

## Original Article

# Translation, validity, and reliability of an Arabic version of the dietary questionnaire on nutrition knowledge, self-efficacy, and practice among Arab young adults

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**Background and Objectives:** Assessing knowledge, self-efficacy, and practice among a given population using a validated and reliable questionnaire is crucial. The aim of this study was to translate, validate, and test the reliability of the knowledge, self-efficacy, and practice in the Arabic population. **Methods and Study Design:** A previously published knowledge, self-efficacy, and practice nutrition questionnaire was translated and validated into Arabic. A panel of translation and nutrition experts from Arab countries participated in translation and testing validity. A convenience sampling technique was used to recruit participants across 22 Arab countries. An online self-administered questionnaire was completed twice with an interval of 2 weeks. Tests of validity (face and content) and reliability (consistency and test-retest reliability) were used. **Results:** A total of 96 participants had a mean age of 21.5 years, 68.7% were female, and 80.2% were students. The mean expert proportional content validity index scale was 0.95, and intra class correlation values ranged from 0.59 to 0.76; all of these values were highly statistically significant at retest. **Conclusions:** The Arabic version of the questionnaire provided valid and reliable results for assessing knowledge, self-efficacy, and practice among Arab adolescents and young adults. This tool could assess nutritional education programs in a community setting and educational institutions targeting this population in Arab countries.

**Key Words:** Arabic, dietary questionnaire, nutrition knowledge, self-efficacy, young adults

## INTRODUCTION

Nutrition plays an important role in maintaining overall health. During the early adulthood period, adolescents and young adults develop numerous health-related nutrition and lifestyle behaviors.<sup>1-3</sup> There is a link between food intake, dietary habits, and the risk of several chronic diseases, such as diabetes mellitus and cardiovascular disease.<sup>4</sup> Unhealthy dietary intake is associated with nutritional knowledge, self-efficacy, and practice (KSP).<sup>5, 6</sup> Nutritional KSP was created in 1950 to evaluate family planning services.<sup>7</sup> Since then, nutritional-related KSP has been used in the nutritional epidemiology community to assess the influence of nutrition on overall health, disease risk, as well as nutritional education programs' influence on KSP and nutritional status.<sup>8</sup> Studies related to nutritional KSP can determine the existing knowledge, attitudes, and practices related to nutrition and identify the priorities of nutrition education programs.<sup>8</sup>

Several studies have assessed university students' nutritional knowledge and found their average nutritional knowledge score to be approximately 60%.<sup>9</sup> An increased knowledge score is associated with lower fat intake and cholesterol levels.<sup>9</sup> Another study examined nutritional KSP among university students in Turkey and the USA

before and after a nutritional education program.<sup>10</sup> The nutritional education program improved overall nutrition knowledge and attitude scores among students in both countries and improved practice scores among students in the USA. A recent study that assessed the nutritional KSP of Chinese and international university students in China found that Chinese students had higher KSP scores than their counterparts.<sup>11</sup> They also reported an inverse relationship between KSP scores and body mass index among international students. This indicates that international students need adequate nutritional education programs to improve their nutritional knowledge, attitudes, and practices.

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Measuring nutritional KSP and assessing the association between nutritional KSP and other health indicators is crucial for designing appropriate nutritional education programs. However, there are limited Arabic tools to assess nutritional KSP among adolescents and young adults. Thus, the current study aimed to translate and validate the sections related to the nutritional KSP questionnaire "Dietary Questionnaire on Food Habits, Eating Behaviour and Nutritional Knowledge of Adolescents" into Arabic and to test the questionnaire's reliability in an Arab population. Selection of this tool was based on the comprehensiveness of its content and adequacy for the objective of our study as it will be used among Arab populations. This questionnaire was previously used among study populations from different countries and different age groups.<sup>12-14</sup> Both validity and reliability are considered as key complementary standards of how sound a questionnaire is as a research tool.<sup>15</sup> The validity of a tool refers to its ability to measure what it is supposed to measure whereas the reliability focuses on the overall consistency of the tool.<sup>16, 17</sup> Thus, a research tool that meets standards for validity and reliability generates accurate and consistent results ensuring a high credibility to the study.

## METHODS

### Questionnaire

The questionnaire consisted of three domains: knowledge, self-efficacy, and practice, with a total of 30 questions

distributed as follows: 10 questions assessing knowledge, 7 questions assessing self-efficacy, and 13 questions assessing practice.<sup>15</sup> The questions were presented in Table 1.<sup>15</sup>

### Participants

The study population was composed of men and women, between the ages of 18 and 25 years, living in Arabic-speaking countries, who could read and understand the Arabic language. Arabic-speaking countries were defined as the 22-member countries of the League of the Arab States: Algeria, Bahrain, Comoros, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Palestinian Territories, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, the United Arab Emirates, and Yemen. Exclusion criteria were having any serious health condition, for example, chronic diseases such as diabetes, hypertension, heart or renal problems, or being on a special diet that could affect their knowledge of nutrition and food intake. Considering that the minimum required sample size needed to validate questionnaires is the number of questions multiplied by 3, a sample size of at least 84 was required for this study. Convenience sampling was used to recruit participants. Before participating in the study, participants gave their consent by clicking on the "I agree" button as the questionnaire was shared online. Institutional review board approval was obtained from the institutional review board of Princess Nourah

**Table 1.** Dietary questionnaire on nutrition knowledge, self-efficacy, and practice among Arab young adults<sup>†</sup>

Knowledge domain	
Q1	Which different foods contain carbohydrates?
Q2	Which different foods do not contain dietary fibre?
Q3	Which different foods are less rich in fat?
Q4	Which different foods are richer in protein?
Q5	Which of the following foods has the highest amount of nutritional energy (calorie)?
Q6	Which of the following nutrients has the highest amount of nutritional energy (caloric) ?
Q7	What are the functions of vitamins and minerals?
Q8	What is a "Balanced diet"?
Q9	What is meant by "Daily energy consumption"?
Q10	Which of the following foods has the lowest salt content?
Self-efficacy domain	
Q1	Do you think that you are able to choose your own food?
Q2	Do you think that you can apply advice aimed at improving your health?
Q3	Do you think that you can reduce or increase your body weight if necessary?
Q4	Do you think that you can apply nutritional advice aimed at improving your eating habits?
Q5	Do you think that you are able to apply nutritional advice aimed at improving your health?
Q6	Do you think that you are able to engage in continuous physical activity to improve your health?
Q7	Do you think that you are able to engage in continuous physical activity to improve your appearance?
Practice domain	
Q1	Do you eat breakfast?
Q2	What drinks do you drink with your breakfast?
Q3	What do you usually eat for breakfast?
Q4	Do you eat at least two servings of fruit per day?
Q5	Do you eat at least two servings (equivalent to two cups) of vegetables per day?
Q6	Do you eat cakes or sweets after your main meal?
Q7	Do you eat breakfast, lunch and dinner regularly every day?
Q8	Is your diet:
Q9	Your diet mainly depends on:
Q10	Your snacks between meals depend on:
Q11	What drinks do you usually drink between meals?
Q12	Do you eat at least one cup of milk, curd, or yogurt daily?
Q13	Do you drink at least 4-6 cups of water a day?

<sup>†</sup>The questions were developed and modified from Turconi et al (2003).<sup>15</sup>

Bint Abdulrahman University (Number: 20-0346).

### Demographic data

Basic demographic data consisting of sex, age, employment, and citizenship status were collected.

### Translation

#### Forward and back translations

As the KSP questionnaire has already been published in English, the process of translation and adaptation of the instrument was undertaken after obtaining the approval of the authors (Figure 1).<sup>15</sup> The objective was to develop the Arabic version to be conceptually equivalent to the English version, while considering Arabic culture in terms of foods commonly consumed. The classic Arabic language used in all 22 Arab countries was used for translation, and Arabic dialectal variations of some foods were added.

At the beginning of the translation process, two questions were excluded from the knowledge section due to their irrelevance in Arab culture: "What are 'biological foods'?" and "What are 'transgenic foods'?" Additionally, a question related to sodium content was added to the knowledge section because sodium intake is a concern in the Middle East.<sup>18-20</sup> Another question that was excluded was: "Do you usually drink wine or beer at meals?" This question was removed because alcohol consumption is culturally not appropriate in most Arab societies.<sup>21-24</sup>

The remaining KSP questions in the Arabic version were in the same order as the original questionnaire. As such, forward and back-translation processes were as follows:<sup>25</sup>

**Forward translation:** Clear instructions were given to the expert panel of translators, who were scientists and nutritionists, whose mother tongue was Arabic, had excellent knowledge of English, and were from five different countries: Saudi Arabia, Jordan, Egypt, Algeria, and Morocco. Emphasis was placed on the need for conceptual rather than literal translations, and the importance of using a natural, acceptable, and common language for the broadest audience across all Arab countries.

**Back-translation:** The instrument was then translated back from Arabic to English by an independent panel fluent in both languages, who had no previous knowledge of the questionnaire. It was composed of five experts in the field of nutritional sciences from the same five countries: Saudi Arabia, Jordan, Egypt, Algeria, and Morocco. Similar to the initial translation, emphasis in the back-translation was also placed on conceptual and cultural equivalence and not the exact linguistic equivalence.

**Comparison:** An expert committee composed of three members reviewed and compared the backward translation of the original questionnaire. Because of discrepancies in terms of dialectal meaning, after discussion, more work on the translation was conducted. The process was conducted twice to obtain a satisfactory version that was approved by the back-translation panel.

**Pre-testing:** The final translated version was pre-tested. The translated version was evaluated by 13 expert nutritionists from different Arab countries including: Saudi Arabia, Egypt, Morocco, Bahrain, Yemen, Syria, Mauritania, Comoros, Lebanon, Tunisia, Palestine, Oman, and Qatar. The experts had not participated in the translation process. Each expert was requested to give feedback and comment on any question that was unclear to him/her, as recommended by Sousa (2011).<sup>26</sup> The expert then gave a score on a scale from 1 to 5 on whether the questionnaire items were relevant, precise, well-articulated, and understandable. The questions were revised if the average score obtained was < 3.

### Validity

Once the translation process was finalized, the questionnaire was re-distributed to the same group of experts who performed the pre-test to answer questions related to validity (face validity, floor and ceiling effects, and content validity).<sup>27</sup>

#### Face Validity

Face validity consisted of measuring three main aspects, as indicated by Ehrenbrusthoff et al., which are: completeness of content, comprehensibility, and time to com-

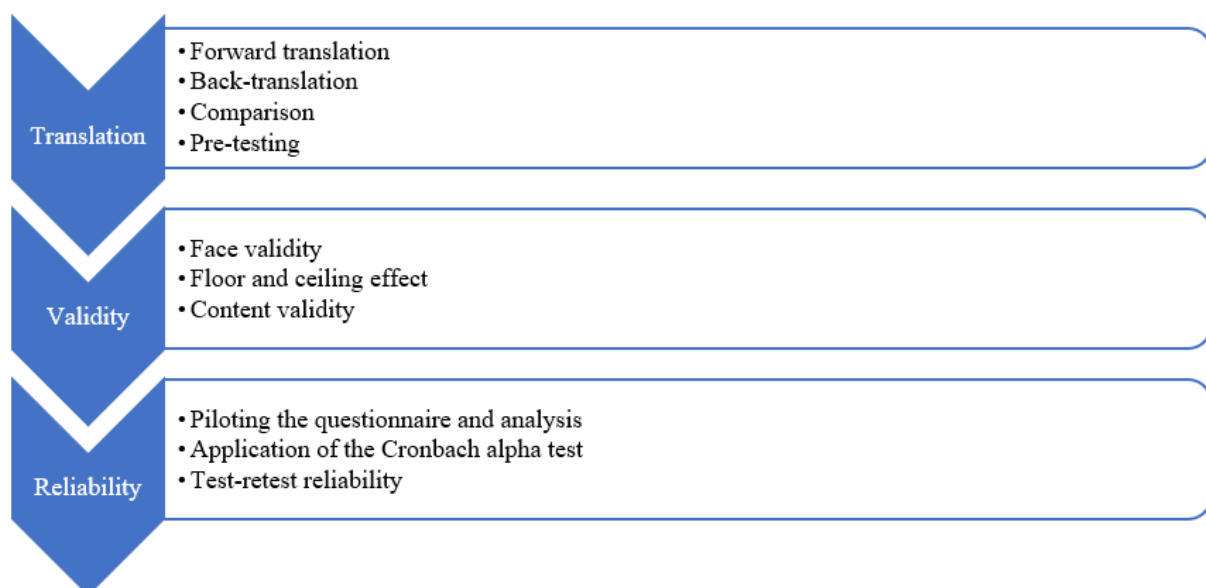


Figure 1. Flowchart of the translation, validity, and reliability processes

plete.<sup>28</sup>

**Completeness of content:** “Do you think that this questionnaire covers the most important aspects of altered back-related perception?” [Yes/No]; if “No,” the respondent was asked to indicate “which aspects they would incorporate?”

**Comprehensibility:** “Are the questions sufficiently comprehensible?” [Yes/No]; if “No,” the respondent was asked, “Which items are not sufficiently comprehensible?”

**Time to complete:** “Is the time needed for filling in the questionnaire appropriate?” Scoring on a 0–10 scale was used, with 0 representing “unacceptably long” and 10 “completely okay.”

These questions helped provide an insight on the overall usability. Based on the feedback received, no extra revision was needed as per any content or linguistic ambiguities as an important step recommended by Janssens et al.<sup>29</sup>

### Floor and ceiling effect

Ceiling and floor effects occur when a substantial percentage of participants give the highest or lowest score on a specific scale. This indicates that the measure was not suitable for discriminating between participants at either extreme of the scale.<sup>30</sup> The floor and ceiling effects of the questionnaire were assessed in participant groups from different countries for each item level by assessing the total scores. Ceiling or floor effects were considered if >15% of the participants indicated the highest or lowest possible scores. This means that none of the participants got the lowest score on the questionnaire (e.g., 0 points) or the maximal score (e.g., 100 points). Therefore, no floor or ceiling was considered in the translated version of the questionnaire.

### Content validity

Content validation was checked by asking the experts to give a score of 1 (item not relevant) to 4 (item is very relevant) based on the relevance of the translated items in the KSP questionnaire. Scores were categorized as follows: 3 and 4 were categorized=1 (relevant), and scores of 1 and 2=0 (not relevant). The content validity index (CVI) was calculated using an average scale.

### Individual CVI

Additionally, the CVI for individual items (I-CVI) and the CVI for scale (S-CVI) were assessed by a panel of 10 experts who reviewed the relevance of each question based on a 5-point Likert scale (1=not at all relevant, 2=not relevant, 3=neutral, 4=relevant, 5=very relevant). Items were considered relevant with scores of 4 and 5. S-CVI/Average and S-CVI/Universal agreements were calculated as reported by Rodrigues et al.<sup>31</sup>

### Reliability

Reliability was tested to ensure that the questionnaire consistently produced the expected result, along with homogeneity. This was achieved according to the following steps.

- Piloting the questionnaire involving at least 50 Arab-speaking participants, aged 18–25 years.<sup>32</sup>

- We analyzed the pilot data for appropriate reliability measures using SPSS software. The questionnaire was administered to the same sample and the respondents were requested to answer without any assistance from the researchers.

- Cronbach’s  $\alpha$  was applied to each of the three domains of the KSP. The acceptable reliability score was considered as ranging from 0.7 and higher for each of the three domains.<sup>33,34</sup>

- The obtained Cronbach’s  $\alpha$  was very low for the domains of knowledge, which is why the option “I don’t know” was added to all the questions and the reliability was retested. A higher score (Cronbach’s  $\alpha=0.71$ ) was then obtained.

- Test-retest reliability: Scores obtained from the participants on the two occasions were compared and calculated using the correlation coefficient formula (Pearson  $r$ ) to ensure that individuals’ responses to the questionnaire items remain relatively consistent across repeated administrations of the same questionnaire.<sup>35</sup> It is worth noting that in this step, the same individuals answered the same translated version of the questionnaire twice, with a minimum interval of 2 weeks between the first and second administrations. Respondents were not given any information regarding their respective scoring on the first occasion to avoid bias in the results. Spearman’s rho was used to calculate the correlation coefficients. Additionally, the intraclass correlation coefficient (ICC) with a two-way random model was used to measure the coefficient of stability of the questionnaire. ICC scores were categorized as follows: <0.75, poor reliability; 0.75–0.89, moderate reliability; and 0.90, excellent reliability.<sup>22</sup> Statistical significance was set at  $p<0.05$ .

### Data analysis

Data were analyzed using SPSS 26.0 (IBM Inc., Chicago, United States) version statistical software. Descriptive statistics (mean, standard deviation, frequencies, and percentages) were used to describe quantitative and categorical variables. Internal consistency of the nutrition scale (KSP) was assessed using Cronbach’s alpha. Spearman’s correlation coefficient among the items was calculated to assess the test-retest validity. The construct validity of the nutritional scale was assessed using factor analysis in which the correlation matrix, Kaiser–Meyer–Olkin (KMO) measurement of sampling adequacy, and Bartlett’s test of sphericity were used to assess the factorability of the 30 items. The factor structure was restricted to three factors (KSP) using the principal component method for the factor extraction process. Eigen values were used to assess the proportion of variance explained by each of the three factors (knowledge, self-efficacy, and practice). Varimax rotation was used to obtain the rotated factors. A  $p$ -value  $\leq 0.05$  was used to report the statistical significance of the results.

## RESULTS

### Translation

As per culture, religion, and most dominant dietary habits in Arab countries, the following words were replaced by commonly consumed food items: “*focaccia*” by “*pizza*,” “*dover sole*” by “*fish*,” “*grilled meat*” by “*grilled chicken*”

breast," "Alcohol" by "water," "Chocolate" as a drink by "water." The question on "what are 'biological foods'?" and "what are transgenic foods?" were removed due to their irrelevance to the Arab context. While the question "Do you usually drink wine or beer at meals?" was removed, considering culture and religion for most Arab countries, as mentioned earlier. In addition, the "1 to 1.5 liter of water" was replaced by "4–6 glasses of water" to make an easier estimation for the respondents. Another question was added in the knowledge section about salt content as follows: "Which of these foods has the highest salt content?" (Options: orange, French fries, canned tuna, nuts). These changes were suggested and approved by all members of the translation expert panel. The back-translation was checked and revised. Agreement was obtained regarding all questions in the three different sections.

### Face validity, individual CVI

The results of face validity are summarized in Table 2. For completeness of the content, 80% of the expert nutritionists considered the questionnaire complete. However, there was a suggestion to add a question on the proportion of food types that people should eat to have a healthy and balanced diet, mainly for macronutrients, and another question on the frequency of physical activity. As these suggestions would affect the faithfulness of the translation of the original questionnaire, the questions were not added. In terms of comprehensibility, 70% judged it comprehensible. Additional details were added to the following questions:

- Question 3 (practices) required adding jam, butter, and olive oil to the question.
- Question 4 (practices) needed the addition of examples of apple, banana, and prunes.
- Question 5 (practices) needed to specify the cup size or indicate mL.
- Question 9 (practices) needed the addition of a definition of "diet."

The time needed to complete the questionnaire was considered appropriate, with an average scoring of 9.7 ( $\pm 0.4$ ) out of 10. The obtained values for the I-CVI were  $\geq 0.90$  and equal to 0.96 and 0.40 for CVI/Average and S-CVI/ Universal agreement, respectively. The mean proportion of experts was 0.95.

### Reliability

In this exploratory study of reliability and validity, 96 participants were recruited. Their mean age was 21.5 years, 68.7% were female, and 80.2% were students. The nationality of the study participants was distributed across 22 countries in the Middle East and Africa (Table 3).

Table 4 shows the internal consistency (Cronbach's alpha) for each of the three factors of the nutrition scale (KSP) and all items of the scale for the responses that were collected twice (test and retest). The Cronbach's alpha values of the test for the three factors (KSP) and all items ranged from 0.46 to 0.64 which were statistically significant. However, poor internal consistency was found for self-efficacy and moderate internal consistency for knowledge and practice items, whereas acceptable internal consistency was found for all items of the scale. Regarding the retest reliability, the Cronbach's alpha values for the three factors and all items showed better internal consistency as the Cronbach's values range from 0.59 to 0.76 and all these values were highly statistically significant.

Figure 2 shows the Spearman's correlation coefficient values, which provides a measure of test-retest reliability of items. The correlation values for all items of the three factors of the nutritional scale showed a statistically significant positive correlation between the responses of participants observed twice (test-retest). The correlation values, for the 10 items of the knowledge factor ranged from 0.32 to 0.60 where the lowest correlation 0.32 relates to Q7 and highest correlation 0.60 relates to Q5 of knowledge items; for the 7 items of the self-efficacy factor ranged from 0.17 to 0.50, where lowest correlation 0.17 relates to Q4 and highest correlation 0.50 relates to Q6 of self-efficacy items and for the 13 items of practice factor ranged from 0.42 to 0.69 where the lowest correlation 0.42 relates to Q10 and highest correlation 0.69 relates to Q4 of practice items. Among the three factors, the correlation values for the items of self-efficacy factor were lower than the correlation values of items of knowledge and practice.

Correlation among the 30 items on the nutritional scale were statistically significant. The KMO measure of sampling adequacy was 0.44, which was closer to 0.5, and Bartlett's test of sphericity was significant ( $p < 0.0001$ ), showing that the correlation matrix derived from these items is not an identity matrix. The factor extraction with the initial eigen values, percentage of variance attributable to each factor, and cumulative variance of the factors showed that the first factor accounted for 10.5% of the variance, the second factor accounted for 9.05%, and the third factor accounted for 6.67%, with a cumulative variance of 32.7%. The factor loadings of the 30 items of the scale on the three factors (KSP) were extracted. The higher the absolute value of the loading, the more the factor contributes to the respective item. The loading indicated that three factors contributed to each of the 10 items of knowledge, 7 items of self-efficacy, and 13 items of practice. For the four items (Q2, Q4, Q6, and Q10) of

**Table 2.** Face validity items

Item	Results
Completeness of contents	80%
Comprehensibility	70%
Appropriateness of time complete (mean $\pm$ SD)	9.7 $\pm$ 0.4

SD; standard deviation

N = the proportion of experts indicating a complete agreement with the item. Means and SD are calculated based on the scoring (0–10 scoring system).

**Table 3.** Characteristics of study participants (n = 96)

Characteristics	No.	(%)
Age (mean $\pm$ SD)	21.5	$\pm$ 2.02
Sex		
Male	30	(31.3)
Female	66	(68.7)
Occupation		
Unemployed	6	(6.3)
Student	77	(80.2)
Employee	13	(13.5)
Country		
Algeria	1	(1.0)
Bahrain	5	(5.2)
Comoros	4	(4.2)
Djibouti	1	(1.0)
Egypt	6	(6.2)
Iraq	4	(4.2)
Jordan	4	(4.2)
Kuwait	7	(7.3)
Lebanon	2	(2.1)
Libya	5	(5.2)
Mauritania	4	(4.2)
Morocco	7	(7.3)
Oman	5	(5.2)
Palestine	5	(5.2)
Qatar	5	(5.2)
Saudi Arabia	4	(4.2)
Somalia	1	(1.0)
Sudan	4	(4.2)
Syria	4	(4.2)
Tunisia	6	(6.3)
UAE	6	(6.3)
Yemen	6	(6.3)

SD; standard deviation

**Table 4.** Intraclass correlation coefficients of nutrition knowledge, self-efficacy, and practice items of responses of study participants at the two test times (test and retest)

Factors	Test				Retest			
	ICC	95% CI	F-value	p-value	ICC	95% CI	F-value	p-value
Knowledge items	0.587	0.452–0.700	2.422	< 0.001	0.755	0.675–0.822	4.084	< 0.001
Self-efficacy items	0.458	0.274–0.609	1.844	< 0.001	0.726	0.634–0.803	3.656	< 0.001
Practice items	0.528	0.376–0.656	2.117	< 0.001	0.594	0.455–0.710	2.463	< 0.001
All items	0.639	0.527–0.735	2.771	< 0.001	0.586	0.449–0.702	2.413	< 0.001

CI; confidence interval, ICC; intraclass correlation

the knowledge factor, two items (Q2 and Q5) of the self-efficacy factor and six items (Q3, Q4, Q6, Q8, Q10, and Q13) of the practice factor showed loadings less than 0.30 (Table 5).

## DISCUSSION

The objective of the current study was to translate, validate, and assess the reliability of the sections related to KSP of the questionnaire “*Dietary Questionnaire on Food Habits, Eating Behaviour and Nutritional Knowledge of Adolescents*” into the Arabic language for Arab adolescents and young adults. Nutrition knowledge is defined as the individual cognitive process in relation to information on food and nutrition that might affect the dietary practices such as making healthy food choices and its success in preventing non-communicable diseases. It is considered as one of the factors that affect nutritional status and nutritional habits of individuals, families, and

societies.<sup>36</sup> Consequently, researchers in the field of nutrition continuously attempt to design and develop reliable and valid questionnaires that distinguish and measure nutrition knowledge and its impact on dietary behavior, diet-health awareness, attitudes and self-efficacy. In fact, the first step in delivering successful health promotion to targeted audiences requires the identification of their current level of nutrition knowledge.<sup>37</sup>

The original questionnaire consisted of 99 questions divided into nine sections that covered numerous topics, such as food and dietary intake, nutrition knowledge, and lifestyle.<sup>15</sup> As a first step, the current study chose only three sections related to nutrition knowledge, self-efficacy, and practice (with a total of 30 questions) to start translation, validation, and assessment of reliability. The KSP questionnaire can be used in a community setting as a screening tool to assess nutrition knowledge,

Items	Knowledge (Retest)												
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10			
Knowledge (Test)													
Q1	0.358	--	--	--	--	--	--	--	--	--			
Q2	--	0.449	--	--	--	--	--	--	--	--			
Q3	--	--	0.430	--	--	--	--	--	--	--			
Q4	--	--	--	0.438	--	--	--	--	--	--			
Q5	--	--	--	--	0.596	--	--	--	--	--			
Q6	--	--	--	--	--	0.506	--	--	--	--			
Q7	--	--	--	--	--	--	0.320	--	--	--			
Q8	--	--	--	--	--	--	--	0.371	--	--			
Q9	--	--	--	--	--	--	--	--	0.471	--			
Q10	--	--	--	--	--	--	--	--	--	0.336			
Self-efficacy (Test)													
Q1	0.420	--	--	--	--	--	--						
Q2	--	0.422	--	--	--	--	--						
Q3	--	--	0.380	--	--	--	--						
Q4	--	--	--	0.171	--	--	--						
Q5	--	--	--	--	0.261	--	--						
Q6	--	--	--	--	--	0.498	--						
Q7	--	--	--	--	--	--	0.256						
Practice (Test)													
Q1	0.616	--	--	--	--	--	--	--	--	--			
Q2	--	0.607	--	--	--	--	--	--	--	--			
Q3	--	--	0.551	--	--	--	--	--	--	--			
Q4	--	--	--	0.691	--	--	--	--	--	--			
Q5	--	--	--	--	0.566	--	--	--	--	--			
Q6	--	--	--	--	--	0.601	--	--	--	--			
Q7	--	--	--	--	--	--	0.569	--	--	--			
Q8	--	--	--	--	--	--	--	0.427	--	--			
Q9	--	--	--	--	--	--	--	--	0.553	--			
Q10	--	--	--	--	--	--	--	--	--	0.416			
Q11	--	--	--	--	--	--	--	--	--	--	0.559		
Q12	--	--	--	--	--	--	--	--	--	--	--	0.659	
Q13	--	--	--	--	--	--	--	--	--	--	--	--	0.607

Figure 2. Test and retest reliability of knowledge, self-efficacy, and practice items of the nutritional scale

Table 5. Factor loadings of items across the three factors of the nutritional scale

Items	Factor		
	Knowledge	Self-efficacy	Practice
Knowledge items			
Q1	.531		
Q2	.200		
Q3	.690		
Q4	.249		
Q5	.602		
Q6	.149		
Q7	.628		
Q8	.556		
Q9	.339		
Q10	.202		
Self-efficacy items			
Q1		.373	
Q2		.224	
Q3		.440	
Q4		.304	
Q5		.234	
Q6		.674	
Q7		.532	
Practice items			
Q1			.566
Q2			.493
Q3			.252
Q4			.198
Q5			.476
Q6			.127
Q7			.553
Q8			.019
Q9			.368
Q10			.246
Q11			.410
Q12			.626
Q13			.294

self-efficacy, and practice among Arab adolescents and young adults.

The current study followed a rigorous translation and adaptation process of the questionnaire sections related to nutrition KSP into Arabic. Arabic countries cover an immense area, with distinct cultures and diverse nutritional backgrounds, across Africa and Asia. Therefore, translating a questionnaire for Arab countries is challenging because it needs to include food items that are known in all 22 countries and words that have the same meaning in all these countries. To accomplish this, validity was measured by dietitians and nutritionists from different Arab countries. In addition, the reliability of the translated questionnaire was evaluated in men and women who are university students across all Arab countries.

Several assessment methods for validity, such as face validity, content validity, and reliability, including internal consistency and test-retest reliability, were used in the current study. The Arabic version of the questionnaire provided valid and reliable results. The potential threat to validity related to the translation process of the questionnaire was decreased based on expert assessment in terms of completeness, comprehensibility, and appropriateness of time to complete the questionnaire. Content equivalence and semantic equivalence were checked to ensure that the intended meaning after translation agreed with the original questions. The translation and adaptation processes were consistent with those reported in previous studies.<sup>38, 39</sup> In fact, the obtained statistics revealed that the mean expert proportional CVI scale was 0.95, which is considered excellent, indicating that the content of the translated KSP questionnaire is well adapted to the local context of Arab countries.<sup>40</sup>

As far as the reliability is considered, the overall internal reliability of the Arabic version of the nutrition scale (KSP) was acceptable. Hence, the retest Cronbach's alpha ranged from 0.59 to 0.76, with all values being highly statistically significant. This is consistent with the original questionnaire where the retest of Cronbach's alpha for the three factors ranged from 0.56 to 0.75 among adolescents.<sup>15</sup> In another study on Arab Lebanese adolescents, nutrition-related knowledge, self-efficacy, and practice subscales showed Cronbach's alphas of 0.64, 0.74, and 0.62, respectively, with total ranges from 0.495 to 0.809.<sup>41</sup> However, the questionnaire differed in terms of related nutrition measures and the items used. Furthermore, it has been reported that the nutrition knowledge Cronbach's alpha value ranged from 0.5 to 0.8 (mostly from 0.6 to 0.7).<sup>41-43</sup> It is worth mentioning that a Cronbach's alpha of <0.7 is common in the case of subscales containing <10 items and could be attributed to some degree of divergence of the responses to the items in the subscales.<sup>41</sup> In fact, the tendency of individuals to answer toward extremes will decrease the spread of responses on each subscale item, leading to a decrease in the size of sub-item correlations. Consequently, the obtained value of Cronbach's alpha was low.<sup>41</sup>

The correlation coefficients of knowledge and self-efficacy items in the current study were significantly improved at retest compared to the practice items of the nutrition scale responses. This could be explained by the relatively short duration between the two test times (2-

week interval) and the fact that dietary practices take longer to change in any community.<sup>44</sup>

With regard to the test-retest reliability of the three factors of the nutritional scale, the correlation coefficient showed a statistically significant positive correlation between the responses of participants. In general, the correlations were moderate, except for questions about the ability to use nutritional advice to improve dietary habits and health status in the self-efficacy section. Self-efficacy has been proven to be an important predictor of nutrition and health behavior change, and it reflects an individual's self-confidence in initiating and maintaining a new behavior.<sup>45</sup> However, the factor loading showed that some items had a KSP factor of less than 0.30. This could be due to the small sample size and variability in responses, as the study participants were from different countries, and the Arabic nutritional scale was being used among them for the first time.

The KSP was translated by several nutritionists and dietitians from diverse Arab countries. Involving dietitians from different Arab backgrounds enriched the KSP, in which the food items and terminology used can be applied and understood by most of the Arab population. During the translation phase, we noticed diverse dietary habits among Arab populations; hence, the reliability test showed consistency in test scores. However, some limitations were encountered in the translation, validation, and reliability of the KSP questionnaire. Although we had 96 participants from 22 countries, it was challenging to obtain participants from Djibouti, Algeria, and Somalia.

The translated KSP questionnaire is a reliable and valid questionnaire to assess nutrition knowledge, self-efficacy, and practice among Arab adolescents and young adults, and can be used in the future to assess the impact and efficiency of nutritional education programs. It is advocated for use in community settings and educational institutions such as high schools and universities targeting adolescent and young adult Arabs. From a research perspective, we recommended further translation, validation, and reliability assessment of the remaining sections of the original questionnaire (food habits, barriers to change, healthy and unhealthy diet and foods, and physical activity and lifestyle).

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#### CONFLICT OF INTEREST AND FUNDING DISCLOSURE

The authors report that there are no competing interests to declare.

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