Feeding Difficulties in Late Preterm Infants and their Impact on Speech and Language Development

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Posted Date: 14 January 2026

doi: 10.20944/preprints202601.1070.v1

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 doi:10.20944/preprints202601.1070.v1

Article

Feeding Difficulties in Late Preterm Infants and their Impact on Speech and Language Development

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Abstract

Background/Objectives: The study aimed to compare feeding difficulties (FD) in Slovenian late preterm infants (LPIs) and full-term infants (FTIs), to identify risk factors for FD, and to examine a possible association between FD and later speech-language disorders (SLD) among LPIs. **Methods**: Parents of 177 children (n_{LPI} = 89; n_{FTI} = 88), born at Ljubljana Maternity Hospital between 1 July 2021 and 30 June 2022 completed a questionnaire providing general information on their child, the child's health, birth history, and development of feeding, swallowing, and speech-language skills. Additional clinical data were obtained from medical documentation. Using these data, comparisons were made between LPIs and FTIs, and within the LPI group according to the presence or absence of FD and SLD. **Results**: LPIs experienced significantly more FD than FTIs (32.6% vs. 11.4%, $p < 0.001$). They were breastfed less frequently (68.5% vs. 94.3%, $p < 0.001$) and had a shorter breastfeeding duration (13.8 months vs. 17.3 months, $p = 0.038$). LPIs also demonstrated more challenges in speech and language development (34.1% vs. 15.3%, $p = 0.004$). However, no significant association was found between FD and later SLD ($p = 0.324$). **Conclusions**: Slovenian LPIs are at increased risk of both FD and SLD. The findings highlight the importance of high-quality preventive care and timely multidisciplinary interventions.

Keywords: late preterm infants; feeding difficulties; speech and language disorders; risk factors; feeding support

1. Introduction

Late preterm infants (LPIs), born between 34 and 36 weeks of gestation [1], account for 65–75 % of all preterm births [2]. Their proportion has been increasing in recent decades, highlighting their growing public health significance [3,4]. Although physiologically more mature than very preterm infants, LPIs remain at elevated risk of neonatal morbidity and mortality [5]. Compared with full-term infants (FTIs), LPIs are more susceptible to respiratory complications [6], thermoregulation problems [7,10], and feeding difficulties (FD), which can contribute to or coexist with other common complications such as hypoglycaemia, dehydration, and hyperbilirubinaemia [7–10]. Their relatively immature immune system predisposes them to higher rates of infection [8,9]. Consequently, LPIs more often require intensive care [6] and experience longer hospitalisations [9], with increased rates of emergency department visits and rehospitalisations after discharge – most commonly due to jaundice, but also because of FD, respiratory problems, and fever [11].

FD in LPIs primarily arise from the developmental processes of sucking and swallowing. The first signs of non-nutritive sucking and pharyngeal swallowing appear around 15 weeks of gestation, with basic sucking and swallowing skills developed by week 28 [12–14]. However, effective oral feeding requires precise coordination of sucking, swallowing, and breathing, which matures only

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after birth. In premature infants, this coordination typically develops around 37 weeks postmenstrual age. Between 34 and 36 weeks postmenstrual age, this coordination is often incomplete, leading to substantial variability in feeding abilities among LPIs [15–17].

FD affect 40–60% of LPIs, with incidence inversely related to gestational age (GA) [10]. They are most often characterised by difficulties initiating and maintaining breastfeeding, delayed oral feeding, and fatigue during feeding [18]. Although breastfeeding is well-recognised for its health benefits [19], LPIs are rarely exclusively breastfed [20]. Contributing factors include poor sucking–swallowing–breathing coordination, lower sucking pressure, decreased muscle tone, disturbed sleep–wake cycles, general fatigue, early maternal–infant separation [18], and various pregnancy-related conditions that predispose to preterm birth or delay lactogenesis, such as multiple pregnancy, gestational diabetes, or caesarean section [21]. Consequently, LPIs and their mothers often require additional professional support with feeding. Even though early support in clinical settings is crucial for successful breastfeeding establishment [22–24], it is often not consistently provided [25]. Nutritional management strategies also vary, as evidence-based guidelines for LPIs remain limited [26]. FD may persist into toddlerhood: while the introduction of solid food is generally unaffected [27,28], LPIs are more prone to oral-motor issues and picky eating at the age of two [29].

LPIs are also at increased risk of speech and language disorders (SLD) [30–35], although findings are inconsistent [36]. Evidence suggests that these risks may diminish with age [35], and by primary school, no significant differences between LPIs and FTIs are observed [37]. As feeding and speech use common anatomical structures (oral cavity, pharynx, larynx), early feeding development may influence later articulation skills; however, the existing literature on this association is sparse and methodologically limited [38–40].

Despite their clinical and public health importance, no study in Slovenia has yet addressed FD in LPIs. Therefore, the present study aimed to (1) determine the prevalence of FD in LPIs compared with FTIs, (2) describe the nature of these difficulties in LPIs, (3) identify potential risk factors, and (4) explore possible associations between FD and later SLD among LPIs. The findings may help improve medical support for LPIs and their families.

2. Materials and Methods

2.1. Participants

Parents of 339 LPIs and an equal number of randomly selected FTIs were invited to participate in the study. Inclusion criteria were birth at Ljubljana Maternity Hospital between 1 July 2021 and 30 June 2022, and survival of the child until the time of data collection. A total of 177 parents participated in the study ($n_{LPI} = 89$, $n_{FTI} = 88$); 106 of them also provided consent for the research team to use their child's medical documentation for the purpose of this study.

2.2. Instruments and Measures

Data were collected using a structured online parental questionnaire designed specifically for this study. The questionnaire was adapted from the *Feeding and Swallowing Disorders in Preterm Infants* questionnaire developed by Slana et al. [41]. It covered four domains:

1. General child data: sex, date of birth, birth order.
2. Birth and early health history: pregnancy complications, delivery details, GA at birth, birth weight and length, neonatal health status, hospitalisation details, need for special care.
3. Feeding and swallowing development: parental feeding intentions before birth, timing of first breastfeeding, breastfeeding duration, breastfeeding difficulties, and other information related to infant feeding.
4. Speech and language development: age at first word and first sentence, presence of SLD, and need for speech and language therapy.

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The questionnaire also included a statement asking parents for permission to review the child's medical documentation for the purposes of the study. Medical data were used to supplement parental reports.

Definitions

In the present study, feeding difficulties (FD) were defined primarily as problems with breast- or bottle feeding during infancy, not with the intake of solid foods (although some participants may have experienced difficulties with both milk and solid feeding). FD were identified solely based on parental reports and were considered present if all three of the following criteria were met:

Feeding problems during the first days after birth;

1. Specific challenges with sucking at the breast or bottle (e.g. latching difficulties, poor sucking strength, fatigue during feeding, clicking sounds, suck–swallow–breathe incoordination);
2. At least one sign of a feeding and swallowing disorder (e.g. choking, vomiting, feeding refusal, excessive air swallowing, difficulties managing saliva, feeding lasting more than 30 minutes, abnormal oral sensitivity, insufficient food intake).

The term speech and language disorders (SLD) was used to refer to speech and language developmental delays, including developmental language disorders or speech–sound disorders.

2.3. Data Collection Procedures

Parents of 678 children were invited to participate in the study. Their addresses were obtained from Maternity Hospital records. Invitation letters, including a link and a QR code to the online questionnaire, were sent to them. Parental questionnaires were collected in November 2024.

2.4. Data Analysis

Statistical analyses were conducted using IBM SPSS Statistics 30.0. Descriptive statistics (frequencies, percentages, arithmetic means, standard deviations, minimum and maximum values) were calculated for all participants and separately for LPIs and FTIs. Comparisons between the groups were performed using χ^2 tests (with Likelihood Ratio correction where appropriate), independent samples t-tests (with Welch's correction for unequal variances when necessary), Mann-Whitney U tests, and McNemar tests. Normality and homogeneity were assessed using Kolmogorov–Smirnov and Levene's tests. Using the same procedures, subgroups of LPIs with and without FD, and LPIs with and without SLD were compared. Logistic regression analyses were conducted to identify potential risk factors for FD and SLD in LPIs. Statistical significance was determined at $p < 0.05$.

2.5. Ethics

The study was conducted in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki) and was approved by the National Medical Ethics Committee of the Republic of Slovenia (Protocol No. 0120-407/2024-2711-3, dated 16 October 2024).

By completing the questionnaire, all participants provided informed consent. Participation was voluntary and anonymous; personal data were coded and stored in accordance with legislative requirements. For parents who provided explicit informed consent, their child's hospital records were retrieved by the research team and linked to the questionnaire data using a study ID number.

3. Results

A total of 177 parents completed the questionnaire: 89 had LPIs and 88 had FTIs. As shown in Table 1, the groups did not differ significantly in gender distribution or age at the time of the study. They were also similar in the prevalence of delivery complications and general health issues of the child. However, significant differences were found between LPIs and FTIs in all other birth-related variables, including birth weight and length, GA, mode of delivery, fetal plurality, hospitalisation variables, as well as pregnancy and neonatal health complications.

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Table 1. Comparison of general and birth variables, feeding variables, and speech and language variables between late preterm infants (LPIs) and full-term infants (FTIs).

Variable	LPIs (n = 89)	FTIs (n = 88)	p
General and birth variables			
Male gender, *n* (%)	43 (48.3%)	49 (55.7%)	0.327
Age at the time of the study, mos, M ± SD	34.28 ± 3.67	34.55 ± 3.56	0.701
Gestational age, wks, M ± SD	35.13 ± 0.82	39.85 ± 0.74	
Birth weight, g, M ± SD	2471.02 ± 543.61	3582.50 ± 384.94	< 0.001
Birth length, cm, M ± SD	46.81 ± 3.02	52.00 ± 1.79	< 0.001
Multiple pregnancy, *n* (%)	24 (27.0%)	0 (0%)	< 0.001
Caesarean delivery, *n* (%)	32 (36.0%)	13 (14.8%)	< 0.001
Hospitalization length, days, M ± SD	7.09 ± 4.67	3.09 ± 1.37	< 0.001
Maternal-infant separation, *n* (%)	31 (34.8%)	11 (12.5%)	< 0.001
Separation length, days, M ± SD	4.63 ± 4.58	2.59 ± 3.97	< 0.001
Pregnancy complications, *n* (%)	60 (67.4%)	31 (35.2%)	< 0.001
Delivery complications, *n* (%)	8 (9.0%)	11 (12.5%)	0.329
Neonatal complications, *n* (%)	58 (65.2%)	19 (21.6%)	< 0.001
Child's general health issues, *n* (%)	29 (32.6%)	18 (20.5%)	0.068
Feeding variables			
Exclusive breastfeeding, *n* (%)	43 (48.3%)	76 (86.4%)	
Bottle feeding, *n* (%)	28 (31.4%)	5 (5.7%)	< 0.001
Mixed feeding, *n* (%)	18 (20.3%)	7 (7.9%)	
Exclusive breastfeeding intentions, *n* (%)	81 (91.0%)	82 (93.2%)	0.122
Breastfeeding duration, mos, M ± SD	13.82 ± 10.06	17.32 ± 8.83	0.038
Breastfeeding in first hour after birth, *n* (%)	39 (43.8%)	68 (77.3%)	< 0.001
Feeding problems on postnatal ward, *n* (%)	33 (37.1%)	15 (17.0%)	0.003
Breast- or bottle feeding challenges, *n* (%)	61 (68.5%)	30 (34.1%)	< 0.001
Signs of feeding and swallowing disorders, *n* (%)	53 (59.6%)	47 (53.4%)	0.410
Adequately informed about newborn feeding, *n* (%)	53 (59.6%)	58 (64.8%)	0.474
Speech-language variables			
Age at first word, mos, M ± SD	13.65 ± 4.44 n = 86	12.37 ± 3.72 n = 83	0.045
Age at first sentence, mos, M ± SD	19.28 ± 5.06 n = 85	17.22 ± 4.20 n = 81	0.005
Speech and language disorders, *n* (%)	30 (34.1%) n = 88	13 (15.3%) n = 85	0.004
Referral to SLP, *n* (%)	7 (7.8%) n = 89	4 (4.8%) n = 84	0.048

M = mean, SD = standard deviation, *n* = numerus, n = number of participants who provided information for this variable, g = grams, cm = centimeters, wks = weeks, mos = months, SLP = speech and language pathologist.

As presented in Table 1, the groups differed significantly in their feeding modalities. LPIs were less likely than FTIs to be exclusively or partially breastfed, despite mothers reporting similar intentions to breastfeed prior to delivery. They also exhibited a higher prevalence of specific challenges with breast- and bottle feeding, most commonly fatigue during feeding (44.9%), regurgitation or vomiting (39.3%), insufficient sucking strength (36.0%), and latching difficulties (32.6%). Only 5.6% of participants reported difficulties with suck–swallow–breathe coordination.

On the other hand, no significant differences were observed between LPIs and FTIs in the prevalence of reported signs of feeding and swallowing disorders, such as choking, vomiting, feeding refusal, excessive air swallowing, difficulties with saliva management, prolonged feeding times (> 30 minutes), abnormal oral sensitivity, or insufficient food intake. Maternal satisfaction with

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information on newborn feeding provided until discharge from the postnatal ward did not differ significantly between the groups. Additional analyses showed that while the child's GA was not associated with maternal satisfaction, the child's birth order and maternal satisfaction with information were significantly related (χ^2 (4) = 30.009, $p < 0.001$). More than half of first-time mothers (57.6%) and only 19.6% of mothers with at least two children reported feeling inadequately informed about infant feeding upon discharge.

In accordance with the study's definition, FD were identified in 29 LPIs (32.6%) and 10 FTIs (11.4%), with a significant difference between the two groups ($p < 0.001$). Further analysis within the LPI group revealed that FD prevalence was higher in subgroups with lower GA at birth (41.7% vs. 34.5% vs. 25.0% for 34, 35, and 36 weeks GA, respectively).

To identify potential risk factors for FD among LPIs, comparisons were made between LPIs with and without FD (as shown in Table 2). Only variables with both a statistically significant association and a plausible causal link were considered potential risk factors. Breastfeeding in the first hour after birth was the only variable showing a significant association with FD in bivariate analysis (Table 2); however, logistic regression did not identify it as a statistically significant risk factor ($\beta = -0.055$, 95% CI [–0.120, 0.010], $p = 0.094$). Thus, no significant predictive factors for FD among LPIs were identified in this study.

Table 2. Possible risk factors for feeding disorders (FD) among late preterm infants (LPIs): a comparison of LPIs with and without FD.

Variable	LPIs with FD (*n* = 29)	LPIs without FD (*n* = 60)	p
Male gender, *n* (%)	10 (34.5%)	33 (55.0%)	0.069
Gestational age, wks, M ± SD	34.97 ± 0.82	35.22 ± 0.80	0.174
Birth weight, g, M ± SD	2456.32 ± 419.35	2478.18 ± 604.40	0.843
Birth length, cm, M ± SD	46.71 ± 2.37	46.87 ± 3.31	0.817
Multiple pregnancy, *n* (%)	8 (27.6%)	16 (26.7%)	0.927
Caesarean delivery, *n* (%)	9 (31.0%)	23 (38.3%)	0.501
Maternal-infant separation, *n* (%)	11 (37.8%)	20 (33.3%)	0.670
Separation length, days, M ± SD	3.77 ± 3.78	5.10 ± 5.00	0.604
	n = 11	n = 20	
Pregnancy complications, *n* (%)	22 (75.9%)	38 (63.3%)	0.237
Delivery complications, *n* (%)	3 (10.3%)	5 (8.3%)	0.758
Neonatal complications, *n* (%)	22 (75.9%)	36 (60.0%)	0.141
Child's general health issues, *n* (%)	12 (41.4%)	17 (28.3%)	0.218
Exclusive breastfeeding, *n* (%)	12 (41.4%)	31 (51.7%)	
Bottle feeding, *n* (%)	9 (31.1%)	19 (31.6%)	0.682
Mixed feeding, *n* (%)	8 (27.5%)	10 (16.7%)	
Breastfeeding in first hour after birth, *n* (%)	18 (62.1%)	21 (35.0%)	0.035
Adequately informed about newborn feeding, *n* (%)	16 (55.2%)	37 (61.7%)	0.559

M = mean, SD = standard deviation, *n* = numerus, n = number of participants who provided information for this variable, g = grams, cm = centimeters, wks = weeks.

As also presented in Table 1, LPIs experienced more frequent delays in speech and language development compared to FTIs. On average, they produced their first words and first sentences later, had a higher prevalence of SLD, and were more often referred to a speech-language pathologist. Not all participants provided complete information about their child's speech and language development; therefore, statistics are based on the available data, and differences in sample size are indicated in Table 1.

To identify risk factors for SLD among LPIs, bivariate (Table 3) and logistic regression analyses were conducted. Variables without a statistically significant association with SLD, and those unlikely to represent causal factors, were excluded from the logistic regression analysis. Speech and language

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development variables were also not included, as they represent manifestations or consequences rather than causes of SLD. Logistic regression identified the child's general health issues as a significant risk factor for SLD (β = 1.468, 95% CI [1.240, 15.182], p = 0.022). LPIs with developmental or congenital health conditions (e.g., hypo- or hypertonia, gastro-oesophageal reflux, congenital heart conditions, atopic dermatitis, or others) had 4.3-fold higher odds of developing SLD. No other factors were significantly associated with an increased risk of SLD.

Table 3. Possible risk factors for speech-language disorders (SLD) among late preterm infants (LPIs): a comparison of LPIs with and without SLD.

Variable	LPIs with SLD (n = 30)	LPIs without SLD (n = 58)	p
General birth variables			
Male gender, *n* (%)	13 (43.3%)	29 (50.0%)	0.553
Gestational age, wks, M ± SD	35.00 ± 0.83	35.21 ± 0.81	0.264
Birth weight, g, M ± SD	2300.17 ± 610.82	2547.69 ± 495.39	0.043
Birth length, cm, M ± SD	46.42 ± 2.95	46.95 ± 3.04	0.434
Multiple pregnancy, *n* (%)	12 (40.0%)	12 (20.7%)	0.054
Caesarean delivery, *n* (%)	16 (53.3%)	16 (27.6%)	0.017
Maternal-infant separation, *n* (%)	16 (53.3%)	15 (25.9%)	0.011
Separation length, days, M ± SD	6.03 ± 5.42	3.13 ± 2.98	0.075
	n = 16	n = 15	
Pregnancy complications, *n* (%)	21 (70.0%)	38 (65.5%)	0.672
Delivery complications, *n* (%)	3 (10%)	5 (8.6%)	0.832
Neonatal complications, *n* (%)	19 (63.3%)	38 (65.5%)	0.839
Child's general health issues, *n* (%)	15 (50.0%)	14 (24.1%)	0.014
Feeding variables			
Exclusive breastfeeding, *n* (%)	13 (43.3%)	30 (51.7%)	
Bottle feeding, *n* (%)	11 (36.7%)	17 (29.3%)	0.831
Mixed feeding, *n* (%)	6 (20.0%)	11 (19.0%)	
Exclusive breastfeeding intentions	83.3%	94.8%	< 0.001
Breastfeeding duration, mos, M ± SD	8.93 ± 6.68	16.26 ± 10.48	0.016
	n = 15	n = 35	
Breastfeeding in first hour after birth, *n* (%)	10 (33.3%)	28 (48.3%)	0.016
Feeding problems on postnatal ward, *n* (%)	13 (43.3%)	20 (34.5%)	0.416
Breast- or bottle feeding challenges, *n* (%)	20 (66.7%)	40 (69.0%)	0.826
Signs of feeding and swallowing disorders, *n* (%)	18 (60.0%)	35 (60.3%)	0.975
Adequately informed about newborn feeding, *n* (%)	20 (66.7%)	33 (56.9%)	0.375
Speech-language variables			
Age at first word, mos, M ± SD	15.62 ± 4.82	12.52 ± 3.819	0.003
	n = 29	n = 56	
Age at first sentence, mos, M ± SD	21.83 ± 5.75	17.96 ± 4.13	0.002
	n = 29	n = 56	
Referral to SLP, *n* (%)	12 (40.0%)	4 (6.9%)	0.001
	n = 30	n = 56	

M = mean, SD = standard deviation, *n* = numerus, n = number of participants who provided information for this variable, g = grams, cm = centimeters, wks = weeks, mos = months, SLP = speech and language pathologist.

Although LPIs were at higher risk for both FD and SLD, no significant association was observed between the two variables (p = 0.957), suggesting that early FD do not directly predict later SLD in LPIs.

 doi:10.20944/preprints202601.1070.v1

4. Discussion

Although several attempts have been made to operationalise paediatric FD [42,43], no universally accepted definition or standardised inclusion criteria currently exist. This lack of conceptual clarity, combined with differences between clinical and parental perspectives on FD, complicates comparisons across studies. Reported prevalence of FD among LPIs ranges from 32% to 60% [10,44–46), depending strongly on how FD are defined. In our study, 37.1% of parents reported FD during the postnatal ward stay, whereas 68.5% identified at least one specific challenge with sucking at the breast or bottle.

Several factors may explain this discrepancy. FD may emerge or become more apparent after discharge, when lactation is fully established [45] or when parents become solely responsible for infant care [47]. FD may also develop later due to interactional challenges within the parent-child relationship [48], changes in feeding practices [49], or subsequent health conditions such as food sensitivities, reflux, or colic [48]. Methodological characteristics of our questionnaire could also have contributed to the observed difference: parents were first asked whether their child had any FD, followed by a list of specific signs. Thus, some parents may have recognised particular features of their child's feeding behaviour only when prompted, even if they did not initially perceive their child as having FD.

In addition to biological and methodological factors, insufficient and inconsistent feeding support provided to parents is likely to play an important role in the occurrence or delayed recognition of FD. Almost 40% of mothers participating in our study felt inadequately informed about infant feeding at the time of discharge from the postnatal ward. This finding is concerning and calls for evaluation of health education programmes for expectant and new mothers, as well as institutions providing postnatal support. Feeling inadequately prepared places considerable amount of stress on new mothers, potentially exacerbating FD [18,50].

Consistent with previous research [7–10], our findings confirm that late LPIs are at higher risk for FD than FTIs. In our sample, 32.6% of LPIs were classified as having FD – that is, FD on the postnatal ward, at least one specific challenge with sucking at the breast or a bottle, and at least one sign of feeding and swallowing disorders. Earlier studies have attributed this increased vulnerability primarily to immature sucking skills and inadequate suck–swallow–breathe coordination, which are still developing between 34 and 36 weeks postmenstrual age [15–17]. Interestingly, only 5.6% of parents in our study reported difficulties in suck–swallow–breathe coordination among LPIs. This does not necessarily indicate a lower prevalence of such issues in our cohort, but rather suggests that parents are more likely to recognise and report overt symptoms (e.g. regurgitation, prolonged feeding times, latching difficulties) than subtle physiological mechanisms such as poor suck–swallow–breathe coordination. These findings highlight the importance of combining parental reports with clinical assessments in future studies to more accurately characterise the nature and underlying mechanisms of FD [51,52].

Breastfeeding is one of the most clinically relevant domains in which FD manifest among LPIs [18]. This was clearly reflected in our findings, which showed that exclusive breastfeeding rates were significantly lower among LPIs compared to FTIs (48.3% vs. 86.4%), with a shorter overall breastfeeding duration (14 vs. 17 months), despite similar maternal intentions to breastfeed prior to delivery. These trends have already been consistently documented [53,54] and are mainly attributed to the combined influence of LPIs' biological immaturity, weak sucking strength and perceived insufficient milk supply in the early postnatal period, and early introduction of solid foods before four months of age [54]. These difficulties are further associated with increased maternal psychological distress, which is more common among mothers of LPIs [18,54]. Importantly, previous research has demonstrated that with adequate and timely professional support, LPIs can substantially improve their breastfeeding performance in the first months of life [54]. This shows that breastfeeding is not only a marker of feeding ability but also an outcome that can be substantially modified through structured interventions, underscoring the critical importance of early and continuous lactation support for this population.

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Clinical practice on postnatal wards – particularly the availability and quality of lactation support – plays a decisive role in establishing and maintaining breastfeeding, either facilitating or hindering it [22–24,53). Therefore, systematic integration of early lactation support into routine postnatal care for LPIs is essential. Such support may include teaching mothers to recognise early hunger cues (responsive feeding) [19,22], encouraging mothers to trust their instincts and parenting skills [47], actively involving them in newborn care on the postnatal ward [50], promoting frequent and prolonged skin-to-skin contact and rooming-in, providing guidance on milk expression, offering individualised advice on the use of appropriate feeding utensils (e.g. carefully selecting bottles and pacifiers, supplemental nursing systems, or alternatives such as spoon, cup, or syringe) [22,55,56] and using donor milk when needed [57]. When complementary feeding is required, choosing suitable feeding methods and ensuring close monitoring with timely initiation of oral feeding are key steps to support breastfeeding success [55,56]. Experimental programmes that combined these steps with educating nursing professionals about LPIs and their care proved highly successful in promoting breastfeeding and human milk feeding [57,58].

While numerous studies have consistently shown that LPIs are at increased risk of FD, the predictive factors underlying this risk remain less well understood. In our study, no significant risk factors for FD were identified. Previous research has emphasised GA as one of the strongest predictors of FD, with lower GA at birth or postmenstrual age at the time of oral feeding initiation associated with a higher likelihood of FD [10,17,59,60]. Although this trend was also observed in our cohort, with FD prevalence decreasing as GA increased, the association was not statistically significant. Interestingly, early initiation of breastfeeding (within the first hour after birth) was significantly associated with FD in univariate analysis but was not confirmed as an independent risk factor in logistic regression. This finding contrasts with previous studies [61–63], which primarily examined breastfeeding success, whereas our outcome focused on overall feeding performance. These differences in study endpoints likely explain the discrepancy.

Beyond GA, other studies have identified several potential risk factors for FD among preterm infants, including neonatal morbidities [17], hypotonia and lower socio-economic status [64], early maternal-infant separation [18,50], and clinical indicators such as low birth weight, low Apgar score, or prolonged mechanical ventilation [59,60]. However, these factors have been investigated mainly in the broader preterm population. Risk factors specific to LPIs remain insufficiently explored, highlighting the need for future research focusing specifically on this subgroup.

Our findings are consistent with previous studies showing a higher prevalence of SLD among LPIs compared to FTIs [30–35]. Although associations between FD and SLD have been reported in broader preterm populations [38,39,65,66], our study did not confirm such an association specifically in LPIs. This may reflect the limited accuracy of parental reports on speech and language development. As the data on our cohort are therefore limited, the topic should be further explored; however, future studies should integrate parental reports on children's speech and language development with objective clinical assessments by speech-language pathologists [67].

Developmental or congenital health conditions (e.g. hypotonia, hypertonia, gastro-oesophageal reflux, atopic dermatitis, heart conditions) were identified as a significant risk factor for SLD among LPIs. Interestingly, maternal intention to breastfeed was also associated with SLD, whereas actual feeding methods were not. Mothers of LPIs with SLD were less likely to intend to breastfeed. Although this association may seem illogical, similar findings have been reported previously [68], suggesting that mothers who intend to breastfeed tend to seek more diverse sources of information on child feeding and possess higher levels of knowledge about child development and health awareness. The higher prevalence of developmental or congenital health conditions in our LPI-SLD subgroup may partially align with this pattern. Further research is required to clarify the links between child's health, feeding intention, and speech-language development in LPIs. Nevertheless, providing parents of these children with clear information on early communication milestones and strategies to support language development at home could be beneficial. Paediatricians should

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closely monitor speech and language development in LPIs with underlying health conditions and ensure timely referral to a speech-language pathologist when needed.

Overall, these findings highlight the need for standardised definitions and assessment tools for feeding difficulties, which could enable more consistent research and clinical practice across settings. Early identification and targeted support for LPIs experiencing FD could improve breastfeeding outcomes and potentially mitigate downstream risks such as SLD. Integrating structured parental questionnaires with clinical feeding assessments by institutions for postnatal support may enhance early detection of FD. Moreover, given the observed link between congenital or developmental health conditions and SLD, paediatric follow-up programmes for these children should include routine speech and language screening and provide families with early intervention resources. At the public-health level, these results emphasize the importance of strengthening postnatal care and breastfeeding support programmes for LPIs – including early lactation support, interdisciplinary collaboration, and accessible speech-language services – to support overall infant health and optimise long-term developmental outcomes.

5. Conclusions

The study demonstrated that LPIs are at increased risk for both FD and SLD. Although no specific risk factors for FD were identified, general health conditions of a child emerged as a significant risk factor for SLD. Furthermore, no significant association was found between FD and SLD among LPIs.

Despite these limitations, the findings have important clinical implications for LPIs and their families. They highlight the need for comprehensive multidisciplinary support for LPIs and their families, particularly in establishing and maintaining effective oral feeding, promoting breastfeeding, and ensuring timely prevention and intervention of speech and language disorders.

Author Contributions: Conceptualization, I.H.B. and L.K.C.; methodology, I.H.B., L.K.C. and N.Ž.; formal analysis, N.Ž.; investigation, N.Ž.; resources, N.Ž. and L.K.C.; data curation, N.Ž. and L.K.C.; writing—original draft preparation, N.Ž.; writing—review and editing, I.H.B., L.K.C. and N.Ž.; visualization, N.Ž.; supervision, I.H.B. and L.K.C., project administration, N. Ž., L.K.C. and I.H.B.; funding acquisition, L.K.C. All authors have read and agreed to the published version of the manuscript.

Funding: This research was supported by the University Medical Center Ljubljana, grant number 20180018).

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the National Medical Ethics Committee of the Republic of Slovenia (Protocol No. 0120-407/2024-2711-3, approved on 16 October 2024).

Informed Consent Statement: Written informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data published in this research are available on request from the first author (N. Ž.).

Acknowledgments: The authors are sincerely grateful to all the families who participated in this study. We also wish to express our special thanks to Mira Blagojević for her administrative and technical support.

Conflicts of Interest: The authors declare no conflicts of interest. The funder had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

Abbreviations

The following abbreviations are used in this manuscript:

LPI	Late preterm infant
FTI	Full-term infant
GA	Gestational age

 doi:10.20944/preprints202601.1070.v1

FD	Feeding difficulties
SLD	Speech and language disorders

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