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ORIGINAL ARTICLE

Standardization of Early Feeding Skills (EFS) scale in preterm infants

Normalización escala Early Feeding Skills (EFS) en recién nacidos prematuros

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Abstract

Introduction: The Early Feeding Skills (EFS) scale assessed the neonate's behavior before, during, and after the feeding process. **Objectives:** To determine the face and content validity, and to evaluate with this scale the feeding process in premature newborns comparing with relevant variables. **Patients and Method:** Premature newborns were evaluated; they were between 34 to 36 weeks of corrected age, without neurological damage or craniofacial malformations. Cross-sectional descriptive study. The data were obtained through the EFS scale, version corrected by face and content validation. The study variables were gender, breastfeeding achievement, and feeding skills during the feeding process, evaluated by two observers. Dispersion measures were analyzed, and the Fisher test was used at 5% significance, establishing the association of the obtained results with the variables. **Results:** 5 domains were evaluated: (1) Ability to stay focused on food, in which 75.3% have a poor performance level, and 28.6% equitable, with significant differences in the sex variable. (2) Ability to organize motor-oral functioning presents 10.5% deficient, 68.8% equitable, and 20.6% good. (3) Ability to coordinate swallowing 95.2% presents an equitable performance. (4) Ability to maintain physiological stability 96.7% was equitable; and (5) Evaluation of oral food tolerance presents 41.6% of poor performance. **Conclusion:** The EFS scale is a tool that provides relevant information to describe the oral feeding process in premature infants, allowing to identify the areas of greatest difficulty that require professional treatment, however, this tool is not enough by itself to carry a comprehensive evaluation of the newborn feeding process.

Keywords:
Preterm;
oral feeding;
swallowing;
evaluation

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Introduction

In newborns, oral feeding is a complex process that, in order to be successful, it depends on the anatomo-functional indemnity of the orofacial structures that favor the sucking-swallowing process. In cases of prematurity, this process is greatly affected.

A newborn is considered premature when born before 37 weeks, which leads to several comorbidities that can be observed in poor postural control, impaired oral-motor skills, immature gastrointestinal tract, and physiological control difficulties. All these difficulties interfere with a safe, effective, competent, and comfortable oral feeding[4,5]. It is important to have guidelines for the evaluation and monitoring of the feeding process in premature babies which ease the work of the Neonatal Critical Patient Unit team. Several authors suggest scales such as the Preterm Oral Feeding Readiness Assessment Scale[8,9] and the Neonatal Oral-Motor Scale[10], which consider a predictor of oral-motor skills for oral feeding in infants[8,10,11]. In this article we analyze the Early Feeding Skills (EFS) scale that assesses the newborn's behavior before, during, and after the feeding process which also allows the identification of impaired areas and to establish guidelines to subsequently provide speech therapy according to the needs and skills of the newborn[5,12,13]. The objective was to describe through the EFS scale the feeding process in preterm newborns. Specific objectives were: 1) To determine the face validity of the EFS scale; 2) To determine the content validity of the EFS scale; 3) To assess the feeding process with the EFS observation scale, and 4) To analyze the outcomes of the items for each of the domains according to the study variables and performance levels or score obtained in each domain (good, equitable, or poor).

Patients and Method

Between 2015 and 2016, 138 preterm newborns were included from the Neonatal Unit of the Dr. Hernán Henríquiez Aravena Hospital, Temuco, Chile. The corrected gestational age was 34 to 36 weeks, excluding those newborns with craniofacial malformations or neurological disorders. Data were obtained using the EFS scale, corrected version through the face and content validity.

Instrument validity

We requested scale manual and scores from author Suzanne Thoyre, then the face validity was carried out through the translation of the instrument from English into Spanish by a native English speaker. Afterward, an analysis from Spanish to English was made, ensuring that the instrument did not lose coherence[12].

Once the instrument was translated into Spanish, it was assessed by six speech therapists who are experts in the field. These experts follow a guideline that considers aspects of sufficiency, clarity, coherence, and relevance, scoring from 1 to 4, where values 3 and 4 (moderate and high scores) are considered optimal for the validation of each aspect. Those items scored with 1 and 2 (low and very low scores) by at least two of the experts were modified according to the suggestions made by them. Finally, these modifications were revealed to all the expert speech therapists who agreed in all assessed areas with a high score (graphic 1). Subsequently, the level of agreement among the experts was assessed, estimating that each item should weigh at least 67% of the total responses. Then, all items groups were analyzed, finding in each group the description of different processes and moments of the feeding process of the newborn such as ability to maintain engagement in feeding, ability to organize oral-motor functioning, swallowing, physiologic stability, and feeding tolerance. These groups are called domains. Afterward, cross-checks were made between domains and the variables described in the methodology.

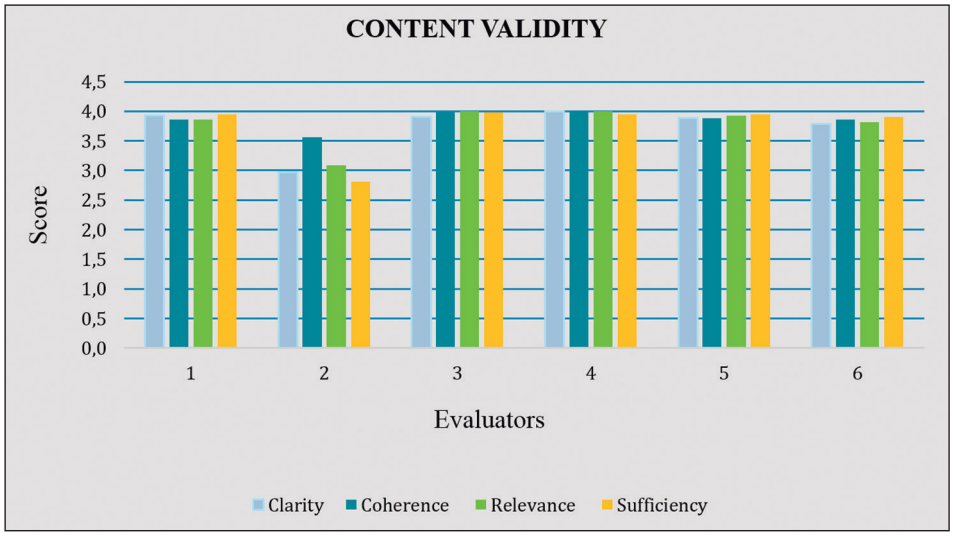
This research followed a cross-sectional study design. Data obtained from the assessment with the EFS scale were analyzed through measures of dispersion (median, mean, and average). The Fisher test was used at a 5% significance, establishing the association of the results grouped into domains with the selected variables. The study variables and the assigned score to each of the options were:

1- Patient sex:
   a. Male: 1 (Since males are more likely to have feeding difficulties at birth, it is considered a lower value)
   b. Female: 2.

2- Achieve breastfeeding.
   a. No: 1.
   b. Yes: 2.

3- Feeding skills during the feeding process.
   a. Declined: 1.
   b. Maintained: 2.
   c. Improved: 3.

The observation was made by two evaluators in parallel who then agreed on the scores assigned to each item. The evaluations were carried out during the feeding periods established by the unit. The used milk was preferentially breast milk, and as a second option milk formula according to the physician's indications.



Graphic 1. Score assigned by each evaluator in each aspect. The average score obtained in the items is considered.

During the feeding process, the mother has to be present to receive a detailed description of the procedure, reading the informed consent corresponding to the observation. Throughout the feeding, we provide support, guiding the mother and giving the pertinent suggestions regarding the posture, necessary pauses and adequate grasp of the mother's breast. In addition, the vital signs are monitored through the process which upon exceeding normal ranges, are sufficient reason to interrupt or end the process, fulfilling the necessary food intake by feeding tube.

The research work was approved by the Ethics Committee of the South Araucania Health Service, which was presented to the Director of the Dr. H.H.A. Hospital, obtaining the pertinent permits to carry out the evaluations in the Neonatology Unit.

Results

Out of the assessed newborns, 50.7% were females and 49.3% were males which were observed by two evaluators, resulting in a total of 276 measurements. The *Ability to maintain engagement in feeding* with the sex variable showed that the poor performance level was higher in boys, and the equitable level was higher in girls. These differences are significant. The performance level in the *Ability to organize oral-motor functioning* did not show significant differences with the sex variable. Regarding the *Ability to coordinate swallowing*, it shows a performance mostly equitable, as well as the *Ability to maintain physiologic stability* domain. There were no significant differences between these two domains and the sex variable. Concerning the *Oral feeding tolerance evaluation* and sex, there was no association (Table 1).

The five studied domains were measured with the *Achieves breastfeeding* variable showing significant differences in the performance levels. It is important to note that newborns have high percentages in the poor performance level in the *Ability to maintain engagement in feeding* and *Oral feeding tolerance evaluation* domains (Table 2).

The *Ability to maintain physiologic stability* was no associated with the *Skills during feeding*. There were significant differences in the performance levels of the *Ability to maintain engagement in feeding* domain in each category of the *Skills during feeding*, where the poor performance level was higher in those newborns that have a decrease in the *Skills during feeding*. Regarding the *Ability to organize oral-motor functioning*, the percentages of poor performance level were lower than the equitable and good ones, where these associations were significant. The *Ability to coordinate swallowing* domain was significantly associated with the *Skills during feeding*, where there was a lower distribution in the poor performance level than in the equitable one. In the *Oral feeding tolerance evaluation,* there were significant differences in the three performance levels regarding the *Skills during feeding* (Table 3).

Discussion

From this study, we can observe that the EFS scale is a predictor of the feeding skills in the studied preterm newborns. Crossover domains with the variables, depending on the performance of the newborns during

Table 1. Comparison of performance levels of the SAI scale by sex

Domain	Gender	Performance Levels			
		Deficient	Fair	Good	P
Ability to stay focused on nutrition	Female	92 (65.7)	48 (34.3)	-	< 0.001
	Male	116 (85.3)	20 (14.7)	-	
	Total	208 (75.4)	68 (24.6)	-	
Ability to organize oral motor functioning	Female	13 (9.3)	97 (69.3)	30 (21.4)	0.771
	Male	16 (11.8)	93 (68.4)	27 (19.8)	
	Total	29 (10.5)	190 (68.8)	57 (20.7)	
Ability to coordinate swallowing	Female	6 (6.4)	131 (93.6)	-	0.256
	Male	4 (2.9)	132 (97.1)	-	
	Total	13 (4.7)	263 (95.3)	-	
Ability to maintain fisiological stability	Female	2 (1.4)	138 (98.6)	-	0.099
	Male	7 (5.1)	129 (94.9)	-	
	Total	9 (3.3)	267 (96.7)	-	
Evaluation of oral food tolerance	Female	49 (35.0)	57 (40.7)	24 (24.3)	0.069
	Male	66 (48.5)	46 (33.8)	24 (17.7)	
	Total	115 (41.7)	103 (37.3)	58 (21.0)	

Data expressed in frequencies and (%). Fisher's Exact Test.

Table 2. Comparison of performance levels of the SAI scale according to breastfeeding ability

Skill	Logra alimentarse por pecho	Performance Levels			
			Fair	Good	P
Ability to stay focused on feeding	No	16 (61.5)	10 (38.5)	-	0.097
	Yes	192 (76.8)	58 (23.2)	-	
	Total	208 (75.4)	68 (24.6)	-	
Ability to organize oral motor functioning	No	2 (7.7)	18 (69.2)	6 (23.1)	0.898
	Yes	27 (10.8)	172 (68.8)	51 (20.4)	
	Total	29 (10.5)	190 (68.8)	57 (20.7)	
Ability to coordinate swallowing	No	2 (7.7)	24 (92.3)	-	0.351
	Yes	11 (4.4)	239 (95.6)	-	
	Total	13 (4.7)	263 (95.3)	-	
Ability to maintain fisiological stability	No	2 (7.6)	24 (92.3)	-	0.204
	Yes	7 (2.8)	243 (97.2)	-	
	Total	9 (3.3)	267 (96.7)	-	
Evaluation of oral food tolerance	No	10 (38.5)	10 (38.5)	6 (23.0)	0.930
	Yes	105 (42.0)	93 (37.2)	52 (20.8)	
	Total	115 (41.7)	103 (37.3)	58 (21.0)	

Data expressed in frequencies and (%). Fisher's Exact Test.

the feeding process, indicates that they have a high percentage of equitable performance in the *Ability to organize oral-motor functioning* and the *Ability to coordinate swallowing* domains. This allows them to initiate oral feeding through the mother's breast. However, this does not mean that they can receive all the necessary food orally. Sometimes, it is necessary to fulfill their nutrition through an alternative feeding route such as the nasogastric or orogastric tube. This situation can be observed in the *Ability to maintain engagement in feeding* and the *Oral feeding tolerance evaluation* domains which present a higher poor performance level. On the other hand, it is worth to mention that the *Ability to maintain physiologic stability* domain has a higher equitable performance level. The research team associates this result to the fact that the newborn was fed by the mother's breast, being protected by the mother and for a limited time since the energy level of the newborn does not allow him/her to be fed orally for more minutes. In 2005, Thoyre et al. described the EFS scale as an instrument for the identification of the strength areas and those areas in which a preterm baby requires

Table 3. Comparison of performance levels of the SAI scale according to abilities during feeding

Skill	Skills during Feeding	Performance Levels			
			Fair	Good	P
Ability to stay focused on feeding	Decreases	112 (92.6)	9 (7.4)	-	< 0.000
	Holds	75 (57.7)	55 (42.3)	-	
	Increases	21 (8)	4 (16)	-	
	Total	208 (75.4)	68 (24.6)	-	
Ability to organize oral motor functioning	Decreases	24 (19.8)	90 (74.4)	7 (5.8)	< 0.000
	Holds	4 (3.1)	77 (59.2)	49 (37.7)	
	Increases	1 (4.0)	23 (92.0)	1 (4.0)	
	Total	29 (10.5)	190 (68.8)	57 (20.7)	
Ability to coordinate swallowing	Decreases	9 (7.4)	112 (92.6)	-	0.040
	Holds	2 (1.5)	128 (98.5)	-	
	Increases	2 (8.0)	23 (92.0)	-	
	Total	13 (4.7)	273 (95.3)	-	
Ability to maintain fisiological stability	Decreases	7 (5.8)	114 (94.2)	-	0.144
	Holds	2 (1.5)	128 (98.5)	-	
	Increases	-	25 (100.0)	-	
	Total	9 (3.3)	267 (96.7)	-	
Evaluation of oral food tolerance	Decreases	75 (62.0)	36 (29.7)	10 (8.3)	< 0.000
	Holds	32 (24.6)	55 (42.3)	43 (33.1)	
	Increases	8 (32.0)	12 (48.0)	5 (20.0)	
	Total	115 (41.7)	103 (37.3)	58 (21.0)	

Data expressed in frequencies and (%). Fisher's Exact Test.

support to achieve a safe and effective feeding, agreeing with this study[12]. In addition, it indicates that babies frequently experience episodes of oxygen desaturation, increased energy expenditure in response to stress, and fatigue, which can be observed in the data mentioned above.

The EFS scale has been analyzed in other studies. In 2017, in Brazil, the validity and reliability of the scale was studied through the 'Validation of the Early Feeding Skills Assessment Scale for the Portuguese population'[14], which considers a sample of 698 newborns of gestational age between ≥ 24 and < 37 weeks, concluding that it is a sensitive, valid, and reliable scale to observe the early skills of the newborn during oral feeding, allowing to develop an intervention plan and to work along with the families.

Another study that stands out is the 'Validation of a clinical nutritional sucking scale'[15] that considered a sample of 179 infants < 6 months old and 86 infants at high risk of impaired sucking, which has face and psychometric validation, establishes a relation between the sucking performance and the volume ingested, swallowing and peripheral oxygen saturation, and ventilation with respiratory rate. With this scale, alteration patterns were fixed according to neurological condition history, hemodynamic stability, and immaturity.

Notwithstanding the above, the evaluation team considers that the scale should complement the assessment with the objective observation of the non-nutritive sucking skills, the mother-child attachment, and the breast anatomy since these aspects may directly affect the feeding performance in newborns. In the literature, the instrument 'Oral Feeding Readiness in Preterm Infants' by Fujinaga et al. stands out[9], which has content validity in Brazil and allows an evaluation to initiate the oral feeding of the preterm newborn, scoring orofacial tonicity, adaptive reflexes, non-nutritive sucking and signs of stress[11]. Each one of these scales can be complemented in order to assess the infant comprehensively, however, they should be used by specialized and competent professionals in the area who can observe through a common guideline all the important aspects of the complex feeding process in this population.

Conclusion

The EFS scale is a tool that provides important information to describe the oral feeding process in preterm infants allowing to identify the most difficult areas that require professional treatment, however, this tool is not enough by itself to carry out a comprehensive evaluation of the newborn feeding process. Therefore, it is important to carry out an adequate evaluation by a professional speech therapist beforehand who, using his/her knowledge in the area, also observe the anatomical and functional aspects of the

oral cavity, the adaptive reflexes, and can scored the infant's non-nutritive sucking performance before observing the nutritive sucking performance through the EFS scale.

Ethical Responsibilities

Human Beings and animals protection: Disclosure the authors state that the procedures were followed according to the Declaration of Helsinki and the World Medical Association regarding human experimentation developed for the medical community.

Data confidentiality: The authors state that they have followed the protocols of their Center and Local regulations on the publication of patient data.

Rights to privacy and informed consent: The authors have obtained the informed consent of the patients and/or subjects referred to in the article. This document is in the possession of the correspondence author.

Conflicts of Interest

Authors declare no conflict of interest regarding the present study.

Aknowledgments

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