Validation of the diabetes awareness and knowledge test for medical and nursing students

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The authors of this manuscript are willing to share the data supporting the results of this manuscript upon request.
Ethical aspects:
The study was approved by the Institutional Ethics Committee-Human Research, University College of Medical Sciences, Delhi vide letter no. IECHR-2023-61-8-R1 dated 31/10/2023. Written informed consent was obtained for participation in the study and use of the data for research and educational purposes. The procedures in the study followed the principles of the Helsinki Declaration of 1975, as revised in 2000.
Approval from all authors: The manuscript has been read and approved by all the authors and the requirements for authorship as required have been met. Each author believes that the manuscript represents honest work.

IEC certificate attached below:

INSTITUTIONAL ETHICS COMMITTEE – HUMAN RESEARCH (IEC-HR)
UNIVERSITY COLLEGE OF MEDICAL SCIENCES, UNIVERSITY OF DELHI, DELHI 110095
DHR Registration No EC/NEW/INST/2021/20
CDSCO Registration No. ECR/1129/Inst/DL/2018

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IECHR-2023-61-8-R1 **Dated: 31.10.2023**

Proposal: **Knowledge, Awareness and Risk of Diabetes in Medical and Nursing Students in a Tertiary Teaching Hospital in Delhi**

Dear Dr Pragya,
Your proposal entitled **"Knowledge, Awareness and Risk of Diabetes in Medical and Nursing Students in a Tertiary Teaching Hospital in Delhi,"** was evaluated by the Institutional Ethics Committee for Human Research on 11/10/2023.

The committee constituted of Prof. A P Dubey (Chairman), Dir Prof. Amita Suneja (Clinician), Dir Prof. Navneet Kaur (Clinician), Dir Prof. Pragti Chhabra (Clinician), Prof Rashmi Salotra (Clinician), Dir Prof Farah Khaliq (Basic Sciences Expert), Dr Proteesh Rana (Basic Medical Scientist, Pharmacologist), Dr J S Arora (NGO Representative), Dr Atul Kochhar (Clinician), Dr Vineet Dabas (Clinician), Mr S N Sinha (Lay Person) and Dir Prof. Rumpa Saha (Member-Secretary).

The following decision were made regarding your proposal: Approved from the ethical angle in the present form **IECHR-2023-61-8-R1** w.e.f. **31.10.2023** subject to the following conditions:

1. The study should be conducted as per the plan submitted. Any change in the plan or deviation from methodology must be conveyed to the IEC-HR for consideration.
2. Complete confidentiality of data should be maintained.
3. Approval for your study is valid till the time allotted for the completion and submission of report by ICMR.
4. Ensure that no student nor participant is made to pay any money for participation in this study. The participants must be informed that no financial remuneration will be paid for participating in this study. However, the participants need to be provided free medical care in this hospital in case they experience any illness which is likely to be due the procedures or treatment related to the study.
5. Researchers must ensure that patient is not made to pay for any investigations ordered during the research work and where the findings of that investigation are to be used in the study.
6. If your research qualifies for Clinical trial (use of a new drug/device or use of an existing drug/device in a different dose/indication/route of administration), DCGI approval may be obtained.
7. If questionnaires/tools are being used in the research, are copyrighted, PI & and the Chief Supervisor must take due permissions before using and/ or translating them for the purpose of their research.
8. Where-ever archived material is being used for research; an effort should be made to contact the patient for consent, failing which you need to ensure that the anonymity of data is maintained.
9. Compensation for disability/injury/death is liable to be provided to the patient/patient's kin as per rules.
10. **A brief completion report, duly signed by the Principal Investigator and the Chief Supervisor, must be submitted to the secretariat of the IEC-HR, UCMS, within 3 months of completion**

Regards and best wishes

Rumpa Saha

Dr. Rumpa Saha
(Member Secretary, IECHR)

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KEYWORDS

Cronbach's alpha, reliability, validity, questionnaire, tool, youth

ABSTRACT

Introduction: Diabetes awareness and knowledge is a preliminary step towards controlling and limiting the diabetes burden globally. There is a pressing need for creating validated tests of knowledge and awareness for different targeted groups.
Objective: To create and validate diabetes awareness and knowledge (DAK) test for medical and nursing students.
Methods: We created a 47 item 50 marks English DAK test with questions from different domains of diabetes like basics of diabetes: types, symptoms, pathophysiology and diagnosis of diabetes, its risk factors, basic knowledge about treatment of diabetes including diet and activity and prevention of diabetes and its complications. Content validity ratio (CVR) and content validity index (CVI) for each question and full test was evaluated. This test was administered to 53 medical and nursing students and Cronbach's coefficient α was used to calculate the test reliability.
Results: According to the responses from 8 endocrinologists, the scale CVI and the CVR were acceptable (0.98 and 0.82 respectively). The median DAK score and percentage were higher in medical students as compared to nursing students [36.75 (7.5)] vs [33(6.0)] marks and [72.5 (15)%] vs [66(12)%] respectively (p = 0.001 for both). The Cronbach's coefficient α was 0.77 for the test, which is acceptable.
Conclusion: The DAK test is a valid and reliable instrument to evaluate diabetes awareness and knowledge in medical and nursing students.

Introduction:

Type 2 diabetes mellitus (T1DM) is a common chronic lifestyle disease. Diabetes awareness and knowledge (DAK) is an integral part of its primary, secondary and tertiary prevention. Tools to assess DAK in different domains in our population will help to understand the areas where the health education initiatives need to be directed. The DAK of young population, who have a high risk of developing prediabetes and diabetes in future as well as who are the care-providers for elderly with diabetes at home is important so that prevention of prediabetes and diabetes in them as well as optimum treatment and early diagnosis and management of complications will help in decreasing morbidity and mortality associated with diabetes. The tool to evaluate DAK will help in understanding the domains of diabetes where awareness and knowledge needs to be strengthened by help of a diabetes education program, and can also be used as a research tool. Its prudent to assess the DAK in our medical and nursing students first, as they will be the future healthcare providers.

The DAK tool should be valid, reliable, assessing the knowledge in different domains of diabetes and also simultaneously dealing some basic facts as well as prevailing myths about diabetes. India has one of the largest populations with diabetes in the world. However, a validated tool to assess the diabetes awareness and knowledge in our youth is lacking. Thus, we aimed to create and validate a DAK questionnaire for Indian medical and nursing students.

Methods:

Creating the DAK questionnaire:

A 47 question, 50 marks, questionnaire was created in English (supplementary material). It included questions in the domains of a) Basics of diabetes: types, symptoms, pathophysiology and diagnosis of diabetes: 13 questions, b) risk factors of diabetes: 14 questions, c) basic knowledge about treatment of diabetes including diet and activity: 13 questions and d) prevention of diabetes and its complications: 7 questions. Some considerations about prevalent myths were also taken into account while making the questions. The questions are kept in simple language with no

complex medical terms. Most of the questions are either in the format of "Yes, No, Don't know" or "True, False, Don't Know". Some questions are in the format of multiple choice questions and fill in the blanks while one question is an open ended question.

For content validity, the questionnaire was sent to 8 endocrinologists, who are required to grade each question for relevance, clarity and necessity. Relevance needs to be graded in 4 point likert scale as "1 = not relevant, 2 = somewhat relevant, 3 = quite relevant and 4 = highly relevant" and clarity also needs to be graded in 4 point likert scale as "1 = not clear, 2 = item need some revision, 3 = clear but need minor revision, 4 = very clear". The necessity of items needs to be recorded in 3-point Likert rating scale as "1 = not necessary, 2 = useful but not necessary and 3 = essential". The content validity index (CVI) is evaluated by the formula: CVI= (Number of experts agreeing on items rated as 3 or 4)/ (Total number of experts). Relevance CVI and Clarity CVI is calculated and composite CVI of each question is taken as the average of these two. Scale-CVI is calculated by doing average of CVI of all questions. CVI score of 0.78 or superior is considered to have acceptable content validity. The content validity ratio (CVR) is computed for each item in the instrument based on the formula developed by Lawshe (1975) as follows: CVR = [ne - (N / 2)] ÷ (N / 2) where ne = number of experts indicating a measurement item as essential (point 3 on necessity scale) and N = total number of experts that answer to that item. According to Lawshe table for minimum value of CVR, CVR of 0.75 is acceptable for 8 experts.[1,2]

After the content validity is found acceptable, the questionnaire was administered to medical and nursing students after written consent. The Cronbach's coefficient alpha was used to determine reliability of the DAK questionnaire.

This study was approved by Institutional Ethics Committee approval (IECHR-2023-61-8-R1) dated 31/10/2023.

Statistical analysis was performed using the Statistical Program for Social Sciences version 23 (IBM Corp. New York, USA). Numerical data was mentioned as median (interquartile range). DAK questionnaire scores were denoted in marks as well as percentages. To compare medians between different student groups, Mann whitney U test was done. Spearman correlation was done to correlate DAK scores with age. A two sided p value of <0.05 was taken to be statistically significant.

Results:

Content Validity:

According to the responses from 8 endocrinologists, the scale CVI and the CVR were acceptable (0.98 and 0.82 respectively). Composite CVI of two questions were <0.78 (0.687 and 0.75). Thus the clarity of one question was improved after reframing the question while one question was changed altogether.

Reliability:

Our subjects comprised of 14 medical students from 4th semester and 12 medical students from 8th semester from University College of Medical Sciences, Delhi and 27 nursing students from fifth semester from Florence Nightingale College of Nursing. Median age of subjects was 22 (2) years [Medical 22(2.3) yrs and Nursing 22 (2) yrs]. Validation group had 35 females (66%) out of which all nursing students were female. The students answered the questionnaire. Any queries regarding understanding the question was rectified immediately. Students took around 10-15 minutes to answer the questionnaire.

The median DAK score and percentage were higher in medical students as compared to nursing students [36.75 (7.5)] vs [33(6.0)] marks and [72.5 (15)%] vs [66(12)%] respectively (p = 0.001 for both). The mean total response was 34/50 (68%) with a maximum of 44/50 (88%) and minimum of 11.5/50 (23%). There was no correlation of DAK scores with the age. Cronbach's coefficient alpha came out to be 0.77 i.e. acceptable. So the questionnaire was found to have good content validity and reliability. Test statistics and reliabilities are given in table 1.

Discussion:

Diabetes awareness and knowledge helps an individual to maintain healthy lifestyle and prevent the lifestyle related diabetes i.e. Type 2 diabetes. It also helps in picking up symptoms of diabetes in self or family early leading to early investigations and diagnosis. It also helps in early and optimal treatment if diagnosed and might help in preventing complications as well as might help in remission of diabetes. Thus, DAK test in addition to analyzing the level of knowledge among a targeted group might enable the individual to develop an insight into his/her health and might help in behavior modification, which ultimately can have an impact in limiting the burden of diabetes and its associated complications.

Many tools have been created in different countries so far which test diabetes knowledge among people with type 2 diabetes.[3-5] These included questions related to various aspects of diabetes management like treatment, insulin and medication administration and adjustment, knowledge about foot care or diabetes retinopathy, knowledge about hypoglycemia management etc. Similarly tools to assess the knowledge, attitude and practice regarding diabetes in general population have been created. [6-13]

As the most common type of diabetes, Type 2 diabetes is a lifestyle disease, the researchers especially from high diabetes prevalence countries have started evaluating diabetes knowledge in young or budding healthcare providers who if proper health and diabetes education provided can disseminate early awareness and knowledge. Researchers have found significant knowledge gap in general practitioners, resident doctors, nursing staff and nursing interns as well as final year students.[14-20] In some studies, the awareness and knowledge level have been found to be better in later years of training as compared to early years.[21] The tools used in these studies done on medical and nursing students were found to have multiple limitations: a) the tools used in many studies were not prevalidated, b) the tools had very less items and thus were inappropriate to assess the awareness and knowledge of diabetes comprehensively in all domains, c) the tools were mainly targeting specific management or complications aspect like foot care, diabetic ketoacidosis, diabetic retinopathy etc.[21-30] Thus there was a strong need to create a questionnaire considering all the basic aspects of diabetes in easy language so that students in early years of training can also be targeted. Our questionnaire is valid and reliable, as evidenced by the good CVI, CVR and Cronbach's coefficient alpha. This questionnaire can be used for all medical and nursing students as well as nursing staff and doctors in practice. This questionnaire can also be used after a diabetes education programme, to assess the improvement in knowledge after giving specific educational interventions.

A limitation of the study is the small sample size. The strength of this questionnaire is relatively small time required to complete the test (10-15 mins). Also, this is one of few comprehensive questionnaires addressing all aspects of diabetes awareness and knowledge needed for a non-diabetic individual living in a highly diabetes prevalent country.

Implications for Policymakers:

1. DAK test will help in assessing the specific lacunae in the diabetes awareness and knowledge of our medical and nursing students so that directed medical education can be provided to address it.
2. It will also help them to assess the results of a diabetes education programme.

Contributions: All the authors were involved in the drafting and finalization of the diabetes awareness and knowledge test questionnaire. PM and NR did data analysis. PM did the literature search and wrote the paper and will act as guarantor of the study.

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Table 1: Test statistics and reliabilities

Ques.	Corrected Item-Total Correlation	Mean±S.D	Ques.	Corrected Item-Total Correlation	Mean±S.D
1.	0.040	2.9±0.9	**7.6**	0.450	1.3± 0.7
2.	-0.109	1.0± 0.3	**7.7**	0.602	1.1± 0.5
3.	0.034	2.1±1.2	**7.8**	0.370	1.6± 0.7
4.	-0.252	3.5±0.6	**7.9**	0.219	1.9± 0.6
5a.	-0.041	0.2±0.4	**7.10**	0.382	1.3± 0.6
5b.	0.009	0.3±0.4	**7.11**	0.365	1.9± 0.4
5c.	0.159	0.6±0.5	**7.12**	0.550	1.1± 0.4
6.1	0.178	2.3±0.7	**8.1**	0.662	1.0± 0.3
6.2	0.287	2.2±0.7	**8.2**	0.628	1.0± 0.3
6.3	-0.006	1.0±0.1	**8.3**	0.326	1.8± 0.8
6.4	-0.014	1.1±0.4	**8.4**	0.291	2.3± 0.4
6.5	0.408	1.8±0.8	**8.5**	0.324	2.0± 0.3
6.6	0.421	2.4±0.5	**8.6**	0.507	2.2± 0.4
6.7	0.141	1.9±0.9	**8.7**	0.587	1.1± 0.4
6.8	-0.304	1.1±0.3	**8.8**	0.093	1.9± 0.6
6.9	0.102	1.8±0.7	**8.9**	0.512	2.1± 0.3
6.10	-0.070	1.2±0.5	**8.10**	0.331	2.0± 0.4
6.11	0.310	2.5±0.7	**8.11**	0.393	1.3± 0.7
6.12	0.257	1.9±0.9	**8.12**	0.350	2.0± 0.6
7.1	0.111	1.2±0.6	**8.13**	0.461	1.1± 0.5
7.2	0.179	2.0±0.5	**8.14**	0.314	2.8± 0.3
7.3	0.258	2.1±0.4	**8.15**	0.274	2.0± 0.7
7.4	0.470	2.0±0.4	**9.0**	0.184	2.3± 0.8
7.5	0.091	1.4±0.6			

Diabetes Knowledge & Awareness Test

Instructions: This questionnaire has been prepared to assess your awareness and knowledge about diabetes.

1. How is diabetes diagnosed?
   a) No test is required as symptoms are sufficient.
   b) By plasma glucose test
   c) By urine glucose test
   d) All of the above
2. In your opinion, how prevalent is diabetes in India? (Check one.)
   1. Very common
   2. Not so common
   3. Don't know
3. How many types of diabetes are there?
   (a) 2 (b) 3 (c) 4 (d) >4
4. Which of the following is a symptom of diabetes: (There are multiple correct answers)
   (a) cough (b) chest pain (c) frequent urination
   (d) excessive thirst (e) weight loss despite normal appetite
   (f) abdominal pain and swelling (g) diarrhoea (h) lack of energy
   (i) fever (j) rash
5. Fill in the blanks:

A) Have you heard of oral glucose tolerance test (OGTT)? a) Yes b) No

B)

a) The fasting plasma glucose level cutoff for diagnosis of diabetes is _____mg/dl.
b) The 2 hour post OGTT plasma glucose level cutoff for diagnosis of diabetes is _____mg/dl.
c) The diagnostic cutoff of HbA1c for diabetes is _____%.

6. **A person is more likely to get Type 2 diabetes if he/she**
   [If you are not sure, please tick the 'Don't Know' option.]

No.	Risk factors	Yes	No	Don't Know
6.1	Has seizure disorder			
6.2	Has history of COVID infection			
6.3	Is overweight or obese			
6.4	Has a family history of Diabetes			
6.5	Has a smoker in the family			
6.6	Has history of polio vaccination			
6.7	Has history of polycystic ovaries			
6.8	Doesn't exercise			
6.9	Has high salt intake			
6.10	Is over the age of 35 years			
6.11	Has vitamin B deficiency			
6.12	Has history of large sized baby (>4 kg)			

7. State true and false for the statements about treatment of diabetes:
[If you are not sure, please tick the 'Don't Know' option.]

No.	Statements	True	False	Don't Know
7.1	Patient with high blood pressure, heart attack or paralysis should be regularly checked for diabetes.			
7.2	The only medicine available for Type 2 diabetes is insulin.			
7.3	Treatment of diabetes in children is similar to diabetes in adults.			
7.4	It is not safe to exercise with diabetes.			
7.5	The primary problem in type 1 diabetes is deficiency of insulin.			
7.6	People in early stage of type 2 diabetes can reverse it with weight reduction and lifestyle modification.			
7.7	Complications of diabetes in their early stages can be reversed with good glucose control.			
7.8	Shaking and sweating are signs of high blood sugar levels.			
7.9	Diabetes ketoacidosis can develop in type I diabetes only.			
7.10	The best diet for people with diabetes is balanced healthy diet.			
7.11	Insulin is secreted by the adrenal glands.			
7.12	Individuals with diabetes should have regular medical check-ups.			

8. State true and false for the statements about diabetes:
[If you are not sure, please tick the 'Don't Know' option.]

No.	Statements	True	False	Don't Know
8.1	Women can get diabetes during pregnancy.			
8.2	People with diabetes on medicines should not skip their meals.			
8.3	People with diabetes can feel whether their blood sugar levels are high or normal.			
8.4	All children ultimately grow out of their diabetes.			
8.5	Diabetes is contagious.			
8.6	People with diabetes don't have to take their insulin or pills when they're sick.			
8.7	People with borderline blood glucose levels can normalize it with weight reduction and lifestyle modification.			
8.8	Type 2 diabetes cannot happen to a child.			
8.9	**If no one in your family has diabetes, there are no chances that you will get the disease.**			
8.10	People with diabetes should not eat fruits as they are sweet.			
8.11	People with diabetes should wear covered and comfortable footwear.			
8.12	Too much of insulin causes an insulin addiction.			

8.13	Portion control of food is the key to dietary management in diabetes.			
8.14	**If you have borderline diabetes, there is no need to worry.**			
8.15	All drugs used to treat type 2 diabetes can cause low blood sugar levels.			

9. Name any 3 common late complications of diabetes:
a) _____
b) _____
c) _____