Research Article

Evaluation of the Beginning of Oral Feeding in Premature Children with the POFRAS Instrument: Estudio Piloto-Popayán, Colombia

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Abstract

Objective: To determine the initiation of oral feeding through the POFRAS Premature Preparation Assessment Instrument, for a pilot study.

Methodology: A cross-sectional descriptive quantitative study was carried out through the implementation of a pilot test, applied by previously trained speech therapists with experience in the subject. Thirty-two premature infants from the neonatology unit of the Hospital Universitario San José were evaluated with the POFRAS instrument, chosen by non-random sampling for convenience, applying inclusion and exclusion criteria. The information was analyzed through the SPSS statistical package.

Results: 8 of the 18 items (searching reflex, pause sucking, sucking reflex, pause sucking rhythm, maintenance of alertness, state of consciousness, suction force and tongue movement) evaluated by the POFRAS instrument. are significantly related to the initiation of oral feeding in preterm infants, when obtaining a result in Fisher's statistical test ($p < 0.05$).

Conclusion: A large part of the POFRAS instrument items are pertinent to determine in a timely manner the start of oral feeding. Neonates who obtain a score greater than 28 points are ready to start oral feeding.

Keywords: Neonate; Premature; Pilot Test; Oral Feeding

Abbreviation

POFRAS: Preterm Oral Feeding Readiness Assessment Scale

Introduction

"Food is the beginning of a digestive process that leads to obtaining the necessary nutrients for the growth and development of individuals" [1]; in neonates, it is carried out through nutritional suction understood by Campos [2], as the ability to perform rhythmic and synchronous movements that take food to the oral cavity to swallow it and that, according to Durán., *et al.* [3] is guaranteed by the presence of adaptive reflexes (sucking, swallowing and searching) and protecting the airways (tongue protrusion, biting, vomiting and coughing).

From the anatomical-physiological point of view, the premature neonate presents a clear disadvantage in relation to the term newborn, since, as Campos [4] expresses it, its efficiency to feed does not depend only on the gestational age, but also on the muscle tone, physiological stability, general development, medical condition, behavior, and gastrointestinal and nervous maturity.

The alterations of the aforementioned processes can generate difficulties in the authorization of the oral route, for this reason,

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it is important to know when the newborn is ready to start this process and not to resort to methods that generate negative effects, such as prolongation of the enteral or parental feeding that has the following consequences: inhibition of sucking, reduction of the primitive gag reflex and a generalized alteration of oral function [5], which in turn impairs the mother-child bond, increases the time long-term hospitalization interferes with craniofacial development, thus affecting structures that influence future speech and language processes.

According to the World Health Organization (WHO) "each year about 15 million babies are born prematurely in the world" [6]. In Colombia, according to the National Administrative Department of Statistics (DANE) in 2015, there were "132,385 premature births, 3,100 of these in the department of Cauca" [7]; According to Bautista and Batista [8] it is estimated that between 32 and 40% of premature infants have problems eating properly.

These figures show the need for attention to this population and especially to the evaluation, diagnosis and intervention processes. In this sense, the validation of instruments that make it possible to clearly define when the premature neonate is able to initiate oral feeding is transcendental and that they use a common language among the professionals in charge of these processes, since currently, as mentioned by Fujinaga., *et al.* [9], the evaluation is carried out subjectively based mainly on two criteria: gestational age and weight, leaving aside other variables to consider such as: clinical stability, state of consciousness, oral motor skills and coordination between sucking functions, swallowing and breathing.

However, although there are clinical evaluation instruments for this process that have been standardized in other countries, they cannot be used in Colombia, since they require local validation and training to be applied; In addition, most hospitals Colombian second- and third - level do not have all the available diagnostic processes, including endoscopy found transnasal and video fluoroscopy of swallowing function due to its high cost. Due to the above, this study intends to validate the "Premature preparation assessment instrument for the initiation of oral feeding- POFRAS" prepared and validated by the Speech Therapist Cristina Fujinaga in Brazil, through a study pilot program at the San José de Popayán University Hospital in the first academic semester of 2017.

This research seeks to contribute to the development and well-being of the study population, to contribute to the reduction of the risks associated with enteral or parental nutrition, initiating breastfeeding in a reliable and safe way, reducing metabolic alterations, favoring growth and general development. In turn, having a standardized instrument for the Colombian population will allow the benefit of hospital institutions, since it will facilitate a faster evolution, which is why the hospitalization time will be shorter, avoiding complications in this process, benefiting the neonate and his family.

On the other hand, it will have a great impact for the professional community, since there will be a reliable instrument, easily accessible and with a universal language of speech and language domain, which will incorporate new knowledge, facilitate the adoption of new techniques, and generate a better service. of services and professional performance with quality.

Methodology

The present study sought the content validity of the "Premature Preparation Assessment Instrument for the Initiation of Oral Feeding-POFRAS", using a cross-sectional descriptive quantitative design through a pilot test.

The universe population was all preterm infants born at 30 weeks of gestation onwards and registered between April and June 2018, who were in the neonatology unit of the San José de Popayán University Hospital.

The population was obtained through non-random sampling for convenience, selecting 32 preterm infants, 12 girls and 20 boys with the aforementioned characteristics, who had not yet started breastfeeding. Neonates born with clinically diagnosed congenital malformations and/or critically ill were excluded. The study was carried out after approval of the ethics committee and application of informed consent to the parents of those evaluated, after which the POFRAS instrument was applied by Hospital speech therapists with experience in the subject and previously trained to perform the evaluation of newborns. selected.

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The analysis of the results was carried out in the statistical package SPSS.22 through an exploratory study of data to organize, prepare the data and detect flaws in their design and collection, taking into account the sociodemographic variables and the items of the data. instrument; A univariate descriptive analysis was also carried out where qualitative variables were examined through proportions and 95% confidence intervals and in the case of quantitative variables through measures of central tendency; finally, a bi-variate analysis was performed using Fisher's exact statistic (p < 0.05).

The POFRAS instrument, validated in Brazil by the PhD, Cristina Ide Fujinaga consists of 5 categories, consisting of 18 items: 1 corrected age, 2 state of behavioral organization (state of consciousness, global posture, general tone), 3 oral posture (posture mouth, tongue posture), 4 oral reflexes (seeking, sucking, biting, gagging reflexes) and 5 non-nutritive sucking (tongue movements, tongue grooving, jaw movement, sucking force, sucking by pause, maintenance of the rhythm of suctions by pause, maintenance of alertness, signs of stress); Each item has a maximum score of 2 points and the instrument has a total of 36, with a cut-off point at 28 where it is considered viable to enable the oral route.

Results

Table 1 shows the socio demographic characteristics of the children included in the study; the gender, type of affiliation to the social security system, origin and age are indicated; Within the population, it is highlighted that the majority are male, belong to the subsidized regime, come from the municipality of Popayán and are in an age range of 6 to 10 days, with a statistical mean of 9.5.

The content of table 2 describes the hemodynamic parameters that were taken into account for the evaluation, most of which remained stable, except for respiratory rate and oxygen saturation, presenting increased and decreased values respectively.

Variable		Frequency	Percentage	95% confidence interval	
				Lower	Higher
Sex	Female	12	37.5	21.9	53.9
	Male	20	62.5	46.9	78.1
Affiliate type	Contributory	1	3.1	0	9.4
	Linked	2	6.3	0	15.6
	Special regime	1	3.1	0	9.4
	Subsidized	28	87.5	68.8	96.6
Origin of the mother	Algeria	2	6.3	0	15.6
	The Board	2	6.3	0	15.6
	The Tambo	3	9.4	0	21.9
	Guapi	2	6.3	0	15.6
	Others	7	21.9	9.4	37.5
	Piendamo	4	12.5	3.1	25
	Popayan	9	28.1	12.6	43.8
	Silvia	3	9.4	0	18.8
Chronological age (days)	1 to 5 days	12	37.5	21.9	53.1
	6 to 10 days	13	40.6	25.0	59.3
	11 to 15 days	2	6.3	0	15.6
	16 to 20 days	1	3.1	0	9.4
	21 to 25 days	2	6.3	0	15.6
	More than 25 days	2	6.3	0	15.6

Table 1: Percentage distribution of sociodemographic variables.

Hemodynamic parameters		Frequency	Percentage	95% confidence interval	
				Lower	Higher
Temperature	Normal	32	100	100	100
Heart rate	Normal	32	100	100	100
Breathing frequency	Augmented	4	12.5	3.1	25.0
	Normal	28	87.5	75.0	96.9
Oxygen saturation	Diminished	7	21.9	9.4	37.5
	Normal	25	78.1	62.5	90.6

Table 2: Distribution of hemodynamic parameters of premature infants.

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Table 3 shows the sections to take into account to determine the start of oral feeding, it also shows the frequency with which each of the instrument variables is assigned to the evaluated neonates and their interval of confidence.

The results obtained by the test score are shown in table 4, in which the neonates who were not in a position to start oral feeding predominate.

Variables			Frequency	Percentage	95% confidence interval	
					Lower	Higher
Feeding way Alternative methods (cup and syringe)		Orogastric tube	10	31.3	15.6	50.0
			22	68.8	50.0	84.4
Gestational corrected age Equal to or greater than 34 weeks Less than 32 weeks		Between 32 and 34 weeks	3	9.4	0	21.9
			25	78.1	62.5	90.6
			4	12.5	3.1	25.0
Organizational status includes	Consciousness state	Alert	8	25.0	12.5	40.6
		Mild sleep	19	59.4	40.6	75.0
		Deep sleep	5	15.6	6.3	28.1
	Global posture	Extension	1	3.1	0	12.4
		Flexion	25	78.1	62.5	90.6
		Semiflexion	6	18.8	6.3	34.4
	General tone	Diminished	12	37.5	21.9	53.1
		Normotonia	20	62.5	46.9	78.1
Oral posture	Lip pose	Open	3	9.4	0	21.8
		Ajar	3	9.4	0	21.9
		Sealed	26	81.3	65.6	93.8
	Tongue posture	Elevated	2	6.3	0	15.6
		Flat	26	81.3	68.8	93.8
		Protruded	1	3.1	0	9.4
		Retracted	3	9.4	0	21.9
Oral reflexes	Search reflection	Absent	13	40.6	25.0	56.3
		Present slow	9	28.1	15.6	46.8
		Present fast	10	31.3	15.6	46.9
	Suction reflex	Absent	1	3.1	0	12.4
		Weak	2. 3	71.9	53.6	87.5
		Strong	8	25.0	12.5	40.6
	Bite reflex	Absent	7	21.9	9.4	37.5
		Present	2.3	71.9	56.3	87.5
		Present exacerbated	2	6.3	0	15.6
	Gag reflex	Absent	13	40.6	25.0	59.4
		Present	18	58.3	37.5	71.9
		Present anteriorized	1	3.1	0	9.4

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Non-nutritive suction	Movement of the fill	Suitable	20	62.5	43.8	78.1
		Altered	10	31.3	18.8	50
		Absent	2	6.3	0	15.6
	Grooving of the tongue	Present	4	12.5	3.1	25.0
		Absent	28	87.5	75.0	96.9
	Movement of the jaw	Suitable	26	81.3	68.8	93.8
		Altered	3	9.4	0	21.9
		Absent	3	9.4	0	18.8
	Suction force	Absent	2	6.3	0	15.6
		Weak	24	75.0	59.4	90.5
		Strong	6	18.8	6.3	31.3
	Suctions per pause	From 5 to 8 s/p	7	21.9	9.4	37.5
		Greater than 8 s/p	8	25.0	9.4	40.6
		Less than 5 s/p	17	53.1	34.4	68.8
	Suction rhythm maintenance by pause	Arrhythmic	16	50.0	34.4	68.8
		Absent	5	15.6	3.1	28.1
		Rhythmic	11	34.4	18.8	50.0
	Maintaining alertness	No	5	15.6	3.1	28.1
		Partial	8	25.0	12.5	40.6
		Yes	19	59.4	40.6	75.0
	Signs of stress	Missing	26	81.3	65.6	93.8
		Until 3	6	18.8	6.3	34.4

Table 3: Percentage distribution of the clinical parameters that determine the initiation of oral feeding.

Variables		Frequency	Percentage	95% confidence interval	
				Lower	Higher
Initiation of oral feeding	Does not start	21 (< 28 Points)	65.6	81.3	21
	Start	11 (> 28 Points)	34.4	50.0	11

Table 4: Percentage distribution of preterm infants who started oral feeding.

The information in table 5, has shown that sub items: rooting reflex, rhythm suction pause, reflection suction, suctions for pause, maintaining alertness, consciousness, suction force and movement of the tongue, have a statistically significant relationship with the start of oral feeding, obtaining less than 0.05 in Fisher's exact statistic. Additionally, in the sub-items: gag reflex, tongue posture and jaw movement, although P is > 0.05, they are close values, therefore it is feasible that in a larger sample there is a significance between these items and the initiation of oral feeding. However, in the sub-items: global tone, global posture, corrected age, bite reflex, lip posture and signs of stress, the P value is > 0.05, therefore, there is no statistically significant relationship with the start of oral feeding.

Discussion

To determine the initiation of oral feeding, the instrument takes into account variables including the newborn's hemodynamic parameters, such as the heart rate, which normally ranges from 120

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Variables	Does not start	Start	Exact Fisher
Search reflection			
Present fast	1	9	
	3.1%	28.1%	
Absent and present slow	21	2	000
	62.5%	6.2%	
Pause suction			
Greater than 8 s / p	1	7	
	3.1%	21.9%	
Less than 5 s / p and 5 to 8 s / p	20	4	0.001
	62.5%	12.5%	
Suction reflex			
Strong	1	7	
	3.1%	21.9%	0.001
Absent and weak	20	4	
	62.5%	12.5%	
Suction rate per pause			
Rhythmic	2	9	
	6.2%	28.1%	0.000
Absent and arrhythmic	19	2	
	59.4%	6.2%	
Maintaining alertness			
Yes	8	11	
	25.0%	34.4%	0.001
No and partial	13	0	
	40.6%	0.0%	
Consciousness state			
Alert	2	6	
	6.2%	18.8%	0.010
Light and deep sleep	19	5	
	59.4%	15.6%	
Suction force			
Strong	1	5	
	3.1%	15.6%	0.011
Absent and weak	20	6	
	62.5%	18.8%	

Tongue movement			
Suitable	10	10	
	31.2%	31.2%	0.023
Absent and upset	10	1	
	31.2%	3.1%	
Gag reflex			
Present	9	9	
	28.1%	28.1%	0.061
Absent and present prior	12	2	
	37.5%	6.2%	
Tongue posture			
	15	11	
	46.9	34.4%	0.071
Flat			
Flat retracted and raised	6	0	
	18.8%	0.0%	
Jaw movement			
Suitable	15	11	
	46.9%	34.4%	0.071
Absent and upset	6	0	
	18.8%	0.0%	
Global tone			
Normotonia	11	9	
	34.4%	28.1%	0.139
Decreased and increased	10	two	
	31.2%	6.2%	
Global posture			
Flexion	18	7	
	56.2%	21.9%	0.197
Extension and semiflexion	3	4	
	9.4%	12.5%	
Corrected Age			
Equal to or greater than 34 weeks	15	10	
	46.9%	31.2%	0.374
Less than 34 weeks	6	1	
	18.8%	3.1%	
Bite reflex			

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Present	14 43.8%	9 28.1%	0.441
Absent and present exacerbated	7 21.9%	2 6.2%	
Lingual grooving			
Present	2 6.2%	2 6.2%	0.572
Absent	20 62.5	8 25.0	
Lip pose			
Sealed	17 53.1%	9 28.1%	1,000
Open and between sealed	4 12.5%	2 6.2%	
Signs of stress			
Missing	17 53.1%	9 28.1%	1,000
More than 3 and up to 3	4 12.5%	2 6.2%	

Table 5: Percentage distribution of instrument variables according to the start of oral feeding.

to 170 beats per minute. There is also the respiratory rate that should be between 30 to 80 breaths per minute; the temperature that oscillates between 36.1 to 37.7 degrees centigrade and the oxygen saturation with an average value of 95% [10]. The results of the present study show that in the group of neonates evaluated there is an increase in respiratory rate (12.5%) and a decrease in oxygen saturation (21.9%) when performing the non-nutritive suction process. This becomes evident according to what is reported by Villamizar, Vargas and Díaz [11] who express that these parameters possibly present variations in their normal values, due to the fact that, in preterm infants, autonomic instability is frequently evidenced subsequent to the stress produced by the learning suction feeding. These findings are not related to what was found in the study by Fujinaga., *et al.* [12] in Brazil in 2013, in which the entire population remained clinically stable.

Regarding the way of feeding, Manuel Fernández [13] affirms that in neonatal intensive care units alternative methods are used to contribute to the development of the newborn's oral feeding skills. Taking into account the above, alternative methods such as syringe and cup were the most used for feeding neonates in this study (68.8%); however, almost half of them were fed by orogastric tube (31.3%), which coincides with the study by Fujinaga., *et al.* [14], since the entire population fed through this mechanism, this could be justified according to Fernández., *et al.* [15] who mentioned that enteral nutrition is indicated in patients with a functional gastrointestinal tract but whose oral intake of nutrients is insufficient to satisfy the estimated needs.

Another of the items of the instrument that determines the start of oral feeding is the corrected age, in this regard it was found that a large part of the neonates who started this process were older than or equal to 34 weeks (46.9%), These data are in some way similar to the results of the Fujinaga study [16] in which it was evidenced that the majority of those evaluated were less than or equal to 36 weeks of age. This may be due to the fact that the preterm newborn does not have the mature neurodevelopment of the term newborn; a neonate of 32 to 34 weeks very often demonstrates an immature sucking pattern, characterized by a disorder during the process of sucking, swallowing and breathing [17], Lau, Smith and Schanler [18] affirm that the lack of coordination in these Aspects can result in apneas, oxygen desaturation and bradycardia.

Regarding the state of consciousness, it was determined that this research had a clear dependence on the start of oral feeding in the present study, since it was evidenced that a significant number of neonates evaluated were in light sleep, additionally it is possible to demonstrate that most of the neonates who were under light (59.4%) and deep (14.6%) sleep did not obtain the necessary score for the initiation of oral feeding. In this regard, Thomas [19] states that at six months of corrected gestational age, premature infants are more likely to be sleepy during feeding and to be alert during the rest of the time, for his part, Montserrat Revuelta del Valle [20] exposes a series of necessary conditions that the neonate must have when assessing whether he is ready to make the transition from tube feeding to oral feeding, among them it states that the child should be alert but calm, without signs of stress and showing appetite or interest due to food, in the absence of these conditions or before signs of tachycardia, bradycardia or apnea, the switch to oral feeding will have to be postponed.

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Regarding the global posture item, it was found that the majority of neonates evaluated were in a flexion state (78.1%), which coincides with what was found in the study carried out by Andreara de Almeida [21] in 2013, in which 97.7% of those evaluated had the same posture, this can be explained as a consequence of the fact that at 32 weeks of corrected age flexion of the feet develops and between 36 and 38 weeks the arms and legs are helped spontaneously on flexion, with muscle tone close to what is expected for a full-term newborn [22]. Indistinctly to the above, the present study did not find a dependency between the start of oral feeding and global posture.

On the other hand, in the global tone item, it was found that most of the neonates evaluated were in normotonia (62.5%), which agrees with the study by Andreara de Almeida [23] in 2013, in which the entire population presented this muscle tone, this contrasts with that expressed by Beatriz Carvajal, Carolina Vargas and Luis Díaz [24] who affirm that below 30 weeks of corrected age it is normal to find hypotonia; however Núñez, Aránguiz, Kattan and Escobar [25] point out that the diagnosis of hypotonia during the neonatal period is subjective, since it is based on the experience of the examiner, taking into account gestational age and the state of sleep-wakefulness. From another point of analysis, the present study did not find a statistically significant relationship between the start of oral feeding and global tone; however, Beatriz Carvajal, Carolina Vargas and Luis Díaz [26] affirm that the aforementioned low muscle tone extends to the oral muscles and this is reflected in the lack of strength necessary to maintain suction, requiring support from of the health professional in this process. Considering what was expressed by these authors, the POFRAS instrument evaluates this item taking into account two variables normotonia or decrease in tone, but the tone of the oral musculature is not taken into account as an independent variable, which is directly related in the process. suction if not evaluated in a general way.

Regarding oral posture, the majority of neonates had sealed lips (81.3%), although no significant relationship was found with the initiation of oral feeding; Despite this, there is no theory that supports this information, since the bibliography found shows that an immature sucking pattern can be caused by an inadequate lip seal [27]. Contrary to the above, the results obtained in the lingual posture show a significant relationship because the flat tongue prevailed (81.3%), this being an incorrect pattern, characteristic of the study population, for Wolf [28] a problem in the control of the tongue, that does not channel or does not move properly, results in an inefficient feeding. All of the above coincides with the scores found in the study carried out by Andreara de Almeida [29] in 2013, in relation to oral posture subitems.

Regarding orofacial reflexes, Beatriz Villamizar, Carolina Vargas and Luis Díaz [30] express that the sucking reflex is only synchronized for oral feeding from 34 weeks of corrected age, in addition this and the search reflex are essential to lead to carry out this process [31]. Thus, the findings found in this research showed that the search reflex was absent in most neonates (40.6%), the weak sucking reflex (71.9%), the biting reflex (71.9%) and nauseous (58.3%) present, taking into account that the first two had a significant relationship with the initiation of oral feeding, unlike the last. These results are mostly comparable to those found by Andreara de Almeida [32] in 2013 in Brazil, with the exception of the search reflex that was present slowly in most newborns. It should be noted on this variable that the gag reflex appeared posteriorized in most of the neonates, contrary to what was reported by Fernández., *et al*. [33] who state that initially this reflex is triggered in the most anterior areas of the oral cavity, being able to be in the palatine ridges or in the anterior third of the tongue and only after the sixth month of life does it begin to posteriorize.

Regarding non-nutritive sucking, adequate responses were found in the items of maintenance of alertness (59.4%) and movement of the tongue, (62.5%); contrary to the items of number of suctions per pause (53.1%); maintenance of the suction rhythm by pause (50%) and suction force (75%) in which the responses were inadequate. The foregoing agrees mostly with the results found in the study by Andreara de Almeida [34], with the exception of the maintenance of the pause sucking rhythm, which in her research was rhythmic. On the other hand, this study determined that all these items had a significant relationship with the beginning of oral feeding, this corroborates what is described by Monserrat Revuelta del Valle [35] who states that for the feeding process to be effective the child must be alert and without signs of stress; Furthermore, Campos [36] states that during the suction the tongue must have an adequate movement to press the nipple against the palate generating a positive pressure allowing the extraction of milk, finally

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Rendón and Serrano [37] affirm that this entire process it must be performed in a rhythmic and continuous way, ensuring a sufficient intake of food.

The POFRAS instrument score determines the initiation of oral feeding. Fujinaga [38] reports that a score greater than or equal to 28 is considered feasible to initiate this process; In the present study, the score of 21 neonates was less than 28 points and in 11 of them it was greater than 28, this allowed us to be clear about who did or did not start feeding. In the study carried out by Andreara de Almeida [39] in Brazil in 2013, it was found that the higher the test score, the greater the volume of food ingested by the neonates, observing that in both studies the onset is effectively determined. of oral feeding.

Despite what has been described, the results of this study should be taken with reserve, since it has certain limitations, the main one being the sample of participants taken from the San José University Hospital, as it is a pilot test.

Conclusion

In this study, it is concluded that 8 of the 18 items evaluated by the POFRAS instrument are significantly related to the initiation of oral feeding. It is important to mention that these items (search reflex, pause sucks, suck reflex, pause suction rhythm, maintenance of alertness, state of consciousness, suction force and tongue movement) correspond to the most relevant variables. that is taken into account by the speech therapist for the clinical evaluation of suction in neonates.

Since it is a protocol already validated in Brazil and that no modification of the items was made, it was not necessary to develop statistical tests for diagnostic validation at this stage of the study; however, statistical significance tests were carried out to determine the relationship between each of the variables with the initiation of oral feeding.

Most of the items in the POFRAS instrument are relevant for determining the initiation of oral feeding in a timely manner; however, some of these make a very general evaluation of the aspect to be treated. This is evidenced in the global tone item, in which the tone of the oral muscles is not taken into account as an independent variable, which is directly related to the sucking process. In addition to this, gestational age is not considered for the assignment of the position in which the newborns are, since it varies depending on the degree of maturity.

The results of the study allowed us to contrast the bibliography about oral reflexes with the findings found in this population, since authors such as Joseline Bosnich Mienert describe that the gag reflex is triggered in the posterior area after the sixth month of life, however the evidence after the application of the instrument reveals that it is already posteriorized in newborns 32 weeks and older.

Based on the results of the study, it could be affirmed that there is a degree of validity that justifies the execution of the next stage of the macroproject, in which the criterion validity of the instrument is expected to be carried out and if it is necessary to make modifications to it.

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