# Dietary habits among type 2 diabetic patients in Erbil City

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## Abstract

**Background and objectives:** Dietary modification is the cornerstone in the management of type 2 diabetes. The purpose of this study was to explore the dietary behavior of type 2 diabetic patients, along its association with glycemic control and sociodemographic factors and their perceived obstacles to follow diabetic dietary regimens. **Methods:** A cross-sectional study was conducted in Erbil City, Kurdistan Region of Iraq, from December 2017 to December 2018. In this study, 344 type 2 diabetic patients, who were attending Leila Qasim Center for diabetes care, were recruited. Patients who were ≥18 years and diagnosed at least for one year were enrolled. Data were collected through direct interview based on the questionnaire. Dietary behavior was assessed through modified UK Diabetes and Diet Questionnaire. **Results:** Out of all enrolled patients, 85.5% of them had unsatisfactory dietary habits. Adherence to whole grain and fish consumption were 2.9% and 5.5%, respectively, which had the lowest rate of dietary adherence. Only 24.4% of patients had their glycosylated hemoglobin level below 7%. Statistically significant association was found between dietary habits and glycemic control. Females tend to have more dietary adherence than males (16% vs 12.3%); however, there was no statistically significant association between gender and age with dietary habits. Lack of palatability was perceived as the main barrier for dietary adherence by the patients. **Conclusions:** Type 2 diabetic patients had low adherence to the recommended diet. The educational level and source of dietary advice were significantly associated with adherence. The dietary adherence of the patients was inversely associated with their glycosylated hemoglobin level.

**Key words:** Dietary adherence, Dietary barriers, Glycemic control, Type 2 diabetes mellitus.

## Introduction

Diabetes is a major health burden worldwide. About 425 million people worldwide suffer from diabetes; 79% of diabetics are estimated to be from low- and middle-income countries. It is expected that the number of cases will reach 629 million people by 2045. Type 2 diabetes is the most common form of diabetes and accounts for 87% to 91% of all people with diabetes. The age-adjusted prevalence of diabetes in Iraq in 2012 was 19.7% (in adults 19)[1].

Self-care behaviors of diabetic patients which includes following advised diet, exercise recommendations, taking prescribed medications, and self-monitoring of blood sugar has a substantial role in achieving glycemic control[2]. Healthy dietary habit has integral role in overall management of diabetes mellitus[3]. Through evidence, it has been revealed that Medical Nutrition Therapy (MNT) alone can reduce glycosylated hemoglobin (HbA1c) by 1% to 2%

in type 2 diabetes mellitus with greatest benefit on early stages of diabetes. Healthy diet successfully leads to better metabolic and clinical outcome[4].

Adherence has been defined as the degree to which the patients follows medical recommendations (taking prescribed medicines, following the recommended diet and exercises) corresponding with agreed recommendations[5]. Although there is no ideal method to measure adherence behavior, evaluation of specific behavior corresponding to the specific guidelines (e.g. measuring dietary behavior by food frequency questionnaires) has been reported as one of the reliable methods of measuring adherence behavior[5]. It has been revealed that modifying diet can improve type 2 diabetes in many aspects, such as aiding in controlling of hypertension, reducing the extra weight, increase the release and the responsiveness of insulin. Difficulty in following dietary recommendation is a significant limiting factor in achieving glycemic control[6]. Despite the signifi-

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cance of diet in the management of diabetes, the diabetic patients are often unaware of its importance in achieving glycemic control. Even when community does have good level of education, patients usually fail to follow diet recommendations[6,7]. Nutritional management of type 2 diabetes patients includes an individualized dietary regimen, preferably provided by dietitian because there is no single ideal macronutrient distribution for diabetic patients[8,1].

Despite nutrition being an essential part of type 2 diabetes management, up to the investigator's knowledge, no study was done in Erbil to exclusively address dietary habits of type 2 diabetic patients.

This study was done to explore the dietary behavior of type 2 diabetic patients and their perceived obstacles to follow diabetic dietary regimens.

Specific objectives of the study were to measure the proportion of type 2 diabetic patients who failed to follow dietary guidelines, assess the relation between dietary habits of type 2 diabetic patients and their glycemic control, to know if there is an association between socioeconomic statuses, source of dietary advice and the dietary behavior, and to find out patient's perceived barriers of following diet regimens.

## Patients & methods

This cross-sectional study was carried out in Leila Qasim Center for diabetes care in Erbil City in Kurdistan Region of Iraq. It was conducted from 01/12/2017 to 01/12/2018. Sample size was 344 patients. Sample size was calculated by this formula (n=(z^2 p(1-p))/d^2 ) where n is sample size, z is the statistic corresponding to level of confidence (95%) which is equal to 1.96, p (expected prevalence of failing to follow diet regimens9) = 64%, d (precision) = 5%10. Systematic random sampling (In which every third patient in the list of those attending the center was selected) was used to select type 2 diabetic patients attending Leila Qasim Center for diabetes care regularly.

The inclusion criteria of this study were registered type 2 diabetic patients ≥18 years old attending Leila Qasim Center for diabetes care, and patients who have been diagnosed at least for one year.

Questionnaire in the English language was used in which responses were administered through direct interview.

There were five domains in the questionnaire; the demographic data, the sources of dietary advice, HbA1c level, dietary behavior assessment, and the barriers to follow diet regimen. The socioeconomic status (SES) was evaluated by calculating socioeconomic index that is developed for health researches in Iraq[11]. For dietary assessment part, modified UK Diabetes and Diet Questionnaire (UKDDQ) was used (which can be culturally tailored to the population)[12,13]. United Kingdom Diabetes and Diet Questionnaire was originally designed to assess dietary behaviors in adult patients with type 2 diabetes or those at risk of type 2 diabetes. It has been reported that it's reliable and valid[13].

Modification of the UKDDQ was done with the help of nutritionist and endocrinologist.

The content validity of the questionnaire was assessed by an endocrinologist and nutritionist.

Dietary adherence according to UKDDQ protocol has been categorized to healthy diet, partially unhealthy diet and unhealthy diet[13]. Scoring was done by following UKDDQ scoring protocol, according to the frequency of consumption from 0 (healthiest choice) to 5 (least healthy choice): 0 & 1 are healthy choices, 2 & 3 considered less healthy choices and 4 & 5 are unhealthy choices[13]. For the purpose of data analysis, the mean UKDDQ Score was calculated for each individual; from the range of 0 to 5, the final score was given. Statistical Package for the Social Sciences (SPSS, version 25) was used for data entry and analysis. Measures of statistical dispersion, frequency distribution, non-parametric statistics (Data didn't follow normal distribution as indicated by Kolmogorov-Smirnov test) were used. Mann–Whitney U test and Kruskal-Wallis test were used for comparing continuous variables. Chi square or Fisher's exact test was used to compare categorical variables. Spearman's rank-order correlation was used to determine association between two numerical variables. P-value ≤0.05 will be regarded as statistically significant. Informed consent was taken from all patients prior to the participation in the study.

The research protocol was reviewed and approved by the ethical committee of the Kurdistan Board of Medical Specialties. The anonymity of participants was preserved.

# Results

This study recruited 344 patients with type 2 diabetic mellitus; 138 males (40.1%) and 206 females (59.9%). General characteristics of patients and their association with dietary adherence is shown in Table 1.

Patients were aged between 34 and 74 years old; median age was 56 years old, interquartile range (IQR) of 8 and highest number of patients was between age groups of 50 and 59. In this study, it was found that patients have a minimum socioeconomic index of 1.10 and a maximum of 9.98; the median and the interquartile range (IQR) of socioeconomic index was 3.99 and 3.04, respectively. Meanwhile, most of the patients (56.1%) were in low socioeconomic index scale. The treating doctor was the main source of nutritional advice (56.1%).

Only 14.5% of patients had UKDDQ score of healthy diet scale, 61.6 % had partially unhealthy diet scale and 23.8% had unhealthy diet scale. Median and IQR of UKDDQ score were 2.87 and 1.53, respectively. Males tend to have more UKDDQ score of unhealthy diet scale than females (34.8% vs 16.5%). However, no statistically significant association was found between gender and age with UKDDQ score, p-value = 0.77 and p-value =0.688, respectively. Statistically significant association was found between socioeconomic index and UKDDQ score; UKDDQ score of healthy diet scale was more in higher socioeconomic index patients (spearman rs=-0.391 p-value <0.001). Also, a Kruskal-Wallis H test showed that there was a statistically significant difference between education levels and dietary adherence, $\chi2(2)$ =52.2, p-value <0.001. The mean rank of 212.55 for illiterate, 162.90 for primary school, 172.18 for intermediate school, 117.56 for high school, 175.50 for institute and 90.94 for bachelor's degree.

Those who had consulted dietitian had lower rates of unhealthy diet in comparison to those whom the treating doctor was the only source of nutritional advice (10.6% vs 24.9%, p= 0.015).

Of all 344 patients, only 24.4% had HbA1c level below 7%. Median HbA1c of 7.6% with IQR of 2% were considered as poor control. There was a statistically significant association between HbA1c and UKDDQ in which patients with UKDDQ in the healthy diet scale tend to have lower HbA1c (Spearman rs=0.735, p<0.001).

**Table (1):** General characteristics of patients and their association with dietary adherence

| Variables | Total No (%) | Median (IQR) | Healthy diet | Partially unhealthy | Unhealthy diet | p-value |
|---|---|---|---|---|---|---|
| | | | | Frequency (%) | | |
| Gender | | | | | | 0.77* |
|   Male | 138 (40.1) | | 17 (12.3) | 73 (52.9) | 48 (34.8) | |
|   Female | 206 (59.9) | | 33 (16) | 139 (67.5) | 34 (16.5) | |
| Residence | | | | | | 0.11* |
|   Urban | 290 (84.3) | | 33 (11.4) | 189 (65.2) | 68 (23.4) | |
|   Sub-urban | 54 (15.7) | | 17 (31.5) | 23 (42.6) | 14 (25.9) | |
| Education | | | | | | <0.001** |
|   Illiterate | 132 (38.4) | | 10 (7.6) | 86 (65.2) | 36 (27.3) | |
|   Primary | 68 (19.8) | | 8 (11.8) | 51 (75) | 9 (13.2) | |
|   Intermediate | 19 (5.5) | | 5 (26.3) | 6 (31.6) | 8 (42.1) | |
|   High school | 63 (18.3) | | 12 (19) | 45 (71.4) | 6 (9.5) | |
|   Institute | 46 (13.4) | | 8 (17.4) | 18 (39.1) | 20 (43.5) | |
|   Bachelor degree | 16 (4.7) | | 7 (43.8) | 6 (37.5) | 3 (18.8) | |
| Occupation | | | | | | <0.001** |
|   Government employee | 80 (23.3) | | 17 (21.3) | 44 (55) | 19 (23.8) | |
|   Private sector employee | 20 (5.8) | | 0 (0) | 18 (90) | 2 (10) | |
|   Self-employed | 81 (23.5) | | 11 (13.6) | 43 (53.1) | 27 (33.3) | |
|   House wife | 131 (38.1) | | 20 (15.3) | 18 (74.8) | 13 (9.9) | |
|   Retired | 20 (5.8) | | 2 (10) | 3 (15) | 15 (75) | |
|   Unemployed | 12 (3.5) | | 0 (0) | 6 (50) | 6 (50) | |
| SES | | 3.99(3.04)+ | | | | <0.001*** |
|   Low SES | 193 (56.1) | | 21 (10.9) | 120 (62.2) | 52 (26.9) | |
|   Medium SES | 138 (40.1) | | 24 (17.4) | 87 (63) | 27 (19.6) | |
|   High SES | 13 (3.8) | | 5 (38.5) | 5 (38.5) | 3 (23.1) | |
| HbA1c | | 7.6(2)+ | | | | <0.001*** |
|   <7 | 84(24.4) | | 48 (57.1) | 30 (35.7) | 6 (7.1) | |
|   >7 | 260(75.6) | | 2 (0.8) | 182 (70) | 76 (29.2) | |
| Source of nutritional advice | | | | | | 0.015** |
|   Doctor | 193 (56.1) | | 29 (15) | 116 (60.1) | 48 (24.9) | |
|   Dietician | 47 (13.7) | | 5 (10.6) | 37 (78.7) | 5 (10.6) | |
|   Relatives | 103 (29.9) | | 16 (15.5) | 59 (57.3) | 28 (27.2) | |
|   Mass media | 82 (23.8) | | 0 | 0 | 1 (100) | |
| Total | 344 | | 50 (14.5) | 212 (61.6) | 82 (23.8) | |

*Mann-Whitney test, **Kruskal-Wallis test, ***Spearman's rank-order correlation
SES, socioeconomic status. HbA1c, glycosylated hemoglobin. + Skewed data
0.735, p<0.001).

Table 2 shows the overall adherence rate for each dietary item in the modified UKDDQ. Adherence to the following items had the highest rate of adherence: low alcohol drinking (96.5%), recommended fruit consumption (64%) and low fast food eating (41.6%). Adherence to the following items had the lowest rate of adherence: whole grain consumption (2.9%) and fish consumption (5.5%).

**Table (2):** Overall adherence of the patients to each item included the recommended diet.

| Items | Mean (SD)* | Healthy (UKDDQ 0-1) | Partially unhealthy (UKDDQ 2-3) | Unhealthy (UKDDQ 4-5) |
|---|---|---|---|---|
| | | Frequency (%) | | |
| Vegetable | 3.29 (1.558) | 91 (26.5) | 34 (9.9) | 219 (63.7) |
| Fruit | 1.77 (1.198) | 220 (64) | 64 (18.6) | 60 (17.4) |
| Pastry | 3.25 (1.738) | 60 (17.4) | 91 (26.5) | 193 (56.1) |
| Sugary drink | 3.6 (1.55) | 43 (12.5) | 77 (22.4) | 224 (65.1) |
| Full fat diary | 3.86 (1.339) | 27 (7.8) | 72 (20.9) | 245 (71.2) |
| Fast food | 2.61 (2.098) | 143 (41.6) | 46 (13.4) | 155 (45.1) |
| Processed meat | 2.97 (1.736) | 83 (24.1) | 98 (28.5) | 163 (47.4) |
| Alcohol | 0.17 (0.864) | 332 (96.5) | 0 (0) | 12 (3.5) |
| Fish | 4.55 (1.076) | 19 (5.5) | 38 (11) | 287 (83.4) |
| Regular meal | 1.9884 (1.557) | 132 (38.4) | 134 (39) | 78 (22.7) |
| Breakfast | 2.011 (1.47) | 124 (36) | 177 (51.5) | 43 (12.5) |
| Whole grain | 4.38 (1.023) | 10 (2.9) | 29 (8.4) | 305 (88.7) |

*Questions with reverse scaling answers

Table 3 shows the perceived barriers of patients to following healthy diet; the palatability was perceived as a main barrier (28.1%), in contrast, the lack of family support and high costs were the least chosen barrier among patients (0.6%).

**Table (3):** Frequency distribution of perceived barriers of patients to following healthy diet

| Barriers* | No. | % |
|---|---|---|
| Lack of palatability | 101 | 28.1 |
| Inability to resist temptation | 87 | 24.2 |
| Small portion size | 83 | 23.1 |
| Confusion | 54 | 15.0 |
| Work conditions | 31 | 8.6 |
| High costs | 2 | 0.6 |
| Lack of family support | 2 | 0.6 |

*Question with multi-response answers

## Discussion

Diabetes mellitus as a chronic disease requires patients to make major alterations in their behaviors. To control diabetes, patients have to change their eating habits and adopt a healthy diet. Thus, adherence to a healthy diet becomes essential to ensure quality of life and success of treatment. The study showed that only 14.5% of patients had dietary adherence and 85.5% of patients had unsatisfactory adherence. Similar adherence rate was found in a study done by Mumu in which dietary non-adherence rate was 88%[14]. Meanwhile, in a study done by Lafta, it was reported that dietary adherence rate was 36%9. The low rate of adherence to diet could be contributed to lack of knowledge, as it is shown in our study that those whom treating doctors were the main source of nutritional advice had higher rate of unhealthy diet than those who consulted dietician ( $x^2$ =10.469, p-value = 0.015).

The pivotal role of dietitian in diet modification and personalizing a diet based on patient's preferences and health status has been documented[15]. Most physicians didn't undergo training for offering nutritional therapy and it is a limiting factor in providing dietary consultations[16,17]. Moreover, nutritional consultation is time consuming for physicians[18]. In the best-case scenario, only a printed menu will be given to patients. Patients generally left the clinic just with a list of medications[18]. The use of nutritional therapy in managing type 2 diabetes mellitus shows wide variation. In our study, only 13.7% received nutritional therapy which is close to a study done by Mohan (5-10%)[19], while Hippisley-Cox reported that 31% of type 2 diabetic patients are reported to be managed only by dietary modification[20]. It has been shown that with one-point percentage reduction in glycosylated hemoglobin (HbA1c), a 35% decrease in microvascular complications and a 7% reduction in all-cause mortality are achieved in patients with type 2 diabetes[21]. Because HbA1c doesn't require specific time or preparation, it is a preferred method to assess glycemic control in diabetic patients[22]. The goal of HbA1c <7% seems reasonable for most people[23]. Only 24.4% of patients had their HbA1c level below 7%. Similar figures was found in a study by Adham (25.4%)[24]. Nationally, Sattar reported that 78.3% of diabetic cases had poor glycemic control[25]. The direct relationship between dietary adherence and glycemic control has been reported[26]. This

direct relationship also has been shown in our study. Beside the clear influence of diet on weight management[18], there are multiple ways in which diet can affect health by both weight dependent and weight independent pathways, by affecting glycemia, glucose insulin balance and weight, the diet has direct influence on glycemic control[18]. Although no statistically significant association was found between gender and dietary adherence, females tend to have better dietary adherence than males (16%vs 12.3%), which is consistent with a study done by Khan [27]. This is in contrast to a study done by Kalyango that shows males were more adherences to the recommended diet[28]. However, Spikmans reported that there were no differences between genders in the term of adherence29. This could be due to variation in social factors and education across countries[27]. Diabetic patients with higher socioeconomic index and higher educational levels had better dietary adherence. The same result was also reported by Khan[27], while no such relation was found in others[29]. This could be due to the better opportunity of patients with the higher socioeconomic and educational levels for finding information about the recommended diet. Lack of palatability was perceived as the main barrier for dietary adherence by our patients. Same finding has been reported by Serour in which majority of patients stated that the recommended diet is distant from their traditional diet[30]. Most patients reported that it is hard to give up on white rice and white bread as they are staple foods.

The limitation of our study was that data collection was done in Leila Qasim Center for diabetes care which is a governmental health facility and most of the patients were from lower socioeconomic level, thus results were more focused on that group.

## Conclusions

Type 2 diabetic patients had low adherence to the recommended diet. The educational level and source of dietary advice were significantly associated with dietary adherence. The dietary adherence of patients was contrarily associated with their hemoglobin A1c level.

## References

1. Mansour A, Al Douri F. Diabetes in Iraq: facing the epidemic. A systematic review. Wulfenia. 2015;22(3):258-73.

2. Lanting LC, Joung IM, Vogel I, et al. Ethnic differences in outcomes of diabetes care and the role of self-management behavior. Patient Educ Couns. 2008; 72(1):20-8.

3. Wheeler ML, Dunbar SA, Jaacks LM, et al. Macronutrients, food groups, and eating patterns in the management of diabetes: a systematic review of the literature. Diabetes care. 2012;35(2):434-45.

4. Pastors JG, Warshaw H, Daly A, Franz M, Kulkarni K. The evidence for the effectiveness of medical nutrition therapy in diabetes management. Diabetes care. 2002;25(3):608-13.

5.Sabaté E. Adherence to long term therapies: evidence for action. World Health Organization. 2003.Available from: http://www.who.int/chp/knowledge/publications/adherence_full_report.pdf

6. Rivellese A, Boemi M, Cavalot F, et al. Dietary habits in type II diabetes mellitus: how is adherence to dietary recommendations? Eur J Clin Nutr. 2008;62(5):660-4.

7. Monnier L, Grimaldi A, Charbonnel B, et al. Management of French patients with type 2 diabetes mellitus in medical general practice: report of the Mediab observatory. Diabetes Metab. 2004;30(1):35-42.

8. Evert AB, Boucher JL, Cypress M, et al. Nutrition therapy recommendations for the management of adults with diabetes. Diabetes care. 2014;37(1): S120-43.

9. Lafta RK, Faiq U, Al-Kaseer A-H. Compliance of Diabetic patients. MMJ. 2017;7(2):17-22.

10. Daniel WW, editor. Biostatistics: A Foundation for Analysis in the Health Sciences. New York: John Wiley & Sons; 2013.

11. Omer W, Al-Hadithi T. Developing a socioeconomic index for health research in Iraq. EMHJ. 2017;23(10):670-7.

12. Emadian A, England CY, Thompson JL. Dietary intake and factors influencing eating behaviors in overweight and obese South Asian men living in the UK: mixed method study. BMJ open. 2017;7(7): e016919.

13. England CY, Thompson JL, Jago R, Cooper AR, Andrews RC. Development of a brief, reliable and valid diet assessment tool for impaired glucose tolerance and diabetes: the UK Diabetes and Diet Questionnaire. Public health Nutr. 2017;20(2):191-9.

14.Mumu SJ, Saleh F, Ara F, Afnan F, Ali L. Non-adherence to life-style modification and its factors among type 2 diabetic patients. Indian J of Public Health. 2014;58(1):40.

15.Tien KJ, Hung HC, Hsiao JY, et al. Effectiveness of comprehensive diabetes care program in Taiwanese with type 2 diabetes. Diabetes Res Clin Pract. 2008;79(2):276-83.

16. Lianov L, Johnson M. Physician competencies for prescribing lifestyle medicine. Jama. 2010;304(2):202-3.

17. Kahan S, Manson JE. Nutrition counseling in clinical practice: how clinicians can do better. Jama. 2017;318(12):1101-2.

18. Forouhi NG, Misra A, Mohan V, Taylor R, Yancy W. Dietary and nutritional approaches for prevention and management of type 2 diabetes. BMJ. 2018;36: k2234.

19. Mohan V, Shah SN, Joshi SR, et al. Current status of management, control, complications and psychosocial aspects of patients with diabetes in India: Results from the DiabCare India 2011 Study. Indian J Endocrinol Metab. 2014;18(3):370.

20. Hippisley-Cox J, Pringle M. Prevalence, care, and outcomes for patients with diet-controlled diabetes in general practice: cross sectional survey. The Lancet. 2004;364(9432):423-8.

21. UK Prospective Diabetes Study Group. Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes. The lancet. 1998;352(9131):837-53.

22. Al-Ghamdi Aisha. Role of HbA1c in management of diabetes mellitus. Saudi Med J. 2004;25(3):342-45.

23. International Expert Committee report on the role of the HbA1C assay in the diagnosis of diabetes. Diabetes care. 2009;32(7):1327-34.

24. Adham M, Froelicher ES, Batieha A, Ajlouni K. Glycaemic control and its associated factors in type 2 diabetic patients in Amman, Jordan. EMHJ. 2010;16(7):732-9.

25. Sattar N Ali. The Adequateness of Glycemic Control in Type 2 Diabetes Mellitus. MJB 2015; 12(4): 1129-36.

26. Raj GD, Hashemi Z, Contreras DC, et al. Adherence to Diabetes Dietary Guidelines Assessed Using a Validated Questionnaire Predicts Glucose Control in Adults with Type 2 Diabetes. Can J Diabetes. 2018;42(1):78-87.

27. Khan AR, Lateef ZN, Al Aithan MA, et al. Factors contributing to non-compliance among diabetics attending primary health centers in the Al Hasa district of Saudi Arabia. J. Fam. Commun. Med. 2012;19(1):26-32

28. Kalyango JN, Owino E, Nambuya AP. Non-adherence to diabetes treatment at Mulago Hospital in Uganda: prevalence and associated factors. Afr health Sci. 2008;8(2):67-73

29. Spikmans F, Brug J, Doven M, et al. Why do diabetic patients not attend appointments with their dietitian? J Human Nutr Diet. 2003;16(3):151-8.

30. Serour M, Alqhenaei H, Al-Saqabi S, Mustafa AR, Ben-Nakhi A. Cultural factors and patients' adherence to lifestyle measures. Br J Gen Pract. 2007;57(537):291-5.