C. C., Winck, A. D., Souza, V. C., & Saccani, R. (2022). Follow-up do desenvolvimento motor de prematuros: impacto das orientações parentais. *Revista de Ciências Médicas e Biológicas*, *21*(1), 46-52.

Author's Contributions

Dara Cristina Leidemer and Dani Laura Peruzzolo conceived the research. Data collection was performed by Dara Cristina Leidemer, Diuliana de Mello Tonelli, Giovanna Affonso Araujo, and Verônica Facco Uliana. Data analysis and interpretation, article writing, critical content review, and preparation of the final manuscript were performed by Dara Cristina Leidemer and Dani Laura Peruzzolo. Diuliana de Mello Tonelli, Giovanna Affonso Araujo, and Verônica Facco Uliana contributed to the critical content review of the final manuscript. All authors approved the final version of the text.

Data Availability

The data supporting the results of this study are available from the corresponding author upon request.

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