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ΕΡΕΥΝΗΤΙΚΗ ΕΡΓΑΣΙΑ

Translation and validation of the Diabetes Knowledge Questionnaire-Revised into Greek in patients with type 2 diabetes mellitus

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ΑΡΧΕΙΑ ΕΛΛΗΝΙΚΗΣ ΙΑΤΡΙΚΗΣ 2027, 44(1):83–87

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OBJECTIVE **The translation and psychometric evaluation of the Diabetes Knowledge Questionnaire-Revised (DKQ-R) into the Greek language, in order to assess the level of knowledge of patients with type 2 diabetes mellitus (T2DM).** METHOD **A cross-sectional study was conducted on a convenience sample of 30 patients with T2DM, with a mean age of 61.2 years. Data collection took place during December 2024 and January 2025. To assess the reliability, the test-retest method was used; Cohen's kappa (κ) and intraclass correlation coefficients (ICC) were calculated. Spearman correlation coefficients were calculated to check the validity. The two-sided level of statistical significance was set at 0.05.** RESULTS **The Spearman correlation coefficient between the DKQ-R score and the educational level was 0.40 (p-value=0.03) in the first measurement and 0.44 (p-value=0.02) in the second. Thus, a higher level of education was associated with more knowledge. Therefore, both correlations were positive and statistically significant. The ICC between the initial and repeated measurements was 0.968 (95% confidence interval: 0.933–0.985, p<0.001). The KR-20 values were 0.662 and 0.655, respectively.** CONCLUSIONS **The Greek version of the DKQ-R proved to be reliable and valid, making it a useful tool for assessing the knowledge of patients with T2DM.**

Μετάφραση και επικύρωση του αναθεωρημένου ερωτηματολογίου γνώσεων για τον διαβήτη στα Ελληνικά σε ασθενείς με σακχαρώδη διαβήτη τύπου 2

Περίληψη στο τέλος του άρθρου

Key words

Diabetes mellitus type 2
Knowledge
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Diabetes mellitus (DM) is a chronic disease that negatively affects life expectancy. Population ageing and obesity, as risk factors, are key elements in its increasingly frequent occurrence.[1] In 2025, the International Diabetes Federation (IDF) reported that 589 million adults suffer from diabetes, and by 2050, this number is projected to increase to 852.5 million. The global population is expected to increase by 25% in the coming years, and the number of people with diabetes is predicted to nearly double. Type 2 diabetes mellitus (T2DM) is the most common type of diabetes. It accounts for 90% of cases diagnosed globally and is expected to be the second leading cause of morbidity by 2050.[2]

According to the epidemiological data regarding Greece, the prevalence of diabetes is estimated to be 12%, 95% of which is type 2 diabetes. At the same time, over the decades, the prevalence of DM in Greece has been increased, starting from 2.4% in 1974 and rising to 12% today.[3]

Studies that assess the level of knowledge conducted worldwide have highlighted the inadequate, low, or even moderate knowledge of patients with DM, playing a decisive role in disease control. Furthermore, good level of knowledge is associated with better adherence to medication and is generally linked to positive health outcomes for the patients.[4–8] Adequate knowledge helps with adherence to the treatment, thus reducing complications, achieving good glycemic control, and generally contributes to the development of self-care behaviours.[7,9] Knowledge is associated with sociodemographic factors such as family history, gender, age, educational level, and family income, as well as with metabolic factors such as obesity, unhealthy diet, sedentary lifestyle, and physical activity. These factors contribute to the progression and development of the disease by influencing the self-management of patients with T2DM across various populations of all ethnicities.[7,10,11]

In Greece, regarding the data on patient knowledge, it was found that patients had a moderate level of knowledge about their disease, with the exception of those with a high level of education.[12] Furthermore, similar studies in Greece have shown that patients had a low to inadequate level of knowledge about the disease, with factors differentiating men and women with T2DM.[13–15]

According to the above, the importance of having updated and validated measurement tools in the Greek language for assessing the knowledge of patients with T2DM is evident. The purpose of this study was to translate into Greek and validate the Diabetes Knowledge Questionnaire-Revised (DKQ-R) in patients with T2DM.

MATERIAL AND METHOD

Study design

This is a contemporary data collection study using a convenience sample conducted in December 2024 and January 2025. Thirty individuals completed the questionnaire at two consecutive time points over a 10-day period, with voluntary participation in the study and a completion time of approximately 15 minutes, at two public hospitals in Athens that included outpatient diabetes clinics: The Diabetes Clinic of the "Agios Panteleimon" General Hospital of Nikaia-Pireus and the Diabetes Clinic of the "Thriasio" General Hospital of Elefsina.

Questionnaire

The DKQ-R questionnaire, which was developed in 2023, is a revised tool for measuring knowledge about T2DM in adults of different races and ethnicities. It helps to quickly assess patients' knowledge to identify gaps, and to address them with an appropriate educational program. It includes 22 items of "Yes/No" questions formulated with as few words and syllables as possible to make them easier to read.[16] The DKQ-R is the newest and updated version of the DKQ-24, which was created about 30 years ago for Mexican-American patients with T2DM.[16,17] It has a simple scoring, and the questions are based on self-management behaviors for DM according to the American Diabetes Association (ADA). Healthcare professionals can use the unanswered questions or even the total score of the questionnaire to design the appropriate educational intervention. Additionally, the questionnaire can be used as a tool to evaluate courses before/after patient education about their illness.[16] It has been used after obtaining permission from its authors (Appendix 1).

Translation process

The translation process involved the standard forward-backward translation procedure. In summary, two translators were involved in translating the questionnaire from the source language (English) into the target language (Greek). The first translator was a healthcare professional, as it is recommended that one translator be familiar with the concepts addressed in the questionnaire to ensure an accurate translation.[18] The second translator knew nothing about the purpose and use of the questionnaire. After discussion between the two, the first Greek version of the questionnaire was finalized. Any ambiguities and inconsistencies were identified and corrected. Subsequently, two independent translators translated the original Greek version into English, creating a second version of the questionnaire in the source language. The back-translated version was compared with the original version of the questionnaire. Further inaccuracies were resolved, and through this process, the final Greek edition of the questionnaire was created.

Ethical issues

The research was conducted in accordance with all the principles of the Helsinki Declaration (1975), with respect for the patients' participation in the research.[19] The study was designed and conducted while protecting the rights of the participants, in accordance with research ethics and deontology. The confidentiality of patients' personal data was ensured throughout the research. The information was used only for the purpose for which it was collected. Regarding the complete transparency with which the study was conducted, the patients were adequately informed about the assurance of their anonymity, the purpose of the study, the data collection process, and their right to refuse to participate in the present study. There was a signed consent with a code number, without any reference to the patient's name, as well as a complaint form. Data collection was conducted after obtaining written approval from the Research Ethics Committee of the University of West Attica (ref. no: 10/20.7.2020), and permission of the "Thriasio" General Hospital of Elefsina, with registration number 46/26.11.2021, and the "Agios Panteleimon" General Hospital of Nikaia-Pireus – "Agia Varvara" General Hospital of Western Attica, with registration number 7290/15.2.2021.

Statistical analysis

To investigate the known groups' validity of the DKQ-R, the correlation between the total correct answer score on the DKQ-R and educational level were examined, as a higher educational level is expected to be associated with more knowledge. In this case, Spearman's correlation coefficients were calculated between the total score of correct answers on the DKQ-R in the two measurements and the educational level. To assess reliability, the test-retest method was used. In this case, the following were calculated: (a) Cohen's kappa (κ) for the 22 items of the DKQ-R, as the responses were dichotomous (Yes or No answers). Cohen's kappa values >0.8 indicate excellent reliability, and values between 0.6 and 0.79 indicate very good reliability, (b) intraclass correlation coefficients (ICC) between the initial measurement and re-measurement for the total correct answer score on the DKQ-R. Values for ICC >0.8 indicate excellent agreement. Additionally, the Kuder-Richardson-20 reliability coefficients were calculated for the total sample, where values >0.60 were considered acceptable. The two-sided level

of statistical significance was set at 0.05. The data analysis was performed using the Statistical Package for Social Sciences (IBM SPSS), version 28.0.

RESULTS

The study sample consisted of 30 individuals with a mean age of 61.2 years (standard deviation [SD]: 8.2), 40.0% (n=12) of which were women and 60.0% (n=18) were men, 10.0% (n=3) were elementary school graduates, 13.3% (n=4) were middle school graduates, 40.0% (n=12) were high school graduates, 23.3% (n=7) were graduates of vocational training institutes, and 13.3% (n=4) were graduates of technological educational institutes [TEI]/universities.

The Spearman correlation coefficient between the total score of correct answers on the DKQ-R and educational level was 0.40 (p-value=0.03) at the first measurement, and 0.44 (p-value=0.02) at the second measurement. Thus, a higher level of education was associated with more knowledge. Therefore, both correlations were positive and statistically significant, indicating that the DKQ-R has high known-groups validity. To assess reliability, a test-retest procedure was conducted with the participation of 30 individuals. Cohen's kappa values for the 22-items of the DKQ-R are presented in table 1, as the responses were dichotomous (Yes or No answers). The p-values for all 22-items indicate a statistically significant relation. Additionally, for 15 items, Cohen's kappa values were >0.8 and for 7 items the Cohen's kappa values were between 0.6 and 0.79. Therefore, the overall reliability of the DKQ-R was excellent.

The ICC between the initial measurement and the re-measurement for the DKQ-R was 0.968 (95% confidence interval [CI]: 0.933 to 0.985) and was statistically significant (p-value <0.001). Therefore, the DKQ-R exhibits excellent reliability. The Kuder-Richardson-20 reliability coefficient for the first measurement was 0.662 and for the second measurement was 0.655, indicating acceptable internal reliability for the DKQ-R.

Table 1. Cohen's kappa (κ) for the 22 items of the DKQ-R as the responses were dichotomous (correct or incorrect answers).

Items	Cohen's kappa (κ)	p-value
1	0.92	<0.001
2	0.71	<0.001
3	0.79	<0.001
4	0.89	<0.001
5	0.87	<0.001
6	1.00	<0.001
7	1.00	<0.001
8	0.62	<0.001
9	0.87	<0.001
10	0.77	<0.001
11	1.00	<0.001
12	1.00	<0.001
13	0.76	<0.001
14	0.65	<0.001
15	0.84	<0.001
16	0.91	<0.001
17	0.93	<0.001
18	0.63	<0.001
19	0.84	<0.001
20	1.00	<0.001
21	1.00	<0.001
22	0.87	<0.001

DISCUSSION

The purpose of the study was to translate and validate the DKQ-R questionnaire. According to our knowledge, this is the first translation of the DKQ-R from the source language to the target language, Greek.

The translation process was carried out with the participation of a group of non-hospitalized patients, translators, and healthcare professionals, who are essential for creating the translated questionnaire, so that it can be used safely in the population of patients with T2DM, based on the patients' culture and characteristics.[18,20]

This study found good test-retest reliability over a one-month period, highlighting that those patients gave similar responses to the translated DKQ-R questionnaire. No difference in their responses regarding their knowledge was expected at this stage, and within a short period of time, without any educational intervention. Furthermore, this study recorded that a higher educational level was associated with more knowledge, supporting that the Greek version of the DKQ-R is a valid tool for assessing patients' knowledge about DM.

A similar translation and validation study of the original DKQ questionnaire by Nguyen et al in Vietnam demonstrated that patients with higher education had better knowledge of DM compared to those with lower levels of education (p<0.001). In the translated questionnaire, Cronbach's alpha for all items was 0.898 in 87 patients, indicating good consistency, and the Cohen's kappa reliability coefficient was >0.600.[21]

In a study by Lim et al, the reliability of the study's translated questionnaire was calculated using the ICC, which was 0.945 (95% CI: 0.87–0.98), indicating excellent reliability. Excellent internal consistency was calculated with a Cronbach's alpha coefficient of 0.926, indicating that it is a valid and reliable measurement tool for assessing knowledge in the Malay target language.[22]

Our study's finding that higher knowledge was significantly associated with a higher level of knowledge in the population, which is also consistent with other studies,[23–25] highlighted the fact that patients with low educational level require increased attention when receiving information about their disease in order to improve their knowledge of it and better manage their illness, leading to optimal health outcomes. Similar results were found in China by Hsieh et al, who demonstrated that patients with T2DM who had a high level of education also had very good knowledge about DM, while conversely, patients with poor knowledge about their disease had elevated glycated hemoglobin (HbA_{1c}).[26]

Another similar study showed that participants had inadequate knowledge about the complications of DM and patients with low educational backgrounds, as well as rural residents and women, had lower knowledge levels. Conversely, it was found that patients with a high level of education had greater knowledge of DM and were aware of its most common complications.[23] The research by Al-Shayban et al, found that most participants had moderate knowledge and some of them had good-to-high adherence to treatment. Furthermore, patients with good adherence to treatment and good knowledge of DM had good glycemic control.[27] Similarly, in India, two studies showed that patients with poor knowledge levels were illiterate or had a low educational level, which aligns with the results of our research.[24,25]

The limitation of the present study was the convenience sample, which makes it difficult to generalize the study's conclusions. Although it was sufficient for performing the statistical analyses, it cannot represent patients with T2DM. Therefore, it is considered necessary to conduct further studies with a larger population sample so that the results are more representative and can help draw safer and more informed conclusions.

In conclusion, with this study, the questionnaire showed high validity and excellent reliability. It seemed simple, quick, and understandable to the participants. It can be used by researchers and healthcare professionals in general to assess knowledge in a patient or population group with T2DM.

ΠΕΡΙΛΗΨΗ

Μετάφραση και επικύρωση του αναθεωρημένου ερωτηματολογίου γνώσεων για τον διαβήτη στα Ελληνικά σε ασθενείς με σακχαρώδη διαβήτη τύπου 2

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ΣΚΟΠΟΣ Η μετάφραση και η ψυχομετρική αξιολόγηση του ερωτηματολογίου Diabetes Knowledge Questionnaire-Revised (DKQ-R) στην ελληνική γλώσσα, με σκοπό την εκτίμηση του επιπέδου γνώσεων ασθενών με σακχαρώδη διαβήτη τύπου 2 (ΣΔτ2). **ΥΛΙΚΟ-ΜΕΘΟΔΟΣ** Διενεργήθηκε συγχρονική μελέτη, σε δείγμα ευκολίας 30 ατόμων με ΣΔτ2, μέσης ηλικίας 61,2 ετών. Η συλλογή πραγματοποιήθηκε τον Δεκέμβριο του 2024 και τον Ιανουάριο του 2025. Για τον έλεγχο της αξιοπιστίας πραγματοποιήθηκε η διαδικασία ελέγχου-επανελέγχου (test-retest method), υπολογίστηκαν οι δείκτες κάππα και οι συντελεστές ενδοταξικής συσχέτισης (intraclass correlation coefficient, ICC). Για τον έλεγχο της εγκυρότητας υπολογίστηκαν οι συντελεστές συσχέτισης Spearman. Το αμφίπλευρο επίπεδο στατιστικής σημαντικότητας ορίστηκε ίσο με 0,05. **ΑΠΟΤΕΛΕΣΜΑΤΑ** Ο συντελεστής συσχέτισης Spearman μεταξύ της βαθμολογίας στο DKQ-R και του εκπαιδευτικού επιπέδου ήταν 0,40 (p=0,03) στην πρώτη μέτρηση και 0,44 (p=0,02) στη δεύτερη. Έτσι, το υψηλότερο εκπαιδευτικό επίπεδο συσχετιζόταν με περισσότερες γνώσεις. Επομένως, και οι δύο συσχετίσεις ήταν θετικές και στατιστικά σημαντικές. Ο ICC μεταξύ αρχικής και επαναληπτικής μέτρησης ήταν 0,968 (95% διάστημα εμπιστοσύνης: 0,933–0,985, p<0,001). Οι τιμές KR-20 ήταν 0,662 και 0,655, αντίστοιχα. **ΣΥΜΠΕΡΑΣΜΑΤΑ** Η ελληνική εκδοχή του DKQ-R αποδείχθηκε αξιόπιστη και έγκυρη, αποτελώντας χρήσιμο εργαλείο για την αξιολόγηση των γνώσεων ασθενών με ΣΔτ2.

Λέξεις ευρετηρίου: Αξιοπιστία, Γνώση, Μετάφραση, Σακχαρώδης διαβήτης τύπου 2, Ψυχομετρική επικύρωση

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