

Evaluation of Psychometric Properties of NutriCHEQ in Iranian Toddlers

Abstract

Background: Although poor dietary habits have a great effect on the health status of children, especially in toddlers, a few questionnaires exist for the assessment of dietary imbalances. This study aims to assess the validity and reliability of the NutriCHEQ in Iranian healthy toddlers. **Methods:** In this cross-sectional study, first, the NutriCHEQ was translated to Persian and culturally adapted by the forward-backward translation technique. In order to assess the face validity, we used a cognitive interviewing technique of 25 parents/caretakers of healthy toddlers. In the next step, experts assessed content validity, respectively. One item was removed during the content validity process. Then, a blueprint of NutriCHEQ was distributed among 156 parents/caretakers of healthy toddlers in different focal points in Tehran for assessing construct validity by nonlinear principal components analysis. In addition, the anthropometric indices checklist and Food Frequency Questionnaire (FFQ) were filled out for toddlers. Then, construct validity was assessed. The Varimax rotation ran for two sections separately. The four-factor structure was confirmed. **Results:** The model showed a good fit, and all the extracted variance of four factors were satisfactory ($F1 = 20.77$; $F2 = 22.30$; $F3 = 14.75$; and $F4 = 13.71$). All of the extracted items of the NutriCHEQ in two parts showed 71.53% cumulative variance. For criterion-related validity, there was a statistically significant positive correlation between the NutriCHEQ and Z-score ($\rho = 0.632$, $P < 0.001$). The Bland-Altman result indicates 95% limits of agreement between the NutriCHEQ questionnaire and Z-score. **Conclusions:** Therefore, we concluded that NutriCHEQ is a valid, reliable, and convenient instrument to identify the Iranian toddlers' nutritional status. Therefore, it can be used for research and clinical settings.

Keywords: Iran, NutriCHEQ, nutritional status, surveys and questionnaires, toddler

Introduction

The early years of life have a significant impact on the growth, development, and health of children.^[1-3] It is evident that malnutrition during childhood can have lifelong effects on human health.^[4] The overall prevalence of being stunted, wasted, and overweight in children between 0 and 59 months has been reported in 22.2% (150.8 million), 7.5% (50.5 million), and 5.6% (38.3 million), respectively.^[5] The prevalence of stunting in Iranian girls and boys was 6.6% and 4.11%, respectively.^[6] The prevalence of malnutrition in Iranian children in terms of wasting, stunting, and underweight was 7.8, 12.4, and 10.5%, respectively.^[7]

A toddler is a child approximately 1–3 years old.^[8] The toddler period is a key phase in the transition from breastfeeding to eating family food. Toddlers need more energy and nutrients per body weight,

which indicates that the energy and nutrient density should be higher in the toddlers' dietary intake than during infancy. In the early years of being a toddler, the demand for micronutrients is as high as infantile but the growth rate is reduced.^[9]

Social status and maternal education are related to the toddlers' nutritional status.^[10,11] High-calorie diets with low nutrient density, such as meat products, fried potato, baked goods, and sweetened drinks, are prevalent. Also, the nutrient-rich diet including fish, raw vegetables, and eggs is consumed less than the recommended dietary allowance.^[12] Adequate nutrient intake in childhood is a key determinant of health in the short and long term.^[3,13-16] The early toddler period is the time when the child's habits and dietary preferences may be formed and it may affect the food intake in adulthood.^[17-20] Inadequate intake of essential micronutrients such as iodine, iron, zinc, folate, and vitamin

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B12 is associated with cognitive abnormalities. This can lead to poor performance in school, reduced economic opportunities, and chronic health problems in adulthood^[13]; it also has a nutrigenomics effect.^[14] This highlights the early diagnosis and intervention based on accurate and cost-effective screening of toddlers.

One of the traditional methods of food intake assessment is the Food Frequency Questionnaire (FFQ).^[12] The 7-day dietary food record is another scale that describes all the food items and the amount that is consumed over the previous 24 h.^[21] The maternal 3-day dietary recall is an approach where the patient is requested to describe all food items and amounts consumed over a 24-h period (including 2 weekdays and a weekend).^[22] Although these approaches are more convenient for comparison with others, an appropriate nutrition assessment questionnaire for toddlers should be short, simple, and provide results based on food groups. The FFQ, food record, and food recall obtain retrospective information about food consumption patterns. Moreover, the FFQ, food record, and food recall just evaluate partial food groups. Therefore, these approaches cannot be sufficient to evaluate the nutritional status of children under 2 years because they are just fed by breast milk or formula.

It seems that the NutriCHEQ questionnaire is preferable for two reasons: it evaluates eating habits that affect the child's health in the future and assesses nutrition intake. Moreover, the questionnaire is related to a wide range of parental comprehensive guides. It is not a Persian questionnaire. Therefore, it is important to validate a reliable questionnaire for the assessment of the nutritional status of toddlers in Iran. Thus, we aimed to assess the validity and reliability of the NutriCHEQ questionnaire in healthy Iranian toddlers.

Methods

Designs

This is a cross-sectional study.

Participants

This study was conducted by health care providers in health centers and parents/caretakers of healthy toddlers who were referred to the primary health care centers of Tehran between August and October 2019. The inclusion criteria for participant selection were as follows: (1) willingness to participate in the study, (2) necessary communication skills, and (3) the absence of other pathological disorders. The exclusion criteria were (1) other diseases except for allergy and (2) toddlers who were on a special diet.

NutriCHEQ questionnaire

Danone Nutricia's Early Life Nutrition has developed the NutriCHEQ questionnaire. Permission to use the questionnaire was obtained from Danone Company.^[23] The NutriCHEQ questionnaire consists of three sections: A,

B, and C. The first section contains four questions which examine the iron and other essential nutrient intakes. The second section contains seven questions; B investigates the child's nutritional balance. Possible answers to each question of these two parts were limited to A, B, C. Answers in the "A" category stand for appropriate or desirable (score 0); in "B" category are less than ideal (score 1); and in "C" category are the potential causes for concern/action (score 2). These scores point out risk indicators for toddlers' nutritional status. The maximum achievable score is 22 from sections 1 and 2.

The third section which is named part "C," contains 10 questions, nine of them have dichotomous response options, and the last one is an open-ended question. This part examines the risk factors associated with parental feeding patterns that affect the child's future nutritional status.

Translation technique

The World Health Organization protocol was used to translate and adapt the English NutriCHEQ questionnaire into Persian.^[24] A forward-backward translation technique was used. Accordingly, two English-Persian translators were invited to independently translate the NutriCHEQ questionnaire. Then an expert panel comprised of the authors of this paper and two translators were used to assess the two translated questionnaires and produce a single Persian version. A Persian-English translator was then asked to back-translate the Persian NutriCHEQ questionnaire into English.

Validity assessment

The validity of the NutriCHEQ questionnaire was assessed using face validity, content validity, and construct validity.

Face Validity Assessment. The face validity of the Persian NutriCHEQ questionnaire was assessed by cognitive interview. For the cognitive interview, 25 parents/caretakers of healthy toddlers were invited and asked to repeat each question of the questionnaire in their own words, and report any difficulties they experienced in responding, and identifying words. The questionnaire was amended according to the comments of the parent/caretaker of the toddler. In addition, the necessary time for completing the questionnaire was determined in this step.

Content Validity Assessment. The experts also assessed the content validity of the Persian NutriCHEQ questionnaire both qualitatively and quantitatively. The experts were not the same absolutely in qualitative and quantitative content validity assessment.

Qualitative content validity assessment

The Persian NutriCHEQ questionnaire was given to 10 experts (five pediatric nutritionists and dietitians, four pediatric gastroenterologists, and 1 psychometrist) who were asked to assess and comment on the wording, item

allocation, and scaling of the items.^[25] The NutriCHEQ questionnaire was revised according to the comments and feedback.

Quantitative content validity assessment

The quantitative content validity of the questionnaire was assessed by calculating the content validity index (CVI) for the items. The CVI reflects the degree of cultural relevancy. The CVI was calculated for each item of the questionnaire (item level or I-CVI) and the overall questionnaire (questionnaire level or S-CVI). Accordingly, we asked the same 10 panelists to rate the simplicity, relevance, and clarity of the Persian NutriCHEQ questionnaire items on a four-point questionnaire from 1 to 4.

For instance, the four points for the Likert rating scale for the relevance of the items were “not relevant,” “somewhat relevant,” “quite relevant,” and “highly relevant,” which were scored as 1, 2, 3, and 4, respectively. The I-CVI of each item was calculated by dividing the number of panelists who had rated that item as 3 or 4 by the total number of panelists. The CVI was calculated by using the following formula: $CVI = (\sum \text{number of answer 3 or 4}) / (\text{total number of answers})$. Lynn *et al.* (2006)^[26] noted that when the number of panelists is equal to 10, the items which acquire an I-CVI value of 0.79 or greater are considered appropriate.

Construct validity assessment

The sample size was calculated based on the following parameters ($\alpha \leq 0.05$, $P = 0.8$, effect size ~ 0.23 , number of items: 20 and number of Dimensions: 2). For construct validity, 156 healthy toddlers were selected using convenience sampling and Nonlinear Principal Components Analysis (NPCA). In the category's module of SPS version 26 was used. It is an implementation of the optimal scaling approach to NPCA.^[27] In NPCA, orthogonal rotation may be useful in the same way, so Varimax rotation was applied.^[28] Also, the percentage of missing values was computed for 19 variables that were less than 10%. We assessed anthropometric indices and Z-score in order to verify the criterion-related validity of the NutriCHEQ questionnaire.

The Z-score is an acceptable standardization method by the World Health Organization (WHO) and Centers for Disease Control (CDC). The Z-score is calculated based on the anthropometric indices and is related to the population reference standard.^[29,30] Mehta *et al.*^[31] (year) recommended, “when assessing nutrition status on admission or first hospital visit, anthropometric parameters should be recorded and plotted on reference/standard age-appropriate curves to obtain the Z-score.” Then, nutritional status was classified based on cutoffs for Z score.^[32]

To assess the criterion-related validity, Spearman's rank correlation coefficient was estimated between the

NutriCHEQ questionnaire and the Z-score. Also, the FFQ was completed by the parent three times during the week for 1 week. This data was analyzed by nutritionist-4 software.

Reliability assessment

The test-retest reliability of the questionnaires and single-item measures were assessed using the intraclass correlations between the second and retest assessments in the 30 parents/caretakers of healthy toddlers referred to health centers in focal points at Tehran 2 weeks later. These parents/caretakers completed a few additional items on the debriefing questionnaire that assessed whether the toddler's health had changed over the days that the test-retest study was performed. Patients who reported a change in the health status (e.g., development of nutritional status) were excluded from the test-retest analyzes. A Bland-Altman evaluation for the agreement was applied to compare the two nutrition methods. A range of agreement was defined as mean bias \pm 2 SD. Next, measurements were compared using the Passing-Bablok regression.

Results

The qualitative results of the face validity of the Persian NutriCHEQ questionnaire showed that items 9 and 10 were difficult to understand. Therefore, we revised these according to the suggestions. The result of the content validation assessment showed S-CVI/Average and S-CVI/universal was .99 and 0.95, respectively.

The Persian version of the NutriCHEQ questionnaire was 19 items with 71.53% cumulative variance. The NutriCHEQ questionnaire was split into two parts: A and B; part A with 10 items measured on a 3-point Likert questionnaire that ranges from 0 to 2. Part A of the original questionnaire had 11 items and we have 10 items after content validity. Experts believed the item “my toddler usually has a ready to eat, iron-fortified cereal” must be removed because, in Iran, cereal was not fortified with iron. Therefore, we removed this item. Then, data were gathered for construct validity. Part B with 9 items answered in dichotomous form, from 0 to 1. The total score was calculated by the sum of the collecting scores within each A and B sections. Table 1 summarizes the scoring of NutriCHEQ.

During the assessment of construct validation, 156 toddlers (1–3 years old) were studied of whom 84 toddlers (53.84%) were boys. The mean age was 20.0 (± 6.7) months (range 12–36 months), weight 11.3 (± 1.90 kg) (range 7.7–18 kg) and height 83.6 (± 8.7) cm (range 71–102 cm).

According to the WHO growth standard charts (weight for height), 16 toddlers (10.3%) were underweight, 132 (84.6%) had normal weight, and 7 (4.5%) were overweight. There were no significant differences between the sex of the toddlers. The percentile and Z-score for weight and height between the three age groups had

statistically significant differences ($P < 0.05$). The mean height and weight of the toddlers in the three age groups showed statistically significant differences ($P < 0.001$). Demographic and anthropometric indices of the Iranian children aged 1–3 years old are summarized in Table 2.

According to the total score of the FFQ, the quartiles were determined so that 28 (18%) children were in the first quartile, 56 (36%) children in the second quartile, 40 (26%) children in the third, and 31 (20%) children were in the fourth quartile [Table 3]. The sex distribution between the quartiles indicated that in the second and third quartiles, the girls were in a greater number. However, there was no significant difference between the mean ages of the individuals in the different quartiles ($P > 0.05$).

NPCA was conducted with Varimax rotation for two sections separately. In the first section, the results revealed that there were two components accounting for 20.77 and 22.30%, respectively. Also, in the second section, two components were extracted with 14.75 and 13.71%, respectively. In addition, all of the extracted items of the NutriCHEQ questionnaire in the two parts showed 71.53% cumulative variance [Table 4].

In the criterion-related validity, there was a statistically significant positive correlation between the NutriCHEQ questionnaire and Z-score ($\rho = 0.632$, $P < 0.001$). This indicates that malnourished toddlers based on Z-score had high scores on the NutriCHEQ questionnaire.

The Bland-Altman analysis indicates that the 95% limit of agreement between the NutriCHEQ and Z-score ranged from 1.1 to 7.2. Therefore, results measured by the NutriCHEQ questionnaire maybe 1.1 units below or 7.2 above the Z-score.

The questionnaires did not provide similar measures because there is a level of disagreement that includes clinically important discrepancies of up to Z-score. The dotted line characterizes the regression line $y = 4.85 (4.13-5.57) + -0.45$ [95% confidence interval (CI): -0.86 to -0.03] are presented as continuous line [Figure 1]. The Passing-Bablok regression equation is expressed as: $y = a (95\% \text{ CI}) + b (95\% \text{ CI}) x$. The regression line has

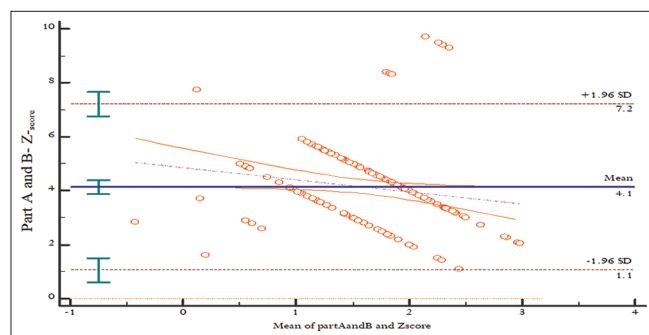


Figure 1: Bland-Altman plot between NutriCHEQ and Z-score including regression line and confidence interval limits

a slope of 0 (0.00–0.32) and an intercept of 4 (3.79–4.00). The correlation coefficient between the two methods is $\rho = -0.08$, CI = -0.24 to 0.07, $P = 0.30$ [Figure 2].

Discussion

Like most studies, our study had a limitation. The experts' perceptions differed because they were also data collectors; thus, the data gathering step was not identical. Likewise, the incomplete FFQ recall was another limitation.

Nevertheless, the NutriCHEQ questionnaire is a short questionnaire that measures dietary intake and risk categories depending on the scores obtained from sections A and B. This reliable questionnaire determines the susceptibility to nutritional imbalances in toddlers. Our psychometric results indicate that the NutriCHEQ questionnaire is a reliable and convenient questionnaire to identify healthy toddlers. This is a concise and facile questionnaire for professionals and parents.

Morino *et al.*^[33] inspected the validity and reliability of the NutriCHEQ questionnaire for identification of Italian toddlers with the risk of inadequate intake of micronutrients and macronutrients. The Mann-Whitney U test or the Kruskal-Wallis one-way analysis of variance was used for comparisons among the different groups derived from the NutriCHEQ questionnaire scoring. Also, they plotted a Receiver Operating Characteristic (ROC) curve to verify the accuracy of NutriCHEQ questionnaire risk categories. Morino *et al.* established that the NutriCHEQ questionnaire, as a multidimensional nutritional screening questionnaire, was a valid, and reliable questionnaire for the assessment of dietary risk factors in Italian toddlers. They concluded that the NutriCHEQ questionnaire can identify toddlers with a probability of having poor iron and vitamin D intake, and other dietary imbalances.

Aramouny *et al.*^[34] investigated the validity of the NutriCHEQ questionnaire, defined the dietary intake of Lebanese toddlers,

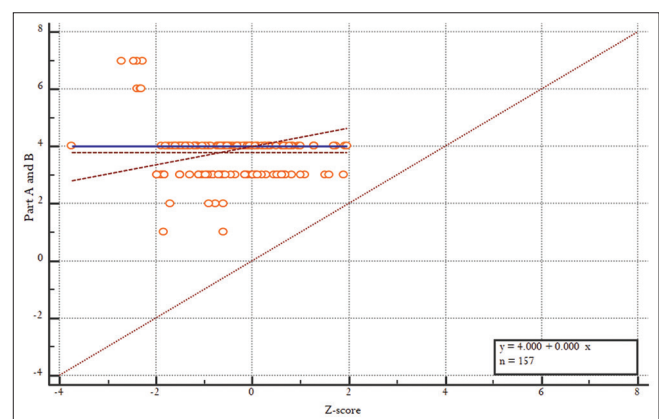


Figure 2: The regression line between hypothetical measurements done by NutriCHEQ and Z-score

Table 1: The NutriCHEQ sections A and B and meaning of the associated scores

| Section | Investigated Foods | Number of items | Score | Evaluation risk of malnutrition |
|---------|---|-----------------|-------|---|
| A | Consumption of breakfast products, milk, fish, and meat | 10 | 0-1 | Low probability of poor intake of micronutrients (iron, vitamin D, and zinc) |
| | | | 2-3 | Moderate probability of poor intake of micronutrients (iron, vitamin D, and zinc) |
| | | | ≥4 | High probability of poor intake of micronutrients (iron, vitamin D, and zinc) |
| B | Processed foods, confectionery, vegetables, and fruits | 9 | 0-2 | Low probability of excessive saturated fatty acids, sugars, and sodium |
| | | | 3-5 | Moderate probability of excessive saturated fatty acids, sugars, and sodium |
| | | | ≥6 | High probability of excessive saturated fatty acids, sugars, and sodium. |

Table 2: Demographic and anthropometric characteristics of toddlers and their parents

| | Total | 1 year | 2 years | 3 years | P |
|--|----------------|----------------|----------------|----------------|-------|
| Number of participants (n) | 156 | 49 | 58 | 49 | |
| Boys: Girls (n) | 80:76 | 24:25 | 30:28 | 26:23 | 0.423 |
| | Mean±SD | Mean±SD | Mean±SD | Mean±SD | |
| Anthropometrics | | | | | |
| Weight (kg) | 11.3±1.9 | 10.3±1.9 | 10.9±1.2 | 12.8±1.8 | <0.00 |
| Height (cm) | 83.8±6.7 | 78.1±4.4 | 82.5±3.7 | 90.9±4.9 | <0.00 |
| Weight for height Z-scores | -0.4±1.3 | -0.2±1.4 | -0.6±0.9 | -0.6±1.4 | 0.18 |
| Percentile | 36.3±31.3 | 42.2±32.6 | 33.1±27.3 | 34.3±34.0 | 0.29 |
| Weight for height Z-scores n (%) | | | | | |
| Underweight (≥3 rd centile) | 15 (9.7%) | 3 (6.3%) | 4 (6.9%) | 8 (16.3%) | 0.12 |
| Normal (>3 rd -≤96 th centile) | 135 (87.1%) | 43 (89.6%) | 54 (93.1%) | 38 (77.6%) | |
| Overweight (>97 th centile) | 5 (3.2%) | 2 (4.2%) | 0 (0%) | 3 (6.1%) | |
| WHO centiles n (%) | | | | | |
| Underweight (≥3 rd centile) | 16 (10.3%) | 4 (8.3%) | 4 (6.9%) | 8 (16.3%) | 0.10 |
| Normal (>3 rd -≤96 th centile) | 132 (85.2%) | 40 (83.3%) | 54 (93.1%) | 38 (77.6%) | |
| Overweight (>97 th centile) | 7 (4.5%) | 4 (8.3%) | 0 (0%) | 3 (6.1%) | |
| | n (%) | n (%) | n (%) | n (%) | |
| Mother's education n (%) | | | | | |
| Primary/Intermediate | 5 (3) | 0 (0) | 3 (5) | 2 (4) | 0.49 |
| Secondary | 66 (43) | 19 (40) | 27 (47) | 20 (41) | |
| Tertiary | 84 (54) | 29 (60) | 28 (48) | 27 (55) | |
| Father's education n (%) | | | | | |
| Primary/Intermediate | 5 (3) | 0 (0) | 3 (5) | 2 (4) | 0.13 |
| Secondary | 76 (49) | 19 (40) | 28 (48) | 29 (59) | |
| Tertiary | 74 (48) | 29 (60) | 27 (47) | 18 (37) | |
| Mother's job n (%) | | | | | |
| Homemaker | 84 (54) | 29 (60) | 28 (48) | 27 (55) | 0.05 |
| Part time | 66 (43) | 19 (40) | 27 (47) | 20 (41) | |
| Employee | 5 (3) | 0 (0) | 3 (5) | 2 (4) | |
| Father's job n (%) | | | | | |
| Employee | 74 (48) | 29 (60) | 27 (47) | 18 (37) | 0.63 |
| Self-employee | 76 (49) | 19 (40) | 28 (48) | 29 (59) | |
| Part time | 5 (3) | 0 (0) | 3 (5) | 2 (4) | |

and classified them into risk groups. The analysis of covariance (ANCOVA) test was used for comparisons across the different categories among the different groups.

In addition, ROC was fitted to determine the scores on the NutriCHEQ questionnaire. They suggested that the NutriCHEQ questionnaire was reasonable and valid in the

Lebanese context to assess the dietary quality of toddlers in Lebanon and identified those at increased nutritional risk.

Another psychometric study by Rice *et al.*^[23] investigated the validity of a parent-administered (NutriCHEQ) questionnaire as a means of evaluating dietary risk in children aged 12–36 months old. The NutriCHEQ scores for

Table 3: Mean daily intakes of micronutrients for Iranian toddlers by quartiles of do this for each table (n=156)

| | Quartile 1 | Quartile 2 | Quartile 3 | Quartile 4 |
|-------------------------|--------------|--------------|--------------|--------------|
| n | 78 | 57 | 14 | 7 |
| Gender (Boys: Girls) | 46:32 | 33:24 | 10:4 | 4:3 |
| Age (years mean±SD) | 1.89±0.83 | 2.14±0.77 | 1.80±0.76 | 2.13±0.81 |
| Nutrient analysis n (%) | | | | |
| Energy (MJ) | 4.71 (1.3) | 4.7 (1.4) | 5.10 (1.6) | 4.83 (1.7) |
| Protein (% TE) | 12.24 (4.7) | 12.93 (3.8) | 13.30 (2.5) | 12.41 (3.7) |
| Carbohydrate (% TE) | 49.90 (14.6) | 49.24 (12.6) | 53.47 (10.6) | 52.10 (11.3) |
| Dietary fiber (MJ) | 11.0 (4.7) | 10.2 (4.4) | 9.1 (4.0) | 8.1 (3.8) |
| Sat. fat (% TE) | 12.65 (6.2) | 11.21 (3.5) | 10.91 (4.5) | 11.40 (4.8) |
| Total fat (% TE) | 39.80 (11.8) | 39.72 (12.6) | 35.10 (9.8) | 37.34 (10.9) |

Table 4: Nonlinear principal components analysis on 10 items in the part one NutriCHEQ questionnaire (n=156)

| Part | Factor | Item No. | Factor loading | Eigen value | Extracted variance |
|------|--------|----------|----------------|-------------|--------------------|
| A | 1 | 5 | 0.814 | 2.077 | 20.77 |
| | | 2 | 0.794 | | |
| | | 3 | 0.572 | | |
| | | 9 | 0.546 | | |
| | | 7 | 0.535 | | |
| | 2 | 10 | 0.413 | 2.230 | 22.30 |
| | | 6 | 0.805 | | |
| | | 4 | 0.756 | | |
| | | 8 | 0.629 | | |
| | | 1 | 0.563 | | |
| 3 | 2 | 0.696 | 1.327 | 14.75 | |
| | 9 | 0.685 | | | |
| | 6 | 0.590 | | | |
| | 4 | 0.250 | | | |
| | 8 | 0.548 | | | |
| B | 4 | 3 | 0.529 | 1.234 | 13.71 |
| | | 1 | 0.528 | | |
| | | 5 | 0.456 | | |
| | | 7 | 0.332 | | |

children across the different categories among the different groups were compared by ROC curves. They stated that the NutriCHEQ questionnaire was a valid questionnaire that can quickly assess dietary quality in preschoolers. Also, they concluded that the questionnaire can identify nutritional risks. Also, Gibbons *et al.*,^[35] supported by Danone Trading BV, established the consistency and reliability of the NutriCHEQ questionnaire to identify pediatrics into the risk of malnutrition in the Irish National Preschool. They used the Principal component analysis in conjunction with Cronbach's alpha as a test of reliability. They concluded that the NutriCHEQ questionnaire is a brief, consistent, and reliable questionnaire. They mentioned that the NutriCHEQ questionnaire correctly identified toddlers with poor nutritional intakes.

The objective of Byrne *et al.*'s^[36] systematic review was in describing a valid, reliable, and brief questionnaire

to measure dietary intake, physical activity, sedentary behavior, and sleep in young children. Byrne *et al.* based on Byrne *et al.*'s study, concluded that the NutriCHEQ questionnaire can measure early-life obesity-related behaviors among children less than 5 years of age.

In our study, the NutriCHEQ questionnaire was found to be a valid and reliable questionnaire for assessing the nutritional status of Iranian toddlers. As a whole, the NutriCHEQ questionnaire can be administered during the pediatricians' periodic visits for growth monitoring, to identify a toddler's malnutrition, and to identify who needs further blood screening in the case of micronutrients and/or nutritional intervention requirements.

Conclusions

The NutriCHEQ questionnaire is a reliable and convenient questionnaire for professionals or parents for the identification of nutritional risks for Iranian toddlers. Our findings support the validity and reliability of the NutriCHEQ questionnaire from previous research. We believe that the NutriCHEQ questionnaire is a valid and reliable questionnaire that can identify the children's nutritional risk and targeted nutrition interventions in Iranian toddlers as early as possible.

Key message

The toddler period is an important phase when the toddler transitions from breastfeeding to family food. In the early toddler phase, the demand for micronutrients is high as the infant's growth depends on the essential nutrients. Therefore, they are at risk of malnutrition. The early diagnosis and intervention based on accurate and cost-effective screening of toddlers are important. We assessed the validity and reliability of the NutriCHEQ questionnaire. We conclude that the NutriCHEQ questionnaire is a reliable and valid instrument for professionals or parents in case of identification of nutritional risks for Iranian toddlers.

Ethical considerations

The study was approved by the Shahid Beheshti University of Medical Sciences Ethics Committee (IR.SBMU.RETECH.REC.1397.454). Patients were informed about

study aims and procedures that participation was voluntary, and would not affect medical care before signing an informed consent document. Patient confidentiality was assured by completing all study procedures in a quiet treatment area.

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Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity.

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The project was approved and financially supported by the ethical committee of the Shahid Beheshti University of Medical Sciences with the ethics code of (IR.SBMU.RETECH.REC.1397.454).

Conflicts of interest

There are no conflicts of interest.

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