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ORIGINAL ARTICLE

Adaptation in Spanish in Mexico of the neonatal nutritional risk screening tool

*Norma A. Ordoñez-Franco[1], Yahiel Osorio-Alamillo[1], Manuel Á. Correa-Flores[2], Claudia Montesinos-Ramírez[2], Mitchel M. Padilla-Rojas[2], and Nallely Bueno-Hernández[3]**

[1]Pediatrics Service, Hospital General de México Dr. Eduardo Liceaga, Secretaría de Salud, [2]Pediatrics Division, Asociación Mexicana de Pediatría; [3]Research Division, Hospital General de México Dr. Eduardo Liceaga, Secretaría de Salud. Mexico City, Mexico

Abstract

Introduction: *The neonatal stage is a vulnerable time, where the newborn is more likely to contract diseases. Screening identifies individuals with risk for some pathology according to each patient's characteristics and risk factors. Few tools detect nutritional risk in neonates, therefore, it is important to have more information, as well as studies in our population.* **Objective:** *The aim of the study was to perform translation and content validation with experts in neonatology of the neonatal nutritional risk screening tool (NNRST).* **Material and methods:** *The validation was realized in the Pediatrics area of Hospital General de Mexico Dr. Eduardo Liceaga, and the translation of the screening into Spanish by three people certified in English and pediatrics. Questions from a questionnaire about the tool were designed and applied to 25 experts in neonatology who met the selection criteria.* **Results:** *The average number of years worked for the study population was reported to be 14 ± 13 years, with a greater predominance of work in the public sector at 52% and the private sector was 48%. 80% of the participants were assigned to the neonatology service. Overall, the tool had an average total content validity index of 0.74 ± 0.17 scores. In each item, observations were made by the neonatologists, who considered whether to make modifications to the tool.* **Conclusions:** *The NNRST is content valid with expert judgment for neonatal nutritional risk screening.*

Keywords: *Screening. Nutritional risk. Newborn. Neonatal nutritional risk screening tool.*

Introduction

Food is one of the fundamental pillars in human life[1,2]. Inadequate nutrition in the short term generates greater morbidity and mortality, prolonged hospital stay, as well as higher medical costs; in the long term, it can cause delayed growth and development, with learning difficulties and increased risk of diseases[3,4].

The objective of a screening is to identify patients who require special intervention with a test or systematized examination[5]. Nutritional risk is defined under the concept of a group of hospitalized patients who, secondary to the severity of their disease, require nutritional support[6].

Although there are multiple screening tools for the detection of nutritional risks in the pediatric setting, there is still a lack of validated tools for newborns that are practical in their application[7-13]. Some tools that assess birth weight, birth height, head circumference, and arm circumference may be useful, however, arm circumference is not routinely measured in an intensive care unit, which is an impractical instrument and without published data on its validity, does not allow its applicability[3,14], or they are usually validated only in intensive care neonates[7].

***Correspondence:**
Nallely Bueno-Hernández
E-mail: nallely_bh5@yahoo.com.mx

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In China, a group of experts developed a neonatal nutritional risk screening (NNRST) tool (supplementary data), which assesses four items: birth status, weight change, form of nutrient intake, and diagnosis of diseases[3,15]. This tool has shown a sensitivity of 85.11%, specificity 91.07%, positive predictive value 60.61%, and negative predictive value of 97.43%[3,16]. However, it is not validated and culturally adapted for use in the Mexican population, which is of special interest to the Mexican population. Due to the above, the objective of this study was to translate and validate content with experts in Spanish, of the NNRST in the Pediatrics area of the Hospital General de México Dr. Eduardo Liceaga.

Material and methods

A study of content validity and cultural adaptation of the NNRST was carried out in Mexico, through a cross-sectional study with a group of experts from the Mexican Association of Pediatrics.

Ethical responsibilities

The study was carried out under the statutes of the general health law on research in Mexico and the Declaration of Helsinki. The protocol was approved by the hospital's research ethics committee, with registration number DI/23/505/03/026. All neonatologists participating in the study signed the informed consent letter and answered the questionnaire about the tool.

Validation

The translation into Spanish and cultural adaptation was carried out by three bilingual people certified in the native Spanish language, two neonatologist pediatricians, and a researcher in the sciences who are experts in nutrition and with experience in validation studies. The content validity of the questionnaire, based on the categories of clarity, coherence, relevance, and sufficiency, was carried out with a pilot test with 25 experts in neonatology.

Participants

Physicians with the specialty of Pediatrics and subspecialty of Neonatology, with experience of 3-10 years, both sexes, residents of the Mexican Republic, in coordination or collaboration in a Neonatology service, were included. Doctors with a conflict of interest or members of a pharmaceutical company were excluded. The method of selection of the evaluating physicians and their respective hospitals was according to the availability of time to participate in the study.

Sample size

In accordance with the methodology established by Galicia et al.[17], for the validity of the content of the screening tool, 5 medical experts were included for each item. In this case, the tool comprises 4 items, for which a minimum sample of 20 neonatologists was required[18], plus 5 physicians due to the losses that occurred during the evaluation. The sample size was 25 neonatologists of both sexes.

Statistical analysis

A database was made to perform the statistical analysis with the Statistical Package for the Social Sciences version 22.0 program. Items with low scores were reviewed. The comparisons of the variables were made with the content validity index (CVI) proposed by Lawshe, to make agreements between experts. A discussion was held on corrections, reworking of items, increasing or omitting items, according to the specific observations mentioned by the experts. Sample estimate with 95% confidence level, population of 25 experts[19].

Results

25 expert neonatologists from different hospitals in the Mexican Republic were included in the period from July 25 to August 11, 2023, who met the selection criteria. Of the total population, a slight majority of the female gender (52%) and 12 people of the male sex (48%) were found.

With regard to the distribution of the place of residence of neonatologists in the subspecialty of Pediatrics, the Instituto Nacional de Perinatología was the most frequent, with a total of 8 people representing 32%, followed by the Hospital Español with 7 people and 28%; third place was occupied by the Instituto Mexicano del Seguro Social with a total of 6 people representing 24%; the Hospital General de México was placed in fourth place with a total of 2 people and 8%. The Hospital Infantil de México and the Hospital Angeles Lomas were in fifth place, with the presence of one person, represented by 4%, in both hospitals (Fig. 1A).

The mean number of years worked of the study population was 13.92 years with a standard deviation of 12.

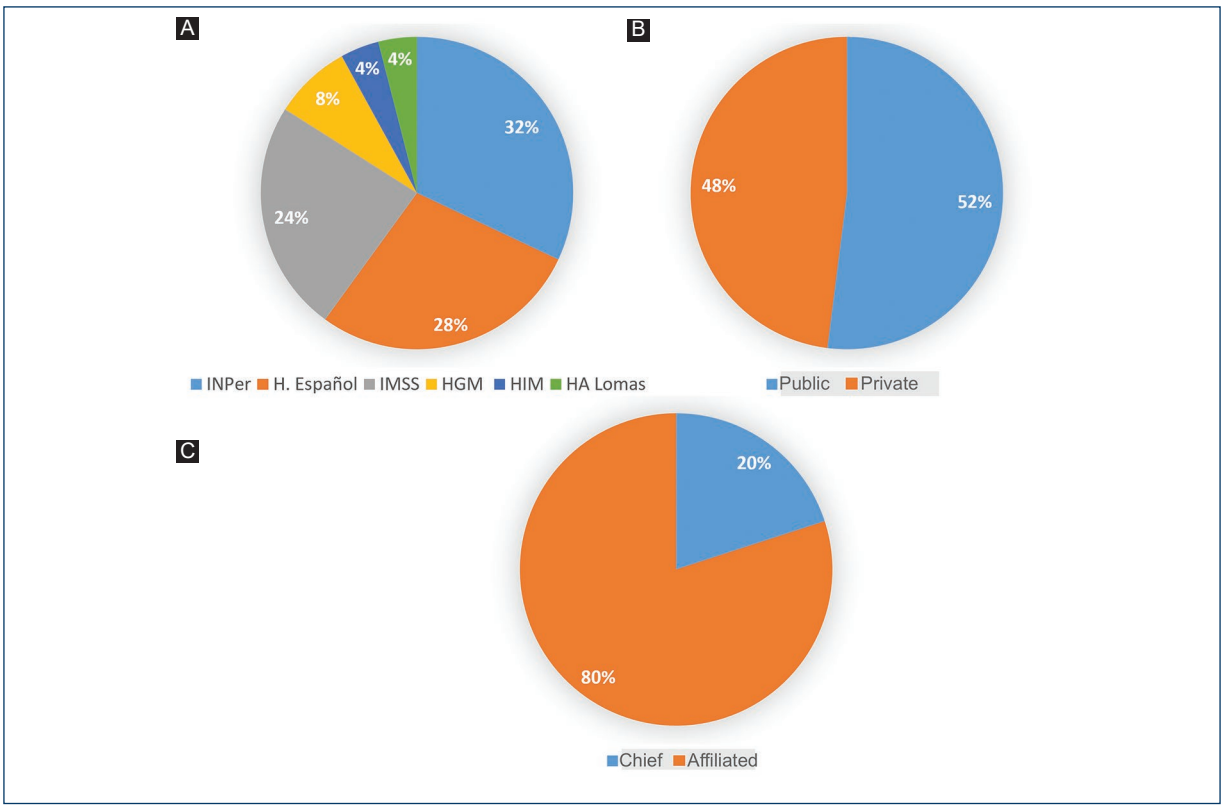

Figure 1. A: distribution of place of residence in neonatology. **B:** public and private sector. **C:** present job position.

Regarding the work hospital, we found a slight predominance of work in the public sector with a total of 13 participants, corresponding to 52%. On the other hand, there were a total of 12 participants, representing 48%, who work in the private sector (Fig. 1B).

Of the total population studied, a total of 20 participants were assigned to the neonatology service, which represented 80%, and 5 of the participants (20%) indicated that they were heads of the pediatrics and/or neonatology service (Fig. 1C).

With the 25 participating experts, according to Lawshe (1975)[20], a CVI of at least 0.54 is sufficient to indicate that each of the items has been assessed as essential. Thus, at the end of the analysis, of the 4 items that make up the initial version of the instrument, all were maintained because they resulted in an average CVI of 0.68 in item 1, 0.74 in item 2, 0.67 in item 3 and 0.87 in item 4.

Similarly, the categories of the items were reported with an adequate average CVI, with 0.63 in the clarity category, 0.77 in the coherence category, 0.94 in the relevance category, and 0.62 in the sufficiency category. Overall, the tool had a total inferior vena cava (IVC) average of 0.74 ± 0.17 (Table 1).

In each item, a fifth question was added to allow the experts to write comments or suggestions, which are summarized in table 2, and which were evaluated for the writing of the Spanish version of the tool.

Discussion

The European Society for Clinical Nutrition and Metabolism, the American Society for Parenteral and Enteral Nutrition, and the European Society of Paediatric Gastroenterology, Hepatology, and Nutrition (ESPGHAN) recommend the application of screening tools to determine the level of nutritional risk in hospitalized pediatric patients[8].

Nutritional screening allows non-specialist staff to identify patients at nutritional risk who need further assessment and support from specialist staff. Due to the lack of validated screening tools for nutritional risk in neonates, the objective of the study was to translate and validate content with experts in Spanish, from the NNRST. In China, due to the large annual number of births and shortage of nutritional support equipment in newborns, as well as the lack of

Table 1. Categories

Items	Clarity		Coherence		Relevance		Adequacy		Average CVI
	Experts in favor	CVI	Experts in favor	CVI	Experts in favor	CVI	Experts in favor	CVI	
1 birth status	14	0.56	19	0.76	23	0.92	12	0.48	0.68
2 weight change	16	0.64	20	0.8	23	0.92	15	0.6	0.74
3 form of nutrient intake	12	0.48	17	0.68	24	0.96	14	0.56	0.67
4 diagnosis of diseases	21	0.84	21	0.84	24	0.96	21	0.84	0.87
Average CVI		0.63		0.77		0.94		0.62	0.74 ± 0.17

CVI: content validity index = # people in agreement/# total number of participants.
Reference: Tristán et al.[20].

Table 2. Synthesis of proposals for change

Items	Remarks
1	– It is suggested to modify the weeks of gestation and add the days to division – Specify what percentiles and grams refer to, as it creates confusion – Establish a parameter that determines the weeks of gestation (date of past menstruation, ultrasound, Capurro) – Clarify if it is only for pre-term and term babies – Consider adding in weight section: intrauterine growth restriction.
2	– Specify the timing of the assessment for weight loss – Indicate that the newborn must be weighed under the same conditions every day – It is suggested to change the term "decreased weight"
3	– It is recommended to add mixed feeding: tube and suction – Consider adding feeding without a tube – Specify the terms full and partial parenteral nutrition – Specify the type of milk: breast, fortified breast, or formula.
4	– It is suggested to define what is acute disease or injury – Consider the following options: surgery, drainage, probes, and ventilation – Instead of recurrent diarrhea, consider other diagnoses such as intolerance without enterocolitis or allergy – Diseases such as diarrhea are not common – Consider adding patent ductus arteriosus with or without hemodynamic repercussions, state of shock – Consider adding a V item with the use of probiotics, lactase, ACD vitamins, and AEC vitamins, as part of the management of pre-mature infants.

nutritional tools in this age group, a group of experts created the NNRST, demonstrating its reliability and detection accuracy[3].

Even if an instrument has been validated in one population, it is important to measure its psychometric properties when it is used in other areas or populations; for this, the process must first begin with the translation of the tool and then validate the instrument[21]. In this way, the translation of the screening into Spanish was carried out and to validate the instrument, it had to be compared with the gold standard; however, in the nutritional screening tools in neonates, there is no one.

However, other methods can be used to carry out validity, and among the most used are: construct, criterion, and content validity[17]. Therefore, content validity was carried out through expert judgment, defined as an informed opinion of people with a background in the subject, who are recognized by others as qualified experts in it, and who can provide information, evidence, judgments, and evaluations[17].

In the analysis of the data, authors report using Lawshe's statistical test to determine the degree of agreement among the judges, observing a CVI with values between –1 and +1; when the value is positive it indicates that more than half of the judges agree and, when it is negative, it means that less than half of the experts agree[22].

In our study, 25 neonatologists were recruited, who were a balanced population when they completed the neonatology residency and were working in hospitals in both the public and private sectors; the majority of them were personnel assigned to the neonatology service, who are in constant and close contact with the neonates, thus providing information based on their experience.

As previously mentioned, the items were analyzed using the Lawshe CVI, with a total average of 0.74, which tells us that the tool in general is adequate to assess nutritional risk. Similarly, the average CVI of

each category on the items was adequate (clarity 0.63, coherence 0.77, relevance 0.94, and sufficiency 0.62), where together with the observations made by the experts, they were taken into account to make the modifications in the tool.

With respect to item 1, birth situation, an average CVI of 0.68 was reported, indicating that it is essential in the tool, however, with a CVI of 0.56 in clarity and 0.48 in sufficiency, the following modifications were made: the lack of division in the weeks of gestation was a constant observation among the experts, and even as mentioned by the ESPGHAN there is not total uniformity in the definition of the subgroups of pre-term birth; however, it was decided to use the terminology of common subgroups used to establish the weeks of gestation, adding a division between weeks 32 and 37, modifying to 32.1-33.7 with a score of 2, and 34.1-36.7 with a score of 1, as it is a very wide range[23].

In the same way, the days and value of a term newborn were added to avoid future confusion for the evaluators. In the same item, it was requested to specify what the percentiles and grams refer to, which is indicated in the tool, since each one represents a different risk score; and to have clarity with the score corresponding to neonates > 2500 g, a box was added for this value, equivalent to a score of zero.

To establish the parameter that determines the weeks of gestation, according to Ventura (2015), he mentions that the Capurro test tends to overestimate the gestational age compared to the ultrasound of the first trimester, therefore when the latter data are available, the gestational age should not be modified with the pediatric exam; therefore, it was annexed in the specifications of the tool, that the weeks of gestation will be obtained by ultrasound report, and if this value is not available, use the Capurro or Ballard method[24].

One of the indicators recommended by the experts to be included was intrauterine growth restriction, which represents a significant increase in the risk of perinatal morbidity and mortality by not reaching its growth potential. Because of the definition established for small for gestational age in the tool, it was important to make modification and clarification at this point to avoid confusion, where intrauterine growth restriction is defined as: growth of the fetus below the 10th percentile for gestational age with abnormality of the feto-placental circulation or a weight <3rd percentile for gestational age, and as for the definition of small for gestational age, they are those whose weight is between the 3rd and 10th percentiles, with an anatomical assessment within normal limits[25].

Regarding item 2, weight change, an average CVI of 0.74 was calculated, but as it presented a CVI of 0.64 in clarity and a CVI of 0.6 in sufficiency, specific modifications were made for a better understanding of the item. I am confused by the moment of evaluation for weight loss; Because most neonates have a period of weight loss immediately after birth, with weight regain around the 3rd day of life, and because the application of screening tools in hospitalized children is < 24 h, the evaluation points were added in the tool (24 h, 1st week, 2nd week and 3rd week), as well as the time of evaluation in weight loss > 15% and > 10%[4,26].

Similarly, a box was added referring to weight loss < 10% and weight gain > 10 g/kg/day with a score of zero, to avoid confusion in the evaluation staff. Another modification was the change from “decreased weight” to “previous weight reduction or intact weight”, since the term was not specified in the tool, being doubtful.

Similarly, the specifications of the tool were added the way to obtain the weight of the newborn to prevent excessive changes in weight, as well as the use of Fenton’s growth charts in children under 37 SDG and the World Health Organization (WHO) for those over 37 SDG, to determine small for gestational age and large for gestational age. As well as the growth evaluation that includes: Weight, length, and head circumference[27].

Regarding item 3, form of nutrient intake, it was shown to be essential in the tool by having an average IVC of 0.67; although having a CVI of 0.48 in clarity and a CVI of 0.56 in sufficiency, the tool was complemented with more options, since the experts referred to considering adding mixed feeding as part of the tool.

As mentioned by Pineda et al., the feeding technique associated with weight gain is the mixed technique with orogastric tube and feeder, demonstrating significant benefits, so that it was added to the tool with a score of 0, in conjunction with single sucking feeding; breastfeeding with breast and infant formula has the same effectiveness in covering the caloric requirements necessary for growth, therefore, the type of milk was not added in instrument[28].

In the same item, the observation was made to specify the terms complete and partial parenteral nutrition, so the definitions were added at the bottom of the tool, referring to complete parenteral nutrition, that which all nutrients are administered intravenously, and partial parenteral nutrition, when enteral nutrition is combined to complete contributions[29].

Finally, in item 4, diagnosis of diseases, an average CVI of 0.87 was reported, where not only was it

essential in the tool, but also adequate CVI scores were reported in clarity (0.84), coherence (0.84), relevance (0.96) and sufficiency (0.84), so minimal modifications were made. The classification of diseases is based on the degree of catabolism and its effects on the nitrogen balance, considering serious those with a negative nitrogen balance in the patient, with insufficient amino acid administration in the 1st days of life being an important factor[30].

Kondrup et al. (2003) mention that the disease process can increase nutritional needs due to stress metabolism associated with serious diseases such as major surgery, sepsis, and multiple trauma[16]. For this reason, assessing the observation of acute disease or injury, as well as evaluating other options (surgery, drainage, probes, ventilation), reference is made to situations that cause negative nitrogen balance such as shock or major surgery, without incorporating sepsis, as it is a disease already included in the variable of severe infection.

In the case of the term recurrent diarrhea in neonates, it has not been clearly established, and as our experts mention, diseases such as recurrent diarrhea is not frequent in the newborn, however in a study carried out by Dol et al., they have evidence that between days 8 and 28 of life, one of the causes of neonatal mortality is diarrhea, considering maintaining the disease, defined by the WHO, as three or more bowel movements per day, or with a greater frequency than normal, of loose or liquid stools[31,32].

With regard to patients with congenital heart disease, the main factors that influence nutritional requirements are: the nutritional status, type of heart disease and hemodynamic status of the patient, where in the latter the presence of symptoms of heart failure determines greater energy needs, therefore it was decided to add as an option: “congenital heart disease with hemodynamic repercussions” with a score of 2, and establishing “congenital heart disease without hemodynamic repercussions” with a score of 1[33,34].

Finally, it was recommended to add a fifth item with the use of probiotics, lactase, ACD vitamins, AEC vitamins, as part of the management of pre-mature infants, however, as it is a single recommendation, an expert judgment should be made focused on assessing adding this item and its score, to determine if it is appropriate or not. However, the plans to be followed were added according to the risk classification presented by the newborn, providing complete and timely care[10].

Conclusions

The content validation with expert judgment, from the NNRST (Supplementary data), had an adequate CVI where the four original items of the tool were maintained.

In each item, modifications were made according to the observations made by the neonatologists, as well as in the instructions for the correct filling of the tool, thus allowing a better understanding and easy use in clinical practice.

In the same way, the behaviors to be followed for cases of high, medium, and low nutritional risk were added, providing a complete tool from how to classify the patient to the action plan to be carried out.

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Conflicts of interest

The authors declare no conflicts of interest.

Ethical considerations

Protection of humans and animals. The study was carried out under the statutes of the general health law on research in Mexico and the Declaration of Helsinki. The protocol was approved by the hospital’s research ethics committee, with registration number DI/23/505/03/026. All neonatologists participating in the study signed the informed consent letter and answered the questionnaire about the tool.

Confidentiality, informed consent, and ethical approval. The authors have obtained approval from the Ethics Committee for the analysis of routinely obtained and anonymized clinical data, so informed consent was not necessary. Relevant guidelines were followed.

Declaration on the use of artificial intelligence. The authors declare that no generative artificial intelligence was used in the writing of this manuscript.

Supplementary data

Supplementary data are available at Revista Médica del Hospital General de México online (DOI: 10.24875/HGMX.24000066). These data are provided by the corresponding author and published online for the benefit

of the reader. The contents of supplementary data are the sole responsibility of the authors.

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