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# Speech therapy intervention impact on the introduction of oral diet in high-risk newborns

## Impacto da intervenção fonoaudiológica na introdução de dieta via oral em recém-nascidos de risco

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### ABSTRACT

**Purpose:** to compare gestational age at birth, weight and corrected gestational age in the introduction of oral diet for premature newborns, who used or not used enteral tubes for feeding, according to the speech therapy intervention received. **Methods:** retrospective, cross-sectional analytical study, carried out in a public maternity reference in northeastern Brazil. One-hundred and forty two medical records of newborns at risk were analyzed. We divided Participants who used or not used an enteral tube (G1 and G2) and who received or not received a speech therapy intervention (GF and GC). **Results:** there was a difference between G1 and G2 regarding Apgar, weights (at birth and at discharge), and gestational ages at birth and corrected for the introduction of oral feeding (with values always lower in G1); and regarding the length of hospital stay and speech therapy intervention (higher in G1). Regarding speech therapy intervention, there was a difference between GF and GC in terms of weights (at birth and at discharge), gestational age at birth and gestational age for oral introduction (with lower values in GF), length of hospital stay and bottle use (higher in GF). **Conclusion:** the use of enteral tube increases the length of hospital stay and the introduction of oral feeding happened earlier in the group that received speech therapy.

**Keywords:** Newborn; Premature; Birthweight; Enteral nutrition; Speech, Language and Hearing Sciences

### RESUMO

**Objetivo:** comparar idade gestacional ao nascimento, peso e idade gestacional corrigida na introdução de dieta por via oral de recém-nascidos prematuros, que utilizaram, ou não, sonda enteral para alimentação, de acordo com a intervenção fonoaudiológica recebida. **Métodos:** estudo retrospectivo, transversal do tipo analítico, realizado em uma maternidade pública de referência, no Nordeste do Brasil. Foram analisados 142 prontuários de recém-nascidos de risco. Os participantes foram divididos quanto ao uso, ou não, de sonda enteral (G1 e G2) e realização, ou não, de intervenção fonoaudiológica (GF e GC). **Resultados:** houve diferença entre G1 e G2 quanto ao teste de Apgar, pesos (ao nascer e na alta) e idades gestacionais ao nascimento e corrigida para introdução de via oral (com valores sempre menores em G1); quanto ao tempo de internação e intervenção fonoaudiológica (maiores em G1). Em relação à intervenção fonoaudiológica, houve diferença entre GF e GC quanto aos pesos (ao nascer e na alta), idade gestacional ao nascimento e idade gestacional para introdução de via oral (com valores menores em GF), tempo de internação e uso de mamadeira (maiores em GF). **Conclusão:** o uso de sonda enteral esteve relacionado ao aumento do tempo de internação, enquanto que a intervenção fonoaudiológica impactou a introdução de alimentação por via oral mais precocemente.

**Palavras-chave:** Recém-nascido; Prematuridade; Peso ao nascer; Nutrição enteral; Fonoaudiologia

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**Conflict of interests:** No.

**Authors' contribution:** AMCM was responsible for the study design and conception, data analysis and interpretation, article review and final approval of the version to be published; DMSA and MOM were responsible for collecting, analyzing and interpreting the data and writing the article; TPLS was responsible for writing and final review of the article; IDCB was responsible for the statistical treatment, analysis, and interpretation of the manuscript data. All authors read and approved the final draft of the paper.

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## INTRODUCTION

Prematurity and low weight, especially when less than 1500 g, are considered risk factors for the newborn (NB) and may interfere with the acceptance of a full oral diet (OD), leading to the need to use alternative routes feeding, such as the enteral tube<sup>(1-3)</sup>.

The World Health Organization (WHO) considers newborns with gestational age at birth (GAB) less than 37 weeks to be premature, being considered extremely premature those born less than 28 weeks; very premature, between 28 and 32 weeks; moderate to late preterm infants between 32 and 37 weeks<sup>(4)</sup> and as low weight, those born with less than 2500 g<sup>(5)</sup>.

The preterm newborn (PTNB) may present conditions that interfere with oral motor skills, such as physiological and neurological immaturity, respiratory disorders, muscle hypotonia and minimized oral reflexes<sup>(1,6)</sup>. Thus, to establish a safe OD satisfactory clinical conditions and the adequacy of the organs of the stomatognathic system must be considered<sup>(2,3)</sup>, with coordination of suction, swallowing and breathing (SSB) functions<sup>(1,3,6-8)</sup>.

It is considered important to promote the adequacy of the stomatognathic system of the PTNB<sup>(2,8,9)</sup>, with establishing SBB coordination<sup>(1,3,6-8)</sup>. This coordination occurs in the 34th week of corrected gestational age (CGA), or even earlier, from the 32nd week onwards, if the alertness behavioral state for breastfeeding readiness is present, being important the Speech Therapy intervention<sup>(3,6,8,10)</sup>.

The speech therapist seeks to improve mobility and tone of the orofacial muscles, favoring the development of stomatognathic functions<sup>(11,12)</sup>. Since breastfeeding is recommended because of the benefits that offers to the NB and his mother, this professional works for the introduction and full establishment of OD occur without risk to the newborn, contributing to the transition from the enteral tube to the breast<sup>(13)</sup> effective, including to enable early hospital discharge<sup>(3,10,14)</sup>.

However, when it is not feasible to establish the OD feeding directly in the mother's breast, other forms of diet offerings, such as the cup and the bottle, have been considered<sup>(15)</sup>. Regardless of the route of supply, in addition to the stable clinical parameters<sup>(6)</sup>, presenting an exclusive and safe OD is an important criteria at the time of hospital discharge<sup>(14)</sup>.

The aim of this study was to compare GAB, weight and CGA in the introduction of OD in NBs, who used, or not, an enteral tube for feeding, according to the speech therapy intervention received.

## METHODS

The research was carried out in a public maternity hospital in the Northeast Region of Brazil, a reference for high-risk mothers and NBs. This is a retrospective, cross-sectional analytical study, approved by the institution's research ethics committee, under number CAAE 0198.0.107.000-11. The data were collected in the sector of Medical and Statistics Archives (SAME), based on the "Protocol for Data Collection of Medical Records of Newborns" (Appendix 1), previously tested in a pilot study.

The sample consisted of medical records of 142 NBs of both genders, born between November 2010 and January 2011, submitted, or not, to speech therapy intervention. Inclusion

criteria were: being premature (GAB <37 weeks)<sup>(4)</sup>, regardless of birthweight and having at least four days of hospitalization. The exclusion criteria were: medical records that were not completely fulfilled as to the aspects addressed in the present study; NBs born at term or post-term; cases that presented craniofacial syndromes and / or malformations at birth and NBs that died during hospitalization.

The variables analyzed were: NB's gender, type of delivery, neonatal clinical conditions (Apgar score in the first minute, birthweight, weight at discharge, GAB, CGA at the beginning of the OD, CGA at discharge) hospitalization, speech therapy intervention (with number of visits, when performed), use, or not, of enteral tube and mode of diet offer on the first OD day.

The first day of the OD offer was considered to be the one in which the NB started to be fed orally, regardless of the need to use an enteral tube as a complement. This introduction could be carried out in several ways, namely: stimulating the mother's breast; offering the cup as the main form of feeding, when the NB did not accept the mother's breast; offering the cup as a complement to the breastfeeding; baby bottle.

The NBs were distributed regarding the use of enteral tube in group 1 (G1), formed by 104 NBs who used a tube at some point, during hospitalization, and group 2 (G2), formed by 38 NBs who did not need this alternative route. In addition, the study population was also divided according to the speech therapy intervention received in the GF group, composed of 91 NBs who received speech therapy intervention and the control group (GC), composed of 51 NBs who did not receive the intervention.

The collected data were tabulated in a Microsoft Office Excel 2010 spreadsheet and treated statistically. The categorical variables collected were described by absolute frequency and relative percentage, the continuous variables by median and interquartile interval (IQI), since their adherence to normal distribution was not confirmed (Shapiro-Wilks test:  $p < 0,05$ ). Associations between categorical variables were tested using Fisher's exact test or Pearson's chi-square test. The median differences were tested using the Mann-Whitney test. They were also magnified by Glass's Bisserial Rank effect sizes, when continuous and Phi Coefficient, when categorical, whose interpretations are: trivial ( $r < 0,1$ ), small ( $0,1 \leq r < 0,25$ ), medium ( $0,25 \leq r < 0,4$ ), or large ( $r \geq 0,4$ ). The software used was the R Core Team 2020 and the significance level adopted was 5%<sup>(16)</sup>.

## RESULTS

The results are presented according to the information obtained in the medical records of 142 NBs, of which 43% ( $n = 61$ ) were male and 57% ( $n = 81$ ), female. GAB varied between 24 and 36 weeks and 4 days, with a median of 34 weeks (IQI = 32-35). Birthweight varied between 735 g and 3190 g, with a median of 1865 g (IQI = 1523.8-2217.5). The median length of hospitalization for NBs was 12 days (IQI = 7-26) and the Apgar score in the first minute, on a scale from 0 to 10, was 8 (IQI = 6-9) (Table 1).

Regarding the form of food supply on the first day OD offer, it was found that 95.8% ( $n = 136$ ) received maternal breast (not necessarily exclusively); 78.8% ( $n = 112$ ) used the cup as a complement to the mother's breast; 28.2% ( $n = 40$ ); they were fed with the cup as the main form and only 9.9% ( $n = 14$ ) received the milk in the bottle (Table 1).

Regarding the use of enteral tubes, groups G1 (n = 104) and G2 (n = 38) showed differences ( $p < 0.05$ ), respectively, regarding the following aspects: Apgar (8 and 8.5), birthweight (1747.5 g and 2057.5 g), weight at discharge (1910 g and 2135 g), length of hospital stay (16 days and 7 days), and GAB (33 weeks and 35.2 weeks). As for receiving speech therapy intervention, there was also a difference between G1 (n = 75; 72.1%) and G2 (n = 29; 27.9%). There was no difference between groups regarding CGA, for the introduction of OD (35 weeks and 35.4 weeks) (Table 2).

Regarding speech therapy intervention, there was a difference ( $p < 0.05$ ) between GF (n = 91) and GC (n = 51), respectively: birthweight (1750 g and 2215 g), discharge weight (1915 g and 2185 g), length of hospital stay (16 days and 8 days), GAB (33 weeks and 35 weeks), CGA to introduce OD (34.7 weeks and 35.7 weeks) and bottle use (n = 13; 14, 3% and n = 1; 2%) (Table 3).

## DISCUSSION

From the analysis of the results it was observed that the study population was composed, in general, by moderate to late PTNBs<sup>(4)</sup> and also low weight<sup>(5)</sup>. The literature points out that low birthweight may be related to prematurity<sup>(17)</sup>.

Of the entire population studied, 104 NBs needed to use an enteral tube at some point during hospitalization (G1), while 38 NBs did not need the tube (G2), showing the predominance of the need to use an alternative feeding route in risk NBs as demonstrated in previous studies<sup>(18,19)</sup>.

Despite the risk characterization (prematurity and low weight) of the population studied here, the Apgar scores obtained in the first minute of life were considered good and reported as low risk for future problems<sup>(20,21)</sup>. Thus, although in the comparison between G1 and G2, the first group had a lower Apgar score, both groups obtained a score considered reassuring<sup>(22)</sup>.

It was observed that most NBs, on the first day of OD offer, had the experience in the mother's breast, even if not necessarily exclusively, and that there was a high prevalence of cup use and low incidence of bottle use. These data can be related both to the good clinical conditions at birth presented by the NBs, and to the fact that the maternity where they were born recommends breastfeeding, following the precepts of the Baby Friendly Hospital Initiative (BFHI), which contraindicates the use of artificial teats<sup>(23)</sup>.

It is important to highlight that PTNBs may present oral disorders that negatively influence the breastfeeding process<sup>(1,6)</sup>. In these cases, in which breastfeeding is not possible, it is only after the speech therapy intervention and investment of the whole team, and all possible techniques are exhausted, that the multidisciplinary team will define the best form of feeding for the NB, whether it is a tube enteral, cup or bottle<sup>(24)</sup>.

Regarding the need to use the enteral tube, both G1 and G2 were composed of PTNBs, however, G1's NBs had a lower GAB median than G2's, showing that the most extreme prematurity was related to the lack of coordination of SSB, being the probable indication for use of enteral tube in G1, as a feeding route<sup>(19)</sup>. It is worth mentioning that both groups had similar CGA medians to start OD, demonstrating readiness to start feeding by OD at an early age, as indicated in the literature<sup>(3,6)</sup>.

**Table 1.** Neonatal clinical conditions, feeding and speech therapy for newborns - Aracaju (SE) - (2013)

	n	%	Median	IQI
Gender				
Male	61	43.0		
Female	81	57.0		
Type of Delivery				
Normal	63	44.4		
Cesarean	79	55.6		
APGAR			8	6-9
Birthweight (g)			1865	1523.8-2217.5
Weight at discharge (g)			1943	1783.8-2235
Length of hospital stay (days)			12	7-26
GA at Birth (weeks)			34	32-35
GA at Oral Diet (weeks)			35	34-36.1
Ga at Discharge (weeks)			36	35.4-37.3
Number of Visits			4	2-6
Use of enteral tube				
Yes	104	73.2		
No	38	26.8		
Speech therapy intervention				
Yes	91	64.1		
No	51	35.9		
Oral Diet				
Breast	136	95.8		
Cup (complement)	112	78.9		
Cup (major)	40	28.2		
Baby Bottle	14	9.9		

**Subtitle:** n = absolute frequency; % = percentage; g = grams; IQI = interquartile interval; GA = gestational age

**Table 3.** Speech therapy intervention and neonatal clinical conditions and feeding newborns - Aracaju (SE) - (2013)

	Speech therapy intervention		p-value	E
	Yes	No		
Gender, n (%)				
Male	32 (35.2)	29 (56.9)	0.012 <sup>Q*</sup>	0.210 <sup>P</sup>
Female	59 (64.8)	22 (43.1)		
Type or Delivery, n (%)				
Normal	44 (48.4)	19 (37.3)	0.222 <sup>Q</sup>	0.107 <sup>P</sup>
Cesarean	47 (51.6)	32 (62.7)		
APGAR, Median (IQR)	8 (6-9)	8 (7-9)	0.368 <sup>W</sup>	-0.089 <sup>R</sup>
Birthweight (g), Median (IQR)	1750 (1395-2005)	2215 (1735-2695)	<0.001 <sup>W*</sup>	-0.467 <sup>R</sup>
Discharge Weight (g), Median (IQR)	1915 (1775-2065)	2185 (1818-2525)	0.003 <sup>W*</sup>	-0.306 <sup>R</sup>
Length of hospital stay (days), Median (IQR)	16 (11-42)	8 (5-11)	<0.001 <sup>W*</sup>	0.535 <sup>R</sup>
GA at Birth (weeks), Median (IQR)	33 (31.6-34.3)	35 (33.9-36)	<0.001 <sup>W*</sup>	-0.525 <sup>R</sup>
GA at Oral Diet (weeks), Median (IQR)	34.7 (33.4-36)	35.7 (35-36.1)	0.010 <sup>W*</sup>	-0.262 <sup>R</sup>
GA at Discharge (weeks), Median (IQR)	36 (35.1-37.6)	36.6 (35.6-37.1)	0.293 <sup>W</sup>	-0.108 <sup>R</sup>
Oral Diet, n (%)				
Breast	85 (93.4)	51 (100.0)	0.088 <sup>F</sup>	0.157 <sup>P</sup>
Cup (complement)	70 (76.9)	42 (82.4)	0.524 <sup>F</sup>	0.064 <sup>P</sup>
Cup (major)	24 (26.4)	16 (31.4)	0.563 <sup>Q</sup>	0.053 <sup>P</sup>
Baby Bottle	13 (14.3)	1 (2.0)	0.019 <sup>F*</sup>	0.198 <sup>P</sup>

Q – Chi-square Test; F – Fisher Exact Test; W – Mann-Whitney Test; R – Glass Rank biserial Effect Size; P – Phi Coefficient; \* - p<0.05;

**Subtitle:** n = absolute frequency; % = percentage; g = grams; IQR = interquartile interval; E = size effect

**Table 2.** Use of enteral tube and neonatal clinical conditions, feeding and speech therapy for newborns - Aracaju (SE) - (2013)

	Use of enteral tube		p-value	E
	Yes	No		
Gender, n (%)				
Male	45 (43.3)	16 (42.1)	0.901 <sup>Q</sup>	0.010 <sup>P</sup>
Female	59 (56.7)	22 (57.9)		
Type or Delivery, n (%)				
Normal	46 (44.2)	17 (44.7)	0.957 <sup>Q</sup>	0.005 <sup>P</sup>
Cesarean	58 (55.8)	21 (55.3)		
APGAR, Median (IQR)	8 (6-8)	8.5 (7.8-9)	<0.001 <sup>W*</sup>	-0.394 <sup>R</sup>
Birthweight (g), Median (IQR)	1747.5 (1432.5-2050)	2057.5 (1915-2530)	<0.001 <sup>W*</sup>	-0.394 <sup>R</sup>
Weight at discharge (g), Median (IQR)	1910 (1741.3-2135)	2135 (1901.3-2381.3)	0.001 <sup>W*</sup>	-0.364 <sup>R</sup>
Length of hospital stay (days), Median (IQR)	16 (10-33.5)	7 (5-11)	<0.001 <sup>W*</sup>	0.513 <sup>R</sup>
GA at Birth (weeks), Median (IQR)	33 (32-35)	35.2 (34.2-36)	<0.001 <sup>W*</sup>	-0.501 <sup>R</sup>
GA at Oral Diet (weeks), Median (IQR)	35 (33.6-36.1)	35.4 (35-36)	0.077 <sup>W</sup>	-0.194 <sup>R</sup>
GA at Discharge (weeks), Median (IQR)	36.1 (35.1-37.4)	36.4 (35.9-37)	0.243 <sup>W</sup>	-0.129 <sup>R</sup>
Number of Visits, Median (IQR)	4 (2-6)	2 (1.3-4)	0.095 <sup>W</sup>	0.263 <sup>R</sup>
Oral Diet, n (%)				
Breast	99 (95.2)	37 (97.4)	1.000 <sup>F</sup>	0.048 <sup>P</sup>
Cup (complement)	80 (76.9)	32 (84.2)	0.486 <sup>F</sup>	0.079 <sup>P</sup>
Cup (major)	32 (30.8)	8 (21.1)	0.297 <sup>F</sup>	0.096 <sup>P</sup>
Baby Bottle	11 (10.6)	3 (7.9)	0.760 <sup>F</sup>	0.040 <sup>P</sup>
Speech therapy intervention, n (%)				
Yes	75 (72.1)	16 (42.1)	0.001 <sup>Q*</sup>	0.277 <sup>P</sup>
No	29 (27.9)	22 (57.9)		

Q – Chi-square Test; F – Fisher Exact Test; W – Mann-Whitney Test; R – Glass Biserial Rank Effect Size; P – Phi Coefficient; \* - p<0.05;

**Subtitle:** n = absolute frequency; % = percentage; g = grams; IQR = interquartile interval; E = size effect

Although the population of the groups was mostly composed of low weight NBs, there was a difference between G1 and G2 in terms of birthweight, always with lower median values in G1, when compared to G2, agreeing with studies that demonstrated that the enteral tube is used in NBs with lower weights<sup>(18,24)</sup>.

The weight difference between the groups persisted throughout the whole hospitalization because G1 maintained a lower median weight than G2, showing a difference in the

comparison between groups at the time of discharge. However, both groups had, at the time of discharge, the minimum weight greater than 1600 g, recommended by the Ministry of Health<sup>(24)</sup>.

Regarding the length of hospital stay G1 had a higher median time when compared to G2 which is in agreement with the literature that stated the prolonged use of enteral tubes may require longer hospital stays until reaching favorable clinical conditions for discharge<sup>(10)</sup>. On the other hand, CGA at hospital

discharge was similar in both groups, pointing out that, despite risk conditions at birth, when reaching CGA close to full-term birth (37 weeks)<sup>(25)</sup>, the population studied here presented adequate clinical and feeding conditions due to OD.

Regarding to speech therapy intervention, in relation to the NBs who used or not using an enteral tube, it was higher in G1 than in G2, with a difference in the comparison between the groups. The use of a probe appeared as an important indicator for the need for speech therapy work, at the same time that it was related to the fact that G1 had lower values in the conditions of birth (Apgar, GAB and weight, and also in the CGA, for beginning of OD and weight at discharge).

When the NBs were divided according to whether they received speech therapy intervention or not, GF showed a difference in the values (in median) of GAB, CGA for OD, weight (at birth and at discharge), always lower than the GC. Previous study pointed out these aspects as important for the indication of speech therapy<sup>(26)</sup>, mainly due to SSB incoordination<sup>(3,6)</sup>. The beginning of OD earlier in GF agrees with a study that states that early speech therapy in PTNB presents satisfactory results<sup>(27)</sup>.

Regarding weight at the time of discharge, GF remained lighter than GC, which can be justified by the fact that the maternity ward where this study was carried out practices the monitoring recommended in the care for low weight NB<sup>(24)</sup>, the rise is already viable after 1600 g, if there is effective SSB coordination<sup>(1,3,6-8)</sup>, with exclusive breastfeeding (when possible), and, above all, with food for safe OD, which, in this study, was provided from the speech therapy intervention.

As they are younger and have lower weights, the GF's NBs needed more hospitalization time, compared to the GC, possibly so that they could establish favorable clinical conditions, including full and safe DO feeding, an important criterion for hospital discharge<sup>(1)</sup>. Nevertheless, they were discharged from hospital on time and GA recommended to NB at term and healthy.

As for the form of OD offer, there was no difference between the groups, neither for the NBs who suckled the breast, nor for those who used a cup. Only the use of the bottle had a difference between the GF and GC groups. It is considered that the NBs who did not progress satisfactorily in the maternal breast, needed speech therapy monitoring to train SSB functions<sup>(2)</sup> and, in specific cases, there was an indication of offering a diet through the artificial nozzle.

It is considered as a limitation of this research the fact that it is not possible to carry out a randomized case-control study, as it is a retrospective study that analyzed archived medical records, without direct contact with the NBs described here.

The findings with the studied population at risk showed what has been treated by the specialized literature in the area, which points out that oral sensorimotor stimulation, performed by a qualified professional<sup>(28,29)</sup>, it is a positive measure for the development of risky NB, improving SSB coordination, accelerating the alimentary transition from enteral tube to OD, favoring early weight gain and breastfeeding<sup>(30)</sup>.

## CONCLUSÃO

Newborns who needed to use an enteral tube during hospitalization had lower GAB, CGA at OD and weight (at birth and at discharge) than those who did not use a probe. More premature and underweight newborns also remained in hospital longer and required a greater number of speech-

language interventions, but managed to start OD in CGA at an age considered safe, with SSB coordination.

However, the introduction of oral feeding happened earlier in the group that received speech therapy and allowed that group, even with a longer hospital stay, to be discharged with the recommended gestational age, similar to term birth.

The findings point to the importance of inserting the speech therapist in the multidisciplinary team to monitor newborns at risk, positively impacting the introduction of an oral diet in these babies.

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**Appendix 1.** Protocol for collecting data from medical records of newborns

Protocol for collecting data from medical records of newborns
Collection date: _____ Medical record number: _____ Birth date: _____ Gender: ( ) Male ( ) Female Type of Delivery: ( ) Normal ( ) Cesarean ( ) Forceps Apgar: _____ Birthweight: _____ Weight at discharge: _____ Length of hospital stay: _____ Gestational Age at Birth: _____ Corrected Gestational Age when starting OD: _____ Corrected Gestational Age at discharge: _____ <b>Nourishment:</b> ⇒ Enteral Tube ( ) ⇒ Breast ( ) ⇒ Cup ( ) ⇒ Baby Bottle ( ) Received speech therapy assistance: ( ) Yes ( ) No Time: _____ <b>Speech therapy opinion:</b> _____ _____ Date of speech therapy opinion: _____ <b>Subtitle:</b> OD= oral diet