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Original Article

Diabetes knowledge, attitude and practice (KAP) study among Iranian in-patients with type-2 diabetes: A cross-sectional study

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SUMMARY

Aim: Recent studies highlight barriers of diabetes educational programs in Iran and also present some successful experiences carried out for improving the knowledge, attitude, and practice (KAP) of type-2 diabetic patients. Hence, evaluation of patients' KAP seems to be needed. We designed a multicenter study evaluating level of KAP in type-2 diabetic patients in the capital city of Tehran and identifying variables that affect this KAP level.

Methods: This multicenter analytical cross-sectional study was approved by Shahid Beheshti University of Medical Sciences Ethics Committee. Questionnaires were designed for evaluation of diabetes-related KAP in patients. After validating the questionnaires by endocrinologists, test–retest method was used for questionnaire reliability by checking in 15 diabetic patients. Two hundred type-2 diabetic patients admitted to 4 hospitals of Tehran filled out the questionnaires. Using SPSS software, the level of KAP and its confounders were evaluated in patients.

Results: Two hundred type-2 diabetic patients with the mean age of 60.17 years were evaluated (106 male and 94 female). The mean diabetes duration was 13.06 years. The levels of patients' good knowledge, attitude, and practice were 61.41%, 50.44% and 52.23%, respectively. Age, treatment methods, DM duration, and existence of diabetic retinopathy had significant correlations with KAP level.

Conclusions: The results of this study showed that recent educational programs in Iran improved KAP level. Patients' KAP increases as their condition worsens/progresses. Hence education should be considered as a priority for newly diagnosed patients and those with lower KAP levels before occurrence of diabetes complications.

Introduction

Diabetes is one of the most common chronic conditions in human history. It is a major public health concern worldwide with a prevalence of 8% in the United States [1,2] and 7.7% in Iran [3]. Progression of type-2 diabetes in most cases results in chronic complications, which lowers patients' quality of life and increases their morbidity and mortality; it also imposes a great economic burden on health systems [4,5]. The final outcome of diabetes depends on patients' knowledge and medical management [6].

It has been proved that self-care is the cornerstone of diabetes treatments, since this has been proven in various studies and populations [6,7]. Prior to beginning an educational program for diabetic patients, their current level of knowledge (K), attitude (A), and practice (P) should be evaluated.

Current practice in management of diabetes in Iran focuses on medical treatment and little attention is paid to educational programs and self-care of diabetic patients [5,8,9]. While prior studies have emphasized the importance of diabetes education [9], some recent articles have highlighted barriers to implementing diabetes educational programs in Iran [10] and have also presented successful experiences carried out for improving the knowledge, attitude, and practice of type-2 diabetic patients [8,11]. Patients

Abbreviations: KAP, knowledge attitude and practice; DM, diabetes mellitus; HTN, hypertension; BMI, body mass index; HbA1C, glycated hemoglobin; R-CVI, C-CVI, and S-CV, Irelevance clarity and simplicity content validity index.

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are at least once educated at the first year of their initial diagnosis of diabetes. [8] Hence evaluation of knowledge, attitude, and practice among patients in Tehran (capital of Iran), where the most educational programs had been held, seems to be needed.

While studies to evaluate patients' knowledge, attitude, and practice (KAP studies) have been performed in many countries around the world, few studies have investigated the situation in Iran [9,12,13]. The most of these studies have been published in Persian and failed to develop a valid and reliable questionnaire.

We designed a multicenter study to evaluate the levels of knowledge, attitude, and practice of type-2 diabetic patients in the capital of Iran and also to identify variables that affect their KAP level.

Methods

In this multicenter analytical cross-sectional study, a simple random sampling method was used to select 200 type-2 diabetic patients who were admitted to 4 govermental hospitals (Loghman-e-Hakim, Imam Hossein, Shahid Labbafinejad, and Shohada-ye-Tajrish) of Tehran, the capital of Iran from February to September 2014. According to the American Diabetes Association (ADA) 2013 diagnostic criteria, diabetes is defined as the presence of fasting plasma glucose $\geq$126 mg/dL (7 mmol/L), symptoms of hyperglycemia and a plasma glucose $\geq$200 mg/dL (11.1 mmol/L), or glucose $\geq$200 mg/dL (11.1 mmol/L) 2 h after glucose load, and/or hemoglobin A1 C $\geq$6.5% [2], and any known cases of diabetes mellitus receiving anti-diabetic medication. Inclusion criteria were: type-2 diabetic patients older than 18 years admitted to surgery, internal medicine, ophthalmology, urology, and otorhinolaryngology wards by any indications except diabetes-related complications (such as glycemia management, diabetic foot, diabetic retinopathy, nephropathy and neuropathy) with at least 1 year past the initial diagnosis of diabetes (this 1 year was for assuring at least one time training about diabetes). Exclusion criteria were patients with gestational diabetes mellitus, patients younger than 18 years, outpatients, patients with diabetes duration less than 1 year, and patients admitted for uncontrolled diabetes.

After approving the validity and reliability of the questionnaire, 200 patients were enrolled. They filled out the questionnaire and their level of knowledge, attitude, and practice as well as the affecting factors were evaluated.

Measurements and definitions

Body mass index (BMI) was calculated using weight (kg) divided by the height squared (m^2) and the BMI $\geq$30 was considered as obesity. The number of years since initial diagnosis was considered disease duration. All laboratory findings were measured using Pars Azmoon lab kits (Pars Azmoon Co., Tehran, Iran) at the Central Laboratory of Labbafinejad Hospital Central Laboratory. Fasting plasma glucose was measured using glucoseoxidase by a Pars Azmoon kit, and glycated hemoglobin (HbA1C) concentration was determined using a Nyco Card Reader II analyser [14].

Systolic and diastolic blood pressures were measured by an expert nurse using an automatic monitoring system (Cardioset FX7, SaIRAN Medical Industry-Iran).

Diabetes was defined according to ADA 2013 criteria [2] and whether patients were receiving anti-diabetic medications, and systolic blood pressure higher than 140 mmHg or diastolic 90 mmHg was considered as hypertension [15]. Known cases of dyslipidemia receiving medication were considered as dyslipidemia. Proliferative (new vessels or neovascularization of the disk and vitreous or preretinal hemorrhage) and non-proliferative (at least one microaneurysm/hemorrhage) were both considered as diabetic retinopathy [16]. Previously known cases of diabetic nephropathy (presence of macroalbuminuria, or "severely increased albuminuria" in the new nomenclature) were considered as nephropathy. Existence of at least one of polyneuropathy, autonomic neuropathy, radiculopathies, mononeuropathies, and mononeuropathy multiplex was considered as neuropathy.

Ethical consideration

This study was approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences (Meeting Feb 2014, No. 151). The details of the study were explained to the patients and written informed consent was obtained from all patients. Enrollment in the study did not disrupt the patients' treatment process. All patients' information was kept secure and anonymous.

Statistical analysis

Data were analyzed using statistics package for social science (SPSS) version 21 for Windows. All continuous data are expressed as mean (SD), and categorical variables are expressed as number and percent. Quantitative variables were checked for normality using the Kolmogorov–Smirnoff test. Differences of continuous variables between groups were analyzed using independent *t*-test for Gaussian data and Mann–Whitney for non-Gaussian data. Additionally, Chi-square test was run for comparison of dichotomous variables which were expressed as percentages.

Moreover, the correlation between variables was tested using the Pearson test and two-tailed Spearman's rank correlation considering the Gaussian and non-Gaussian distribution of variables, respectively.

The effect of medication on knowledge, attitude, and practice was measured by One-Way ANOVA and Tukey's post-hoc tests. *P*-values less than 0.05 were considered significant.

Questionnaire design

A questionnaire was designed by researchers and validated by eight endocrinologists. To check the questionnaire's reliability, fifteen patients completed the questionnaire two times with a 1-week interval.

The questionnaire had four parts including demographic information, knowledge (10 questions), attitude (10 questions), and practice (11 questions). Questions of the knowledge part were multiple choice questions with 0–1 and 0–4 scores, based on the numbers of correct choices. Questions of the attitude part were −2 to +2 Likert-like (strongly agree, agree, no idea, disagree, and strongly disagree). Each question in the practice part belongs 1 point for correct practice and 0 point in case of incorrect practice. The total scores ranges were between 0 and 22 for knowledge part, −20 to +20 for attitude part, and 0 to 10 for practice part. The knowledge, attitude and practice scores were changed to percentage by dividing the total score of each part by the max score of same part, and then the KAP level means KAP percent.

The content validity ratio ($CVR = (n_e - N/2)/(N/2)$) and relevance, clarity, and simplicity content validity index (R-CVI, C-CVI, and S-CVI) were used for instrument validation. The internal consistency of the questionnaire was checked using pretest–posttest and Cronbach's alpha. The reliability of each question was also checked by McNemar and Kappa tests.

The questionnaire items were scored for necessity, relevance, clarity, and simplicity by eight endocrinologists and the CVR R-CVI, C-CVI, and S-CVI were measured. Level of significance was considered 0.75 according to Lawshe's Table. None of the items had CVR and CVI lower than 0.75. Fifteen patients completed the questionnaire 2 times with a 1-week interval to determine the questionnaire's reliability. The internal consistency was approved (overall $\alpha = 0.788$. knowledge part $\alpha = 0.755$, attitude part $\alpha = 0.769$, and practice part $\alpha = 0.845$). There were no significant

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difference between first and second answers in all questionnaire items ($P > 0.05$). The Kappa index was not lower than 0.2 in any item. The validity and reliability checking processes are shown in Fig. 1.

Results

Patients' demographics

Two hundred type-2 diabetic patients with the mean age of 60.17 ± 13.56 years and the mean BMI of 29.03 ± 6.57 kg/m^2 were evaluated (106 male and 94 female patients). Statin consumption, hypertension, and dyslipidemia were significantly higher in female patients in comparison to male patients ($P < 0.05$). But there were no significant differences in other patients' characteristics and risk factors among male and female patients (Table 1). There were no significant differences between male and female patients in laboratory findings ($P > 0.05$, Table 2). The total level of patients' knowledge was 61.41 ± 12.35 (Table 3), total level of patients' attitude was 47.18 ± 28.85 (Table 4), and total level of patients' practice was 52.23 ± 18.02 (Table 5).

Factors affecting knowledge, attitude, and practice

There was a significant correlation between age and practice, with older age having a negative impact on good practice ($r = -0.179$, $P = 0.012$). The disease duration also correlated with patients' levels of knowledge, attitude, and practice ($r > 0.2$, $P < 0.001$), where longer duration improved these scores. The patients' knowledge, attitude, and practice scores were significantly higher in patients on insulin therapy in comparison to other medications ($P < 0.05$). The level of knowledge was significantly higher in patients with a positive family history in comparison to patients with a negative family history (63.1 ± 12.3 vs. 58.5 ± 11.9, $P = 0.012$). Knowledge, attitude, and practice scores were significantly higher in patients with diabetic retinopathy ($P < 0.05$). Practice was better in patients with diabetic nephropathy ($P = 0.0002$), whereas knowledge and practice were better in patients with diabetic neuropathy ($P < 0.05$, Table 6).

Discussion

The patients in the present study had a high general knowledge score and had good attitude and practice scores compared with previous evaluations in Iran. Many studies about Iranian diabetic patients' KAP level are published in domestic language in other cities of Iran [9,12,13]. The diabetic patients' KAP was in good level after some successful experiences carried out for improving the KAP level in Tehran [8,11], where the most educational programs had been held. But this level of KAP is not optimal yet and could be better by continuing these education programs.

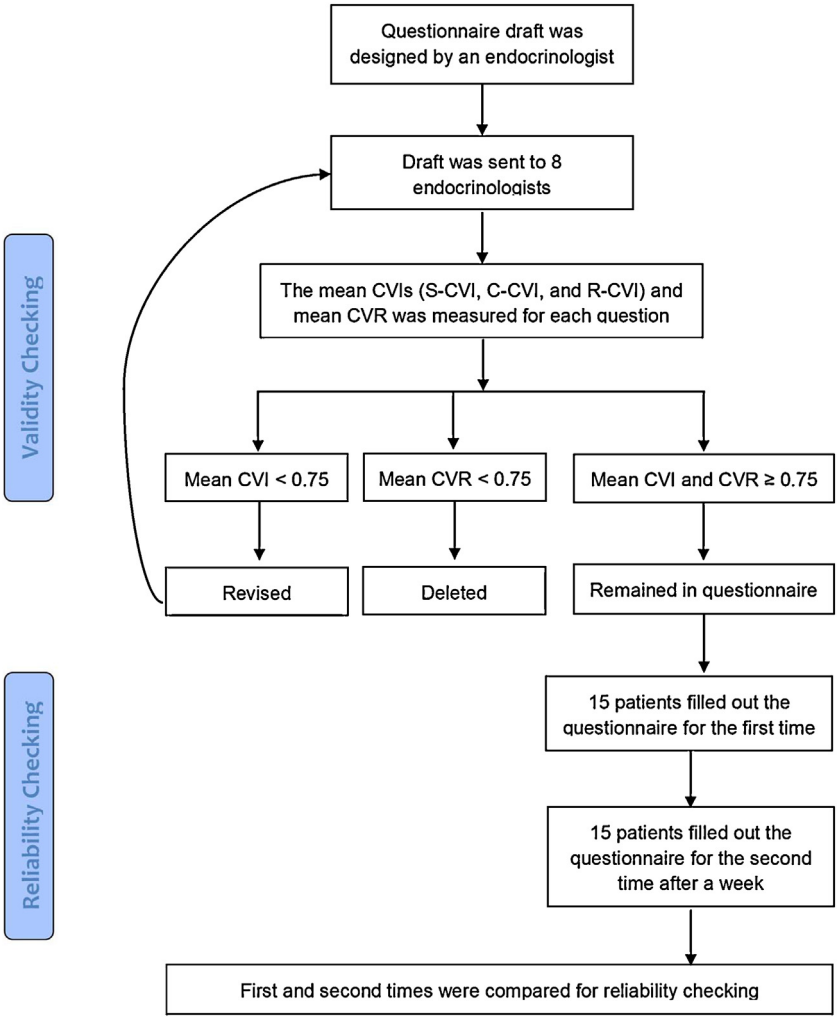

Fig. 1. Flowchart of questionnaire validity and reliability checking process.

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Table 1
Characteristics and risk factors in diabetic patients.

Variable	Male (*N* = 106)	Female (*N* = 94)	*P*	Total (*N* = 200)
Age, years	60.51 ± 12.22	59.77 ± 15.17	0.704	60.17 ± 13.56
≤60 years	47 (44.3)	48 (51.1)	0.342	95 (47.5)
>60 years	59 (55.7)	46 (48.9)		105 (52.5)
BMI, kg/m^2	29.2 ± 7.04	28.82 ± 6.01	0.689	29.03 ± 6.57
Obesity (BMI ≥ 35), No. (%)	40 (37.7)	35 (37.2)	0.942	75 (37.5)
Waist circumference, cm	104.71 ± 27.58	104.72 ± 25.48	0.997	104.71 ± 26.53
Disease duration, years	12.73 ± 9.62	13.36 ± 8.87	0.659	13.06 ± 9.26
Treatment methods, No. (%)			0.165	
Insulin	55 (51.9)	49 (52.1)		104 (52)
Oral Anti-Hyperglycemic Drugs (OAH)	45 (42.5)	44 (46.8)		89 (44.5)
Without treatment	6 (5.7)	1 (1.1)		7 (3.5)
Aspirin Consumption, No. (%)	55 (51.9)	45 (47.9)	0.335	100 (50)
Statin Consumption, No. (%)	54 (50.9)	61 (64.9)	0.032	115 (57.5)
Hypertension, No. (%)	48 (45.3)	65 (69.1)	0.001	113 (56.5)
Dyslipidemia, No. (%)	40 (37.7)	63 (67)	<0.001	103 (51.5)
Nephropathy, No. (%)	32 (30.2)	29 (30.9)	0.520	61 (30.5)
Retinopathy, No. (%)	60 (56.6)	61 (64.9)	0.146	121 (60.5)
Neuropathy, No. (%)	42 (39.6)	46 (48.9)	0.119	88 (44)
Positive Family History, No. (%)	70 (66)	57 (60.6)	0.260	127 (63.5)
Systolic Blood Pressure, mmHg	124.16 ± 14.45	125.66 ± 16.8	0.565	124.88 ± 15.66
Diastolic Blood Pressure, mmHg	75.26 ± 8.12	76.86 ± 9.56	0.278	76.03 ± 8.85

Table 2
Patients' laboratory findings.[a]

Laboratory test (normal range)	Male (*N* = 106)	Female (*N* = 94)	*P*	Total (*N* = 200)
Fasting Plasma Glucose (70–100 mg/dl)	211.2 ± 99.97	216.62 ± 89.94	0.788	213.4 ± 93.69
HbA1c (5.7–6.4%)	8.87 ± 2.86	9.73 ± 0.77	0.489	9.3 ± 2.04
Triglyceride (150–199 mg/dL)	137.44 ± 65.53	159.8 ± 99.91	0.317	145.43 ± 79.36
Cholesterol (<180 mg/dL)	174.09 ± 48.25	155 ± 40.34	0.134	166.93 ± 46.02
HDL (>40–60 mg/dL)	42.33 ± 16.25	43.56 ± 13.77	0.843	42.67 ± 15.41
LDL (100–129 mg/dL)	94.96 ± 32.11	73.18 ± 26.87	0.059	88.11 ± 31.86
BUN (7–20 mg/dL)	30.28 ± 14.49	34.6 ± 22.99	0.248	32.48 ± 19.33
Creatinine (0.7–1.3 mg/dL for men and 0.6–1.1 mg/dL for women)	1.61 ± 1.16	1.62 ± 1.39	0.961	1.62 ± 1.26

[a] Fasting plasma glucose; glycosylated hemoglobin (HbA1c); triglyceride; cholesterol; high density lipoprotein (HDL); low density lipoprotein (LDL); blood urea nitrogen (BUN); and creatinine.

The present study is in concordance with Feleke et al. in that both examined the relationship between age and disease duration with patients' knowledge and practice; with the difference that they did not evaluate patients' attitude and that gender was correlated with practice in their study where male participants showed better practice. All patients in Feleke et al.'s study showed lower knowledge and practice in Northwest Ethiopia in comparison to the present study (Iran) [17].

In India, Rathod et al. described the general population of India and showed lower KAP level, but Raj and Angadi showed higher KAP level in comparison of the present study. In Raj and Angadi's study, longer disease duration was significantly associated with

Table 3
Description of patients' knowledge score in detail. Each question belongs to 0–1 and 0–4 scores, based on the numbers of correct choices.

Knowledge	Score
K1. What are diabetes symptoms? (0–4)	1.78 ± 0.875
K2. What is the effect of exercise on glucose controlling? (0–1)	0.925 ± 0.264
K3. Is dietary intervention necessary in controlling glucose? (0–1)	0.89 ± 0.314
K4. What is necessary for controlling diabetes? (0–4)	3.01 ± 0.962
K5. What is suitable blood pressure for a diabetic patient? (0–1)	0.07 ± 0.256
K6. Which index is suitable for awareness about diabetes control in past months? (0–1)	0.095 ± 0.294
K7. Which one is the normal blood glucose in a healthy person? (0–1)	0.295 ± 0.457
K8. Which one could cause type-2 diabetes? (0–4)	2.91 ± 0.889
K9. Which one is the correct foot care in a diabetic person? (0–1)	0.59 ± 0.493
K10. What is the effect of diabetes on eyes? (0–4)	2.95 ± 0.434
Total knowledge percentage (0–100)	61.41 ± 12.35

Table 4
Description of patients' attitude in detail; each item belongs −2 to +2 Likert-like (strongly agree, agree, no idea, disagree, and strongly disagree) scores.

Attitude	Score
A1. Diabetes mellitus is treatable.	0.22 ± 1.57
A2. Diabetes mellitus is treatable with dietary and exercise.	0.31 ± 1.53
A3. Medication can be discontinued in case of increasing blood glucose and symptoms release.	0.52 ± 1.59
A4. Diabetes reduces life expectancy.	0.955 ± 1.22
A5. Herbal medications have less complication than physicians' medications.	0.265 ± 1.48
A6. Lipid and blood pressure control is necessary in diabetic patients.	1.73 ± 0.67
A7. Regular exercise helps controlling diabetes.	1.88 ± 0.548
A8. Initiating insulin exacerbates diabetes and its complications.	0.505 ± 1.22
A9. Proper diabetes treatment could blockage renal failure and blindness.	1.55 ± 0.843
A10. Smoking exacerbates vascular complications due to diabetes.	5.77 ± 9.44
Total attitude percentage (0–100)	47.18 ± 28.85

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Table 5
Description of patients' practice score in detail; each item belongs 0 and 1 scores for bad practice and good practice respectively.

Practice	Score
P1. When was your last ophthalmologist referral? (0–1)	0.715 ± 0.453
P2. Would you use herbal medications for controlling diabetes? (0–1)	0.625 ± 0.485
P3. When was your last nutritionist referral? (0–1)	0.275 ± 0.447
P4. How many times a week do you examine your feet? (0–1)	0.455 ± 0.499
P5. Have you glucometer? (0–1)	0.73 ± 0.445
P6. When is proper time to check blood glucose by glucometer? (0–1)	0.94 ± 0.238
P7. How many days a week do you exercise? (0–1)	0.3 ± 0.459
P8. How many main meals do you have daily? (0–1)	0.065 ± 0.247
P9. Last year, how many times did you visit a doctor? (0–1)	0.48 ± 0.5
P10. Do you smoke? (0–1)	0.96 ± 0.196
P11. Have you ever participated in a diabetes education class? (0–1)	0.2 ± 0.401
Total practice percentage (0–100)	52.23 ± 18.02

higher knowledge which is in agreement with the findings of the present study [18,19].

Demaio et al., evaluating KAP in general population in Mongolia, reported that one fifth of them had no knowledge about diabetes and had a high rate of incorrect conceptions about diabetes and its symptoms. One third of the study population was not aware of diabetes preventability by changing lifestyle in their study [20].

In Nepal, Upadhyay's study showed less knowledge and practice and similar attitude in comparison to present study, with this difference that they evaluated newly-diagnosed patients [21]. But Singh et al. assessed patients in two groups: governmental and non-governmental hospitals of Nepal. Patients in non-governmental hospitals had the same knowledge as the patients in the present study, while those in governmental hospitals had less knowledge. They did not assess patients' attitude and practice [22].

Similar to the present study, low knowledge of diabetic patients about optimal blood pressure and importance of its control was pointed out in a study in Australia done by Wong et al. [23].

In Saadia et al.'s study in Saudi Arabia patients had the same knowledge as the present study while their attitude and practice were lower. Saadia et al. assessed female diabetic patients [24]. Age and type of treatment were associated with knowledge, attitude, and practice in Tan and Magarey's study in Malaysia which is in accordance with the present study [25].

Age was negatively correlated with practice, while the knowledge and attitude were at good level in old patients. Hence focusing on practice of older patients could be considered in future educational programs. Since there was a significant positive correlation between disease duration and complications with KAP level, the educations could be more useful for newly diagnosed patients before occurring the diabetes complications.

In the present study, surveys with high validity and reliability were applied under the supervision of endocrinologists, and knowledge, attitude and practice were simultaneously evaluated in diabetic in-patients which can be pointed as the strength of the study.

Study limitations

All of the patients in the present study had type-2 diabetes; hence, the obtained results are not extrapolated to patients with type-1 diabetes. Furthermore, reachable samples were evaluated in the patients and the sample size was limited.

Table 6
Correlation of patients' knowledge, attitude, and practice with confounders. Pearson (or Spearman) correlation coefficient (r) and P-value (P).

Variable	Knowledge	Attitude	Practice
Total score (0–100)	61.41 ± 12.35	47.18 ± 28.85	52.23 ± 18.02
Age	r = 0.068 P = 0.340	r = 0.120 P = 0.093	r = - 0.179 P = 0.012
Age categories	P = 0.017	P = 0.257	P = 0.467
≤60 years	59.23 ± 13.27	44.74 ± 29.19	53.21 ± 18.70
>60 years	63.38 ± 11.15	49.38 ± 28.50	51.34 ± 17.42
Gender	P = 0.213	P = 0.149	P = 0.101
Male	62.44 ± 12.22	49.95 ± 27.56	50.26 ± 17.53
Female	60.25 ± 12.45	44.04 ± 27.56	54.45 ± 18.4
Obesity	P < 0.001	P = 0.168	P = 0.120
Yes	65.52 ± 9.69	50.97 ± 25.82	54.79 ± 16.91
No	58.95 ± 13.12	45.08 ± 30.44	50.69 ± 18.55
Hypertension	P = 0.069	P = 0.153	P = 0.840
Yes	59.94 ± 12.28	49.73 ± 30.91	52.45 ± 15.79
No	63.32 ± 12.24	43.85 ± 25.73	51.93 ± 20.65
Disease duration	r = 0.319 P < 0.001	r = 0.304 P < 0.001	r = 0.247 P < 0.001
Medication	P < 0.001	P = 0.001	P < 0.001
Insulin	65.6 ± 12.1	51.7 ± 29.1	57.9 ± 18
Oral pills	57.8 ± 10.5	44.7 ± 26.9	47.3 ± 15.8
Without treatment	44.8 ± 8.9	10.7 ± 18.6	29.9 ± 4.4
Family history of diabetes	P = 0.012	P = 0.068	P = 0.625
Yes	63.1 ± 12.3	50 ± 28.6	51.8 ± 16.7
No	58.5 ± 11.9	42.3 ± 28.8	53.1 ± 20.2
Diabetic retinopathy	P = 0.002	P = 0.006	P < 0.001
Yes	63.6 ± 11.9	51.7 ± 27.6	56 ± 15.9
No	58.1 ± 12.3	40.3 ± 29.5	46.4 ± 19.5
Diabetic nephropathy	P = 0.238	P = 0.606	P = 0.002
Yes	63 ± 12.1	48.8 ± 31.9	58.6 ± 19.6
No	60.7 ± 12.3	46.5 ± 27.5	49.4 ± 16.6
Diabetic neuropathy	P < 0.001	P = 0.069	P = 0.003
Yes	65 ± 9.7	51.4 ± 27.9	56.5 ± 17.4
No	58.6 ± 13.5	43.9 ± 29.2	48.9 ± 17.8

Conclusion

With recent educational programs for type-2 diabetic patients in Iran the KAP level is improved. But this level of KAP is not optimal and needs more evaluations about barriers of KAP in Iran. The results of this study showed that patients with longer duration of diabetes, those developing diabetic retinopathy and those receiving insulin had a better KAP score. This may suggest that patients' KAP increases as their condition worsens/progresses. Future educations should be considered as a priority in newly diagnosed patients and whom with lower KAP levels.

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Authors contribution

Idea development: Mahtab Niroomand; Acquiring data: Seyedeh Najmeh Ghasemi; data analysis: Hamidreza Karimi-Sari; drafting the manuscript: Hamidreza Karimi-Sari, Seyedeh Najmeh

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Conflicts of interest

The authors have none to declare.

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