Original Article

Assessment of Type II Diabetic Patients' Disease Knowledge on the Outcome of Glycosylated Hemoglobin among Iraqi Patients

Esraa A. Hussein, Furqan M. Abdulelah, Asmaa S. Abdulateef, Bushra Malik Jassim and Zahraa M. Jaafar

ABSTRACT

Objective: To inspect the diabetes knowledge could affect HbA1c levels in people with Type 2 diabetes mellitus
Study Design: Observational / cross sectional study
Place and Duration of Study: This study was conducted at the National Diabetes Center in Baghdad, Iraq from 1st February 2022 to 31st July 2022.
Methods: A total of 380 patients were enrolled. Demographic and recent HbA1clevels of the patients were obtained the knowledge about diabetes mellitus was assessed.
Results: The mean value of knowledge was 6.1. The majority of the patients displayed satisfactory knowledge related to appropriate diabetic food (the carbohydrate content of food), the reliable glucose measuring method, cause of hypoglycemia, importance of regular exercising, complications of diabetes, and right method of foot care. While there was no correlation between diabetes knowledge and age, duration of the disease, gender and HbA1c and a significant negative correlation with the body mass index.
Conclusion: There was no significant association between patients' disease knowledge and glycemic control in type II diabetes mellitus.
Key Words: Diabetes mellitus, Knowledge test, National diabetes center

Citation of article: Hussein EA, Abdulelah FM, Abdulateef AS, Jassim BM, Jaafar ZM. Assessment of Type II Diabetic Patients' Disease knowledge on the Outcome of Glycosylated Hemoglobin among Iraqi Patients. Med Forum 2025;36(7):29-33. doi:10.60110/medforum.360706.

INTRODUCTION

Diabetes is a chronic disease requires proper medical care, self-management and education to enhance patients' quality of life thus diabetic patients should attain proper knowledge and skills to manage their day to daycare.[1] Effective management involves understanding the disease and applying knowledge to self-care.[2] The diabetes knowledge is generally poor world widely affecting disease outcomes.[3] Researches from America, China, and Finland showed that lifestyle changes, such as diet and exercise, can delay T2diabetes mellitus onset, reduce complications, and improve life expectancy.[4] In diabetic patients, increased knowledge of disease management correlates with better outcomes, including glycemic control.[5]

As the knowledge about diabetes mellitus makes the basis of informed decisions regarding diet, exercise, weight control, blood glucose monitoring, use of medicinal agent, foot and eye care.[6] Key factors were linked to poor diabetes knowledge, include low education, old age, low income, and short diabetes duration, with low education consistently appearing as an independent risk factor.[7] To improve diabetes care evaluating knowledge levels is essential.[8] Several countries use the Michigan Diabetes Knowledge Test (MDKT), a validated tool developed by The Michigan Diabetes Research Training Centre, to assess diabetes patients' knowledge and understanding.[1]

College of Pharmacy, Al-Naji University, Baghdad, Iraq

Correspondence: Esraa A. Hussein, College of Pharmacy, Al-Naji University, Baghdad, Iraq.
Contact No: 009647706851774
Email: esraa.awad@alnaji-uni.edu.iq

Received: February, 2025
Reviewed: March-April, 2025
Accepted: May, 2025

METHODS

This cross-sectional study included 380 type 2 diabetes patients attending the National Diabetes Center, Baghdad, Iraq from 1st February 2022 to 31st July 2022. Patients were selected based on a diagnosis at age 30 or older, with at least one year of disease duration, managed through diet, oral antidiabetic drugs, or insulin therapy for at least a year to exclude type 1 diabetes, participation was voluntary. Exclusion criteria included patients with type 1 diabetes, hearing or speech impairments, pregnancy, or breastfeeding. Diabetes-related knowledge was assessed using a modified Arabic version of the Michigan Diabetes Knowledge Test (MDKT), condensed to ten questions and adapted to align with Arabic cultural norms.[9]

The data was entered and analyzed through SPSS-25. Continuous variables follow a normal distribution verified by the Anderson-Darling test. If normal, mean and standard deviation are used; otherwise, median and interquartile range 25%-75% apply. Distribution between two groups is analyzed using Chi-square and Fisher's exact test and differences in means (normal distribution) are assessed with a two-sample t-test, while median differences (non-normal distribution) use the Mann-Whitney U test. Variable relationships are examined via linear regression. Pearson correlation applies when at least one variable follows a normal distribution, whereas Spearman correlation is used otherwise. Regression analysis is visualized using scatter plots, with correlation strength classified as weak (r 0.75). Negative r indicates an inverse relationship, while positive denotes a direct link. The Receiver Operating Characteristic (ROC) curve evaluates parameter effectiveness in distinguishing torsion versus non-torsion cases. The Area Under the Curve (AUC) reflects test performance: ROC curves plot sensitivity versus (100 - specificity) at various thresholds. Maximum accuracy occurs when the curve passes through the upper-left corner (100% sensitivity, 100% specificity). The AUC, computed via the trapezoidal method, quantifies test validity - closer proximity to the upper-left corner indicates higher diagnostic accuracy.

RESULTS

Poor glycemic control patients had significantly longer median diabetes duration (7 versus 4 years). No significant differences were observed in other variables (Table 1). The sample's mean glycosylated hemoglobin value was 7.93±1.83 (Fig. 1). The descriptive data of the Michigan Diabetes Knowledge Test (DKT) with a mean score of 6.18 across 10 questions (Table 2).

Table No.1: Comparison of personal, demographic data according to glycemic control

Glycemic control	Glycosylated haemoglobin more than 7% (n=297)	Glycosylated haemoglobin less than 7% (n=83)	Total Mean±SD (n=380)	P value
Hemoglobin	1.6±0.1	1.7±0.1	1.6±0.1	0.304
Weight	79.8±11.9	79.1±12.5	79.6±12.0	0.648
Age (years)	56.3±9.8	57.6±11.2	56.6±10.1	0.302
>65 years	59 (19.9%)	25 (30.1%)	84 (22.1%)	-
<65 years	238 (80.1%)	58 (69.9%)	296 (77.9%)	
Duration of DM, (median [IQR])	7.0 (7.0–11.5)	4.0 (3.0–7.0)	7.0 (4.0–10.0)	<0.001
Body mass index	29.5±4.3	28.8±5.0	29.3±4.4	0.230
< 25	38 (12.8%)	18 (21.7%)	56 (14.7%)	-
≥ 25	259 (87.2%)	65 (78.3%)	324 (85.3%)	
Sex				
Male	140 (47.1%)	43 (51.8%)	183 (48.2%)	0.452
Female	157 (52.9%)	40 (48.2%)	197 (51.8%)	
Salary				
<500,000 D	116 (39.1%)	42 (50.6%)	158 (41.6%)	0.109
500,000 – 1,000,000 D	137 (46.1%)	34 (41.0%)	171 (45.0%)	
>1,000,000 D	44 (14.8%)	7 (8.4%)	51 (13.4%)	
Academic achievement				
Illiterate	15 (5.1%)	3 (3.6%)	18 (4.7%)	0.564
Primary school	50 (16.8%)	18 (21.7%)	68 (17.9%)	
Secondary school	142 (47.8%)	34 (41.0%)	176 (46.3%)	
University	90 (30.3%)	28 (33.7%)	118 (31.1%)	

D = Iraqi dinar DM = Diabetes mellitus IQR = Interquartile range

Table No.2: Descriptive statistics of Diabetes Knowledge test (DKT) components

	Mean	Standard Deviation	Median	IQR
DKT1	0.850	0.358	1	(1 - 1)
DKT2	0.634	0.482	1	(0 - 1)
DKT3	0.647	0.478	1	(0 - 1)
DKT4	0.361	0.481	0	(0 - 1)
DKT5	0.197	0.399	0	(0 - 0)
DKT6	0.682	0.466	1	(0 - 1)
DKT7	0.855	0.352	1	(1 - 1)
DKT8	0.466	0.499	0	(0 - 1)
DKT9	0.632	0.483	1	(0 - 1)
DKT10	0.858	0.350	1	(1 - 1)
DKT	6.182	2.256	6	(5 - 8)

DKT = Diabetes knowledge test, IQR = Interquartile range

Table No. 3: Univariate analysis between Diabetes Knowledge test (DKT) and various variables

	Beta	Odd Ratio	P value
Age	-0.047	-	0.179
Duration of diabetes mellitus	0.013	-	0.800
Body mass index	-0.138	-	0.007
Gender[a]	0.068	1.071	0.136
HbA1c	-0.051	-	0.320

[a]Binary logistic regression used to find the relationship between DKT and gender

Questions 1, 7, and 10 had the highest correct response rates (85%, 85.5%, 85.8%), indicating strong knowledge in these areas. Conversely, questions 4 and 5 had the lowest correct rates (36.1% and 19.7%), reflecting poor understanding of these topics (Fig. 2). There was no correlation between DKT and age, duration of DM, gender, and HbA1c while there was a negative significant correlation with the BMI (Table 3). There was a significant trend (linear increase as the level of education increase) indicating as the level of education increase there is significant increase in the DKT score (Table 4, Fig. 3). No linear relationship was available between DKT and HbA1c (Fig. 4). There was a significant positive correlation between most of the components of the DKT (Table 5).

Table No.4: Trend ANOVA of the relationship between education level and DKT

Diabetes Knowledge test	Illiterate	Primary	Secondary	College	P value
	4.50±2.43	5.24±2.27	6.27±2.11	6.86±2.14	<0.001

Table No. 5: Spearman correlation between Michigan Diabetes Knowledge test (DKT) components

		DKT2	DKT3	DKT4	DKT5	DKT6	DKT7	DKT8	DKT9	DKT10	DKT
DKT1	Beta	0.308	0.214	0.039	0.097	0.251	0.246	0.245	0.351	0.125	0.489
	P value	<0.001	<0.001	0.447	0.058	<0.001	<0.001	<0.001	<0.001	0.015	<0.001
DKT2	Beta		0.183	0.058	0.061	0.302	0.231	0.260	0.360	0.207	0.583
	P value		<0.001	0.258	0.237	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
DKT3	Beta			0.072	0.062	0.146	0.197	0.126	0.156	-0.016	0.423
	P value			0.159	0.231	0.004	<0.001	0.014	0.002	0.749	<0.001
DKT4	Beta				0.275	0.125	0.075	0.255	0.164	0.133	0.459
	P value				<0.001	0.015	0.143	<0.001	0.001	0.009	<0.001
DKT5	Beta					0.140	0.054	0.173	0.201	0.088	0.420
	P value					0.006	0.297	0.001	<0.001	0.086	<0.001
DKT6	Beta						0.281	0.231	0.321	0.175	0.573
	P value						<0.001	<0.001	<0.001	0.001	<0.001
DKT7	Beta							0.219	0.073	0.218	0.436
	P value							<0.001	0.153	<0.001	<0.001
DKT8	Beta								0.319	0.169	0.629
	P value								<0.001	0.001	<0.001
DKT9	Beta									0.267	0.643
	P value									<0.001	<0.001
DKT10	Beta										0.394
	P value										<0.001

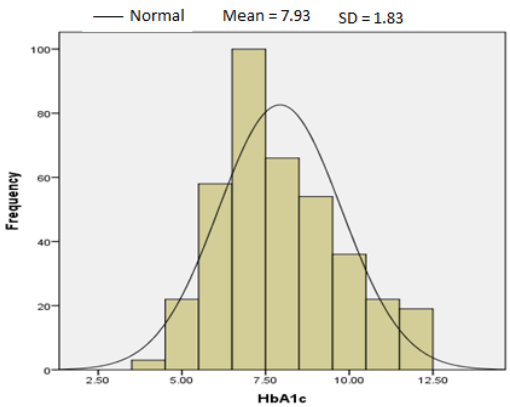

Figure No. 1: Mean HbA1c value for the sample population

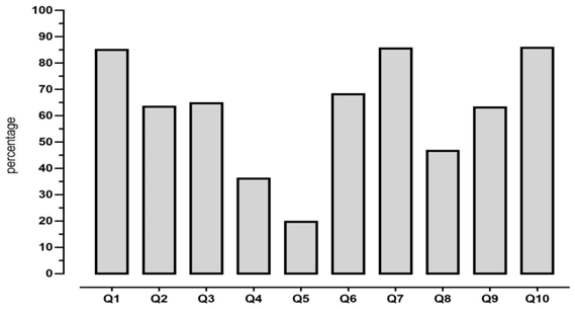

Figure No. 2: Histogram of the patients achieving true answer in Diabetes Knowledge test

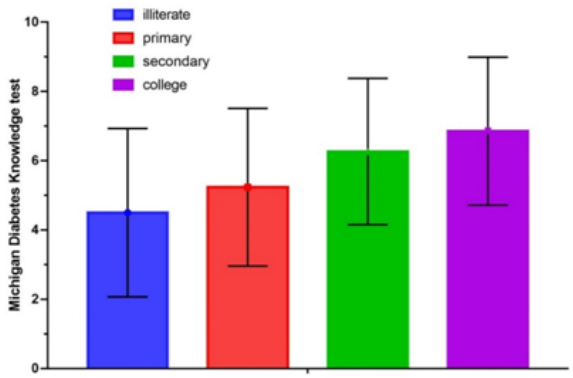

Figure No. 3: DKT according to education level

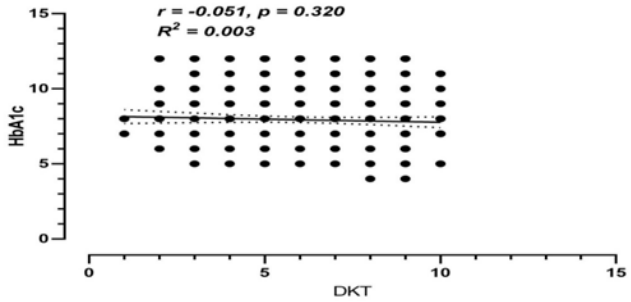

Figure No. 4: Linear correlation between DKT and HbA1c (no relationship was observed)

DISCUSSION

In the present study, the mean age of the patients was 56.6±10.1years, consistent with prior Iraqi studies. AL-Auqbi and Mustafa[10] reported 55 years, while Juda et al[11] recorded 59.14 for male and 56.9 for females. The mean BMI was 29.3±4.4 kg/m², indicating obesity prevalence, similar to Juda et al[12] (26.25 kg/m²) and Basra city (28.0 KG/m²).[12] 85.3% of participants had BMI > 25, higher than Mansour et al[13] (70.3%) but lower than an Egyptian study (91.2%).[15] Obesity was common among diabetic patients. The male-to-female ratio was 183:197, varying across other Iraqi studies, suggesting statistical inconsistency.[15-17] The mean T2DM duration was 7 years, similar to previous studies.[12,14,15] No significant differences were found between patients with good and poor glycemic control in factors such as age, BMI, gender, and social status. However, those with poor control had a longer diabetes duration (7 vs. 4 years), likely due to worsening β-cell function, increased insulin resistance, and decreased insulin secretion.[18]

Diabetes knowledge deficiency is a global issue, contributing to poor metabolic control among patients. Education enhances clinical outcomes and quality of life, making knowledge essential for effective management.[19] This study found an average knowledge level of 6.1, with most patients demonstrating satisfactory awareness of diabetic food, glucose monitoring, hypoglycemia, exercise, complications, and foot care. While some studies report higher knowledge levels, others indicate poor awareness and highlighting the need for intervention programs.[19-22] Most participants correctly answered questions on carbohydrate content, exercise effects, and foot care (85%, 85.5%, 85.8%, respectively). However, fewer answered correctly on blood glucose monitoring (36.1%) and anti-diabetic drugs (19.7%). Comparisons with Odili et al[23] suggest higher overall correct response rates in this study. Demographic analysis showed no correlation between age and knowledge, unlike studies in Malaysia and Singapore, where older patients had higher scores.[24] No gender-based differences were found, though a Jordanian study reported higher knowledge among men.[25] Disease duration had no impact, aligning with findings in Singapore but differing from Nigerian results.[1,24] A negative correlation was found between BMI and knowledge - higher knowledge linked to lower BMI - contrary to Al Qahtani et al.[1] Weight loss improves glycemic control, insulin sensitivity, and cardiovascular risks.[26] Education was the key socio-demographic factor affecting diabetes knowledge. Studies in Malaysia, Gambia, and Ethiopia confirm that higher education levels lead to better awareness.[26,27] However, knowledge alone does not significantly impact glycemic control, as indicated by studies in Nigeria and Singapore. Behavioral changes are necessary for effective self-care and metabolic control.[23,25]

CONCLUSION

There was no significant association between patients' disease knowledge and glycemic control in type II diabetes mellitus. However, the mean diabetes knowledge score was at an acceptable level and showed a strong correlation with patients' educational background.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Esraa A. Hussein, Furqan M. Abdulelah, Asmaa S. Abdulateef
Drafting or Revising Critically:	Bushra Malik Jassim, Zahraa M. jaafar
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No.93jd/QM/Approval/92838730 Dated 07.01.2022

REFERENCES

1. Loai A, Abdulaziz A, Mohamud S, et al. Michigan Diabetes Knowledge Test: translation and validation study of the Arabic version. Int J Acad Sci Res 2016; 4 (1):121-5.

2. Valentine U, Paul D, Aihanuwa E. Patients' Knowledge of Diabetes Mellitus in a Nigerian City. Trop J Pharmaceut Res 2011;10(5):637-42.
3. Deepa M, Bhansali A, Anjana R, et al. Knowledge and awareness of diabetes in urban and rural India: the Indian Council of Medical Research India Diabetes Study (Phase I): Indian Council of Medical Research India Diabetes 4. Ind J Endocrinol Metabol 2014;18(3):379-85.
4. Wang X., Tian B, Zhang S, et al. Diabetes knowledge predicts HbA1c levels of people with type 2 diabetes mellitus in rural China: a ten-month follow-up study. Sci Rep 2023; 3: 18248.
5. Rockmeyer M, Wies E, Joerges J, et al. Knowledge of HbA1c and LDL-C treatment goals, subjective level of disease-related information and information needs in patients with atherosclerotic cardiovascular disease. Clin Cardiol 2023;46: 223-31.
6. Dagmar M, Ľudmila M, Sergej H, et al. knowledge of diabetes in patients with type 2 diabetes on insulin therapy from eastern Slovakia. Diabetologia Croatica 2012: 41-3.
7. Eva K, Jing X, Gwyn R, et al. Factors Associated with Knowledge of Diabetes in Patients with Type 2 Diabetes Using the Diabetes Knowledge Test Validated with Rasch Analysis. Plos One 2013; 8(12): 1-8.
8. Anne H, Morten At, Jannicke I, et al. Diabetes knowledge in nursing homes and home-based care services: a validation study of the Michigan Diabetes Knowledge Test adapted for use among nursing Personnel. Nursing 2016; 15(40): 1-9.
9. Alshehri AR. A model to evaluate diabetes self-management programmes [Ph. D. Thesis]. University of Southampton, United Kingdom. 2010; 18-20.
10. AL-Auqbi TF, Mustafa MA. Obesity and its related clinical and biochemical parameters in a sample of Iraqi Type 2 Diabetics. IJGE 2005; 1 (5): 19-23.
11. Juda TM, Tareq HT, AL-Shouk M. Metabolic syndrome among Type 2 diabetic patients in Babel Goverenate. Med J Babylon 2010;7(4-3): 39-43.
12. Mansour AA, Ajeel NAH. Atherosclerotic cardiovascular disease among patients with type 2 diabetes in Basrah. World J Diabetes 2013; 4(3): 82-7.
13. Mansour AA, Al-Maliky AA, Kasem B, et al. Prevalence of diagnosed and undiagnosed diabetes mellitus in adults aged 19 years and older in Basrah, Iraq. Diabetes Metabol Syndrome Obesity: Targets Therapy 2014;7: 139-44.
14. Taha NM, El-Azeaz MA, El-razek BGA. Factors affecting compliance of diabetic patients toward therapeutic management. Med J Cairo Univ 2011; 79 (1):211-8.
15. Sattar AN. The adequateness of glycemic control in type 2 diabetes mellitus. Med J Babylon 2015; 12(4): 1129-36.
16. Kareem AA. Diabetes mellitus, is our patients` knowledge of its complications adequate to save their useful vision? Med J Babylon 2007; 4: 3-4.
17. Juda TM, Issa AM, Zaidan HK. The role of advanced glycated end products and microalbuminuria on developing diabetic retinopathy in type 2 diabetes mellitus. Med J Babylon 2014; 11(1): 48-51.
18. Kamuhabwa AR, Charles E. Predictors of poor glycemic control in type 2 diabetic patients attending public hospitals in Dar es salaam. Drug, Health Care Patient Safety 2014;6:155-65.
19. Al-Adsani A, Moussa M, Al-Jasem L, et al. The level and determinants of diabetes knowledge in Kuwaiti adults with type 2 diabetes. Diabetes Metabol 2009; 35: 121-8.
20. Islam SMS, Niessen LW, Seissler J, et al. Diabetes knowledge and glycemic control among patients with type 2 diabetes in Bangladesh. Springer Plus 2015; 4:284.
21. Al-Sarihin KK, Bani-Khaled MH, Haddad FH, et al. Diabetes knowledge among patients with diabetes mellitus at King Hussein Hospital. JRMS 2012; 19(1): 72-7.
22. Ling CC, Erh CH, Ling LW, et al. Evaluation of diabetes understanding among diabetic patients in Miri General Hospital. Sarawak J Pharmacy 2015; 1: 58-68
23. Odili VU, Isi PD, Eregie A. Patients' knowledge of diabetes mellitus in a Nigerian City. Trop J Pharmaceutical Res 2011; 10 (5): 637-42.
24. Pongmesa T, Li SC, Wee HL. A survey of knowledge on diabetes in the central region of Thailand. Int Soc Pharmacoeconomics Outcomes Res 2009;12(3): 12-6.
25. Fenwick EK, Xie J, Rees G, et al., Factors associated with knowledge of diabetes in patients with type 2 diabetes using the diabetes knowledge test validated with Rasch Analysis PLOS ONE 2013;8(12): 19-23.
26. Najib MNM, Dali AF, Ahmad A, et al. Knowledge and attitude on diabetes among public in Kota Bharu Kelantan, Malaysia. Int J Educ Res 2014;2(2): 15-8.
27. Foma MA, Saidu Y, Omoleke SA, et al. Awareness of diabetes mellitus among diabetic patients in the Gambia: a strong case for health education and promotion, BMC Public Health 2013;13:1124.