

# A Malayalam Questionnaire for the Assessment of Knowledge regarding Diabetes

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## ABSTRACT

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Diabetes mellitus is common in Kerala. Recent data indicates that 27% of the population  $\geq 30$  years have diabetes. Patient education is a key element in the treatment of diabetes. Assessment of diabetes knowledge is important for effective good treatment. For the assessment of diabetes knowledge, validated tools are essential. While such tools exist for English speaking patients, there are few validated and published tools in Malayalam for assessing diabetes knowledge. One method for developing a questionnaire is to select a validated, published questionnaire in another language, translate it into Malayalam and re-test it.

We report the development of a Malayalam Questionnaire for the assessment of diabetes knowledge. We selected the previously validated Diabetes Knowledge Questionnaire -24 (DKQ 24), developed in English and Spanish; translated it and undertook reliability testing.

**Keywords:** Diabetes, Patient knowledge, Malayalam questionnaire, Validated tools, DKQ24 and reliability testing

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## INTRODUCTION

Diabetes mellitus is the commonest non-communicable disease in Kerala. 27.1% of people above 30 years have diabetes and a further 20% have impaired glucose tolerance.<sup>1</sup> Unless treated correctly, it is only a matter of time before encountering an epidemic of the complications of diabetes, like chronic kidney disease, retinopathy, coronary artery disease, strokes and diabetic foot disease.

In the treatment of diabetes, patient education is considered vital.<sup>2,3</sup> For the assessment of diabetes knowledge, though many English language questionnaires have been validated and published,<sup>4-10</sup> there are no, validated questionnaires in the language of Malayalam.

Our objective was to create a simple and reliable questionnaire in Malayalam for the assessment of diabetes knowledge. We decided to select an appropriate, previously validated, and published English language questionnaire; translate it into Malayalam and test it for internal consistency, test-retest reliability and inter-rater reliability.

## METHODS

**Selecting the questionnaire:** From the many available published questionnaires,<sup>4,10</sup> we selected the Diabetes Knowledge Questionnaire 24 (DKQ 24), developed for the Starr County Diabetes Education Study.<sup>10</sup> This tool originally developed with 60 items<sup>11</sup> was later abridged to 24 items.<sup>10</sup> In our assessment, this questionnaire was better suited to our patients, than any other. Permission of the original authors was obtained for translation and usage of DKQ 24.

**Translation of the Questionnaire:** The questionnaire was translated from English to Malayalam, by a person proficient in both languages. A team of three doctors and a language expert, scrutinized the translated questionnaire, compared it with the original tool and appropriate changes made, including modifications for making the tool culturally more acceptable. This Malayalam version was back translated to English, by another person proficient in both languages. This back translated version was compared with the original English tool. This version was assessed by two experienced senior practitioners, for good face and content validity.

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**Reliability & Validation of the Questionnaire:**

A comprehensive assessment of the reliability of the tool and its cross cultural validation was performed at the Sree Uthradom Thirunal Academy of Medical Sciences (SUTAMS), Vattappara, Trivandrum, between 1 August and 30 September 2015. Tests were carried out for the assessment of internal consistency, test-retest reliability and inter-rater reliability.

For testing test-retest reliability, the questionnaire was administered to 24 individuals. It was re-administered to the same individuals after one week. Participants were the non-medical, non-nursing staff members of SUTAMS.

For assessing inter rater reliability, 27 new patients attending the diabetes clinic of SUTAMS with type 2 diabetes mellitus, were administered the questionnaire; on the same out-patient visit, by two practitioners (ACR, DP) separately.

**Modifying Questions 18, 23 and 24:**

Clinicians administering the questionnaire (ACR, DP, and SL) felt a strong need to change three questions - 18, 23 and 24 of the original DKQ24. The original question 18 was “The way I prepare my food

**Appendix 1. The Questions in DKQ 24**

1	Eating too much sugar and other sweet foods is a cause of diabetes. (പ്രമേഹത്തിന് മൂത്രത്തിൽ പഞ്ചസാര രോഗത്തിന് ഒരു കാരണം പഞ്ചസാരയോ മധുര പലഹാരമോ കൂടുതൽ കഴിക്കുന്നു എന്നതാണ്)
2	The usual cause of diabetes is lack of effective insulin in the body
3	Diabetes is caused by failure of the kidneys to keep sugar out of the urine.
4	Kidneys produce insulin. വൃക്കകളാണ് ഇൻസുലിൻ ഉൽപ്പാദിപ്പിക്കുന്നത്
5	In untreated diabetes, the amount of sugar in the blood usually increases. (പ്രമേഹം (പഞ്ചസാര രോഗം) ചികിത്സിച്ചില്ലെങ്കിൽ രക്തത്തിലെ ഷുഗർ ക്രമാതീതമായി വർദ്ധിക്കും)
6	If I am diabetic, my children have a higher chance of being diabetic. (പ്രമേഹ രോഗിയുടെ മക്കൾക്ക് പ്രമേഹം വരാൻ സാധ്യത കൂടുതലാണ്)
7	Diabetes can be cured. (പ്രമേഹം (പഞ്ചസാര രോഗം) ചികിത്സിച്ചു മാറ്റാവുന്ന രോഗമാണ്)
8	A fasting blood sugar level of 210 is too high രാവിലെ ഭക്ഷണത്തിന് മുമ്പ് രക്തത്തിലെ ഷുഗർ 210 ആണെങ്കിൽ അത് വളരെ കൂടുതൽ ആണ്
9	The best way to check my diabetes is by testing my urine. (പ്രമേഹം (പഞ്ചസാര രോഗം) രോഗാവസ്ഥ അറിയുവാൻ ശരിയായ മാർഗം മൂത്ര പരിശോധനയാണ്)
10	Regular exercise will increase the need for insulin or other diabetic medication. വ്യായാമം ഇൻസുലിന്റെയും പ്രമേഹ ഗുളികകളുടെയും ആവശ്യം കൂട്ടും
11	There are two main types of diabetes: type 1 (insulin-dependent) and type 2 (non-insulin dependent). രണ്ട് തരം പ്രമേഹ രോഗം ഉണ്ട്: ടൈപ്പ് 1 (ഇൻസുലിനെ ആശ്രയിച്ചിരിക്കുന്നത്). ടൈപ്പ് 2 (പ്രമേഹത്തിന് കാരണം ഇൻസുലിൻ കുറവ് മാത്രം അല്ലാത്തത്)
12	An insulin reaction is caused by too much food. ഹൈപ്പോ (രക്തത്തിലെ ഷുഗറിന്റെ കുറവ്) കൂടുതൽ ആഹാരം മൂലമാണ്
13	Medication is more important than diet and exercise to control my diabetes. (പ്രമേഹ ചികിത്സയിൽ വ്യായാമത്തെക്കാളും ഭക്ഷണക്രമീകരണത്തേക്കാളും കൂടുതൽ പ്രധാന്യം മരുന്നുകൾക്കാണ്)
14	Diabetes often causes poor circulation. (പ്രമേഹം (പഞ്ചസാര രോഗം) ധമനികളിലെ രക്തയോട്ടം കുറയ്ക്കുന്നു)
15	Cuts and abrasions on diabetics heal more slowly. (പ്രമേഹ രോഗികളിൽ മുറിവുകൾ ഉണങ്ങുവാൻ കൂടുതൽ സമയം വേണം)
16	Diabetics should take extra care when cutting their toenails. (പ്രമേഹം (പഞ്ചസാര രോഗം) ഉള്ളവർ പാദങ്ങളിലെ നഖം മുറിക്കുമ്പോൾ വളരെ ശ്രദ്ധിക്കേണ്ടതാണ്)
17	A person with diabetes should cleanse a cut with iodine and alcohol അയോഡീനും സ്പിരിറ്റും കൊണ്ട് പ്രമേഹ രോഗികളിൽ വരുന്ന മുറിവുകളെ വൃത്തിയാക്കേണ്ടതാണ്
18	The way I prepare my food is as important as the foods I eat. CHANGED TO: For preventing the complications of diabetes, HbA1C must be maintained below 7% (പ്രമേഹം (പഞ്ചസാര രോഗം) കൊണ്ട് സൂക്ഷിക്കുന്ന മറ്റു രോഗങ്ങൾ തടയുവാൻ എച്ച്.ബി.എ.1.സി (HBA1C) 7% ത്താൽ താഴെ ക്രമീകരിക്കേണ്ടതാണ്)
19	Diabetes can damage my kidneys. (പ്രമേഹം (പഞ്ചസാര രോഗം) വൃക്കകളെ തകരാറിലാക്കാം)
20	Diabetes can cause loss of feeling in my hands, fingers, and feet. (പ്രമേഹം മൂലം (പഞ്ചസാര രോഗം മൂലം) കൈകളിലേയും വിരലുകളിലേയും പാദങ്ങളിലേയും സ്പർശനശേഷി നഷ്ടപ്പെടാം)
21	Shaking and sweating are signs of high blood sugar. വിറയൽ, വിയർപ്പ് ഇവ രക്തത്തിലെ പഞ്ചസാരയുടെ അളവ് കൂടുന്തോറും കാണ്മാണ്.
22	Frequent urination and thirst are signs of low blood sugar. ദാഹം ഇടയ്ക്കിടെ മൂത്രം ഒഴിക്കുക ഇവ രക്തത്തിൽ പഞ്ചസാരയുടെ അളവ് കുറയുന്നതിന്റെ ലക്ഷണമാണ്
23	Tight elastic hose or socks are not bad for diabetics. CHANGED TO: Patients with diabetes must get their eyes examined, at least once a year (പ്രമേഹമുള്ളവർ (പഞ്ചസാര രോഗമുള്ളവർ) വർഷത്തിലൊരിക്കലെങ്കിലും കണ്ണു പരിശോധനയ്ക്കു വിധേയരാകണം)
24	A diabetic diet consists mostly of special foods. Changed to: Kanji and rice are ideal food for diabetics കഞ്ഞിയും ചോറും പ്രമേഹ (പഞ്ചസാര) രോഗികൾക്ക് ഉത്തമ ഭക്ഷണങ്ങളാണ്

is as important as the foods I eat” was confusing to all participants. This was hence changed to “For preventing the complications of diabetes, HbA1C must be maintained below 7%”. The original question 23 was “Tight elastic hose or socks are not bad for diabetics”. As none of the participants wear either elastic hose or socks, this question did not appear relevant. This was changed as “Patients with diabetes must get their eyes examined, at least once a year”. The original question 24 was “A diabetic diet consists mostly of special foods”. As all participants had difficulty in comprehending this question it was modified as “Kanji and rice are ideal food for diabetics”. The three new questions were translated to Malayalam, reviewed by experts and back translated to English according to the steps already described. The original questions in English and the current Malayalam version can be seen in **Appendix 1**.

**Re-testing the modified questionnaire:** After making the changes, the process of testing of the new questionnaire was repeated, by administering it to individuals to whom it had not been administered earlier.

For testing test-retest reliability the new questionnaire was administered to 24 individuals and re-administered after a week. Similarly, for assessing inter rater reliability, 27 new patients with type 2 diabetes were administered the questionnaires, on the same out-patient visit, by two practitioners (ACR, DP) separately.

**Statistical Methods:** Data was analyzed using SPSS version 16. Cronbach’s alpha was computed to summarize internal consistency. A Cronbach’s alpha value of 0.7 suggested high internal consistency, value between 0.4 and 0.6 signifies moderate consistency a value of 0.3 was considered to be inconsistent.

Kappa statistic was computed for testing agreement between responses. Kappa values range from 0 to 1. Values < 0.4 indicate poor agreement, 0.4-0.6 indicate moderate agreement, 0.6 - 0.8 show substantial agreement and >0.8 indicate perfect agreement. Kappa statistic was also used for measuring agreement between the two raters.

## RESULTS

Results discussed are those obtained using the new questionnaire. Mean age of the participants was 51.9 years (SD 17.1). Thirty eight (62.7%) were above 40 years (range 21 - 85) and 19 were above 60 years of age. Twenty eight (54.9%) were females.

**Table 1. Agreement in responses for each item in the questionnaire for test-retest ability and inter-rater reliability**

Item in the Questionnaire	Agreement in responses of the participants for each item on 2 occasions (N=24). Number (%) of individuals with identical responses on both day 0 and day 7	Agreement between raters (n=27). Number (%) of individuals with identical responses to both raters
Item 1	18 (75)	24 (88.8)
Item 2	21 (87.5)	26 (96.3)
Item 3	15 (62.5)	27 (100)
Item 4	20 (83.3)	25 (92.5)
Item 5	22 (91.6)	27 (100)
Item 6	23 (95.8)	26 (96.3)
Item 7	19 (79.2)	23 (85.1)
Item 8	20 (83.3)	26 (96.3)
Item 9	19 (79.2)	25 (92.5)
Item 10	22 (91.6)	26 (96.3)
Item 11	18 (75)	26 (96.3)
Item 12	16 (66.7)	27 (100)
Item 13	19 (79.2)	26 (96.3)
Item 14	19 (79.2)	26 (96.3)
Item 15	24 (100)	27 (100)
Item 16	22 (91.6)	26 (96.3)
Item 17	21 (87.5)	24 (88.8)
Item 18	21 (87.5)	26 (96.3)
Item 19	21 (87.5)	26 (96.3)
Item 20	23 (95.8)	26 (96.3)
Item 21	15 (62.5)	26 (96.3)
Item 22	19 (79.2)	24 (88.8)
Item 23	22 (91.6)	26 (96.3)
Item 24	21 (87.5)	25 (92.5)

**Internal Consistency:** The items in this tool were found to be highly consistent internally. The Cronbach’s alpha for testing the internal consistency was 0.706. The alpha value for the various items ranged from 0.673 to 0.718.

**Test- Retest ability:** The strength of agreement was substantial as indicated by Kappa value of 0.71 and was statistically highly significant ( $p < 0.001$ ). Maximum number of individuals had the same response for item 15 and the response varied the most for items 3 and 21.

**Inter-Rater Reliability:** All individuals gave identical responses to both raters for items 3, 5, 12 and 15. The response for item 7 varied the most between the raters. Kappa value of 0.916 showed almost perfect agreement between the responses obtained by both the raters; and was statistically highly significant ( $p < 0.001$ ).

Second column of the table (**Table 1**) shows the agreement between the responses for each item in the questionnaire when administered to 24 individuals on

2 occasions (days 0 and 7); and the last column shows the agreement in responses of 27 participants for each item when interviewed by 2 raters.

## DISCUSSION

India is the diabetes capital of the world.<sup>12</sup> In Kerala, almost 50% of the population above 30 years of age has diabetes (27.11%) or pre-diabetes.<sup>1</sup> Patient's knowledge of diabetes is an extremely important element in the effective treatment, of this lifelong disease.<sup>2,3</sup> While validated tools are available in the English language, appropriate tools, in Malayalam, for the assessment of diabetes knowledge are lacking.

We felt the urgent need to have one such tool. Developing a tool from scratch, and validating it might be ideal but is time consuming. We hence decided to select a published validated tool and translate it to Malayalam, and test it.

For the purpose of selecting an appropriate questionnaire, we reviewed validated diabetes knowledge questionnaires.<sup>4,10</sup> Diabetes knowledge scales<sup>4</sup> use multiple choice questions. For some of the questions there is only one correct answer, but for some there are two correct answers. We felt that this might confuse our patients. Further we did not understand the need for question 13 - A kilogram is A) A unit of weight. B) Equal to 10 pounds .... There was a question on "diastix" which most of our patients do not use. The Short Diabetes Knowledge Instrument<sup>5</sup> was tested only in patients above 60 years of age, and with only 13 questions, does not cover all aspects of diabetes knowledge. The Michigan Diabetes Research and Training Centre (MDRTC) Diabetes Knowledge Test,<sup>6</sup> has features that make it unsuitable for Indian population. For example, answers to a question on carbohydrate diet include baked potato, baked chicken and Swiss cheese. These rarely if ever form a part of Indian diet. Nine questions on insulin will almost certainly be inappropriate for our patients. The original version<sup>6</sup> had multiple choice questions. Despite the Revised Michigan Diabetes Knowledge Scale<sup>7</sup> having true/ false/ don't know responses, questions on olive oil, can of diet soft drink (both used uncommonly in Kerala) prevented us from considering this questionnaire. Australian questionnaire<sup>8</sup> has questions on The National Diabetes Service Scheme, which are not useful in India. The Spoken Knowledge in Low Literacy patients (SKILLD),<sup>9</sup> specifically designed for type 2 diabetics with poor literacy; is not appropriate for us as Kerala has high literacy.

DKQ 24 developed for the Starr County Diabetes Education Study,<sup>10</sup> was the most appropriate tool for us. Though designed nearly 15 years ago, we considered the questions currently appropriate, for our population. The questions in DKQ 24 cover most areas of diabetes knowledge. There are no multiple choice questions. Participants respond to each of the 24 questions, by selecting one of the three options - True, False or Don't Know. However, when we ourselves administered the questionnaire, we realized that 3 questions had to be changed. We replaced question 18 "The way I prepare my food is as important as the foods I eat", which all our patients found confusing, by the question on HbA1C. Maintaining HbA1C less than 7% is the most important diabetic treatment target to achieve. Knowledge about HbA1C has been shown to improve diabetes control. Hardly anyone in Kerala routinely used elastic hose or socks. Hence question 23 had to be replaced. A question on yearly eye check-up was included, as eye examination prevents blindness. All our participants had difficulty in comprehending the term "special foods". Hence it was replaced by the question on kanji and rice; which are almost universally consumed in Kerala. We believe these modifications add value to the questionnaire, and make it more appropriate to our population. Because the challenge with the original questions became apparent only while administering the questions ourselves, we had to repeat all the tests on fresh participants.

In the current form (appendix 1) the tool has high internal consistency (Cronbach's alpha: 0.706.). It also has good test-retest ability. The strength of agreement was substantial (Kappa value of 0.71,  $p < 0.001$ ). Agreement between responses obtained by both raters was near perfect (Kappa value of 0.916,  $p < 0.001$ ). These show that the tool has been validated and is ready for use in its current form.

## CONCLUSION

Our objective was to produce a Malayalam questionnaire for assessment of diabetes knowledge of patients in Kerala, where the prevalence of diabetes is high. Using the methods described, we have modified the DKQ 24 into a useful tool, in Malayalam, for assessing the diabetes knowledge of patients who have Malayalam as their mother tongue. Among the published, validated questionnaires, DKQ 24 is, according to us, the most apt for our patients. After modifying it we have generated a Malayalam DKQ 24 that is internally consistent and has highly consistent test-retest ability and inter-rater reliability. It is

now ready to be used for the purpose of assessing the diabetes knowledge of patients speaking Malayalam.

## END NOTE

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**Conflict of Interest:** None declared

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