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Original Research Article

Assessment of perceived adherence and barriers to the dietary recommendations among type 2 diabetic patients of Pakistan: a cross-sectional study

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ABSTRACT

Background: Type 2 diabetes mellitus (T2DM) is one of the leading global health concerns, with Pakistan having the highest prevalence rate worldwide. International diabetes federation report 2025 suggests that 31.4% of population is diagnosed with diabetes. This ratio is expected to increase if no intervention is made timely. This study aims to evaluate how well patients with type 2 diabetes adhere to recommended diet and their perceived barrier in adhering to guidelines.
Methods: The cross sectional study was employed in Outpatient department of various hospitals of Punjab, Pakistan. Simple random sampling technique was used. Data was collected from 142 patients about their self-reported diagnosis, duration of disease, medicine adherence, dietary habits and perceived barriers. Perceived dietary adherence questionnaire (PDAQ-9) and Morisky medication adherence scale (MMAS-4) were used to access dietary and medicine adherence respectively. For barrier assessment, questions were taken from previous similar researches.
Results: Among 142 diabetic individuals, 3.52% participants showed good adherence, 38.7% poor adherence and 57.7% no adherence to recommended diet. 50.7% agreed to have lack of knowledge as barrier to recommendations. Chi square analysis showed positive correlation of dietary adherence with age ($a=0.016$, $p<0.05$) and lack of knowledge ($a=0.036$, $p<0.05$).
Conclusions: 3.52% of individuals having good dietary adherence is concerning and needs immediate plan of action by health governance to make pre-emptive measures to address the barrier. Awareness campaign regarding dietary habits and foods to avoid must be launched. National dietary guidelines should be made and communicated with patients during their follow up visits.

Keywords: Diabetes mellitus, Diet, Nutrition policy, Attitude

INTRODUCTION

Diabetes mellitus, namely type 2 diabetes, is now a major global concern and one of the lifestyle-related health risks for public health worldwide. According to the international diabetes federation (IDF diabetes Atlas) 2025, 589 million adults are diagnosed with diabetes (ages between 20 and 79 years). This statistic is predicted to increase to 853 million by 2050. In low- and middle-income countries, over 3 in 4 individuals live with diabetes. Diabetes is an escalating issue in terms of morbidity, mortality, fear of hypoglycaemia, social stigma and fear of the use of

needles, economic burden and invisible cost of poor quality of life.[1,2]

The prevalence of diabetes is rising in developing countries due to the adoption of urbanization and lifestyle changes.[3] Sedentary lifestyle, low level of physical activities and choices of energy-dense but nutrient-poor food are increasing the risk of development of diabetes among the individuals.[3] Nutritional problems are typically observed in type 2 diabetes; therefore, a diet plan is often prescribed for metabolic control.[4] A diet high in fiber and low in carbohydrates, fruits, vegetables and whole grains are among the recommendations from the American diabetes association (ADA). However, weight loss is constrained by the loss of muscle mass, and sarcopenia affects age-related muscle wasting, [5] increasing physical vulnerability, susceptibility to the disease and frailty.

Nutritional modification is considered first-line treatment in initiating the management of the disease and adherence to the treatment plan. This recommended adherence is affected by several individual, social, environmental, and professionals and cultural and religious factors.[2,6] However, previous studies showed that a low percentage of participants were willing to follow the guidelines regarding healthy diet, physical exercise and medication prescribed within one year of the diagnosis of T2DM.[7] Another study was conducted among the diabetic populations of the Netherlands and the UK for the assessment of the willingness of individuals to follow the recommendations of their physician, and results were remarkably impactful. 48% were willing to adhere to all the recommendations (healthy diet, exercise and medications), while 73% adhered to a healthy diet only.[8] A barrier and cause of the unwillingness, if identified timely, can improve the adherence of the patient.[2,5]

The 107 million people (1 in 10 adults) in Southeast Asia were diagnosed with type 2 diabetes, which is estimated to increase by 73% to 185 million by 2050. Over 1 in 2 adults (42.7%) were undiagnosed. 374000 deaths had occurred in 2024 due to diabetes. The IDF diabetes Atlas report 2025 of Pakistan shows a 31.4% prevalence of diabetes among the 20-79-year-old population. 26.9 % were undiagnosed, and 24.8% of diabetes-related deaths under 60 years were reported. This underscores the fragility of the issue and highlights the need for thoughtful consideration.

Pakistan now has the highest prevalence rate of diabetes and the fourth highest number of adults to have diabetes worldwide. The 34.5 million were diabetic in 2024, which is expected to exponentially increase to 70.2 million by 2050. Many factors contributed to the rapid progression of the disease in the country in which dietary modifications and adherence are most prominent. Limited data is available in the existing literature regarding the level of adherence and barriers to dietary recommendations in individuals with type 2 diabetes in Pakistan. Therefore, we need to conduct more studies in Pakistan to improve our understanding of the factors associated with adherence.

METHODS

Study design and sampling method

This is a cross-sectional descriptive study. We conducted the study in the outpatient department of medicine across multiple cities in Pakistan from 1st December, 2024, to 15th May, 2025. Hospitals naming Holy Family Hospital Rawalpindi, Aziz Bhatti Shaheed teaching hospital Gujrat and Independent University Hospital Faisalabad were included in our study.

Patients were selected via a simple random sampling technique. The sample size was 142. It was calculated via the Open Epi and using the equation, sample size $n=[DEFF\times Np(1-p)]/[(d2/Z21-\alpha/2\times(N-1)+p\times(1-p)]$ where p=0.005 and Z=1.96. The confidence interval was taken as 95%, taking into account 150 diabetics visiting the outpatient department.

Inclusion and exclusion criteria

The study population were patients with T2DM aged 18 and above, with a confirmed T2DM diagnosis for 6 months or more, and patients already on oral hypoglycemic agents or insulin or both, and patients with HbA1c >7. Type 1 DM patients and gestational diabetics were excluded from the study.

Statistical analysis

Data was analyzed using SPSS-25 version. Normal curve distribution was obtained by applying the normality test. Descriptive stats, graphs and tables were used for data presentation. Females were 89 (62.7%), while males were 53 (37.3%). There was a total of 142 patients. 30-40 years were 18 (12.7%); 40-60 years were 81 (57%); above 60 years were 43 (30.3%).

The relation between different variables, such as age, gender, other factors such as duration of diabetes and medical adherence with scores, was assessed using the chi-square test. P<0.005 was taken as significant.

Assessment tools

The first part of the questionnaire contained demographic information: age, gender, marital status, residency, education, occupation, and income from all resources. Part two contained a medical history assessment: duration of diabetes, duration since the start of treatment, co morbidities and adherence to medication. We translated the questionnaires into Urdu for patient convenience and to avoid communication bias.

The four-item MMAS-4 was used to assess the adherence of the patient to the medication. It contained four questions with yes and no as answer options. MMAS scoring resulted in three levels of adherence: no adherence (0), poor adherence (1-2) and excellent adherence (3-4).

The third part of the questionnaire evaluated the adherence to dietary recommendations and barriers of T2DM participants by using the perceived dietary adherence questionnaire (PDAQ).[9] This is a nine-item questionnaire that assesses compliance with recommended fruit and vegetable servings, low-glycemic index foods, high sugar, fiber, and fat, fatty acids, monosaturated oils, and carbohydrate spacing for a weekly timeframe. The response utilizes the 7-point Likert scale for measurement of adherence levels.

The high score was equivalent to a high adherence level. For questions 4 and 9, we inverted the score to reflect unhealthy preferences, and the high scores indicated lower adherence.

We used questions from previous studies on similar topics for the assessment of barriers. The following barriers were assessed : food knowledge, cost and desire to adhere to the recommended diet.[3] Most participants reported poor adherence to the prescribed diet and acknowledged their lack of knowledge about it, which was identified as the most significant barrier among our study participants.

Ethical consideration

We asked each participant to give their consent if they wished to participate in the study. All those who agreed to participate in the study were included. We maintained the autonomy and confidentiality of the participants.

Examine the specific areas of dietary knowledge that participants found challenging, and propose educational strategies to address these gaps.

Discuss how maintaining participants' autonomy impacts their engagement with dietary recommendations and potential behavioral changes.

Explore the role of confidentiality in ensuring participants feel safe to disclose their adherence struggles without fear of judgment.

Identify common barriers that impede adherence to dietary recommendations, such as social influences or environmental factors.

Highlight the importance of informed consent in research settings and how it relates to participant motivation and commitment to lifestyle changes.

RESULTS

Table 1 shows the demographic data of the study participants. Majority of the participants fall between the age group 40-60 years while, the females formed more than the half of our sample. The 38.7% of people (n=55) were having less than 5-year duration of diabetes and 28.2% (n=40) were having more than 10-year duration of diabetes. However, only 21.8% started their treatment within 10-year duration of diagnosis of the diabetes mellitus (n=31). 29.6% of total participants were having hypertension (n=42) while 1 participant was having multiple co morbidities (neurological disease, hypercholesterolemia, hypertension, thyroid disease). Additional details of the participants are shown in Table1.

Table 1: Demographic details.

Variables		N (%)
Age (in years)	30-40	18 (12.7)
	40-60	81 (57)
	Above 60	43 (30.3)
Gender	Female	89 (62.7)
	Male	53 (37.3)
Marital status	Married	138 (97.2)
	Unmarried	4 (2.8)
Residency	Rural	53 (37.3)
	Urban/ Urban slum	89 (62.7)
Education	Illiterate	30 (21.1)
	Intermediate	15 (10.6)
	Postgraduate	41 (28.9)
	Primary school	30 (21.1)
	Read and write	10 (7)
	Secondary School	16 (11.3)
Occupation	Employed	57 (40.1)
	Un employed	85 (59.9)
Income from all resources	Able to save and invest money	49 (34.5)
	Inadequate	18 (12.7)
	Just meet routine expenses (adequate)	45 (31.7)
	Meet routine expenses and emergencies (adequate)	30 (21.1)
Co-morbidities	Eye disease	5 (3.5)
	Hypertension	42 (29.6)
	Neurological disease	1 (0.7)
	Thyroid disease	4 (2.8)
	Hypercholesterolemia	9 (6.3)

Perceived dietary adherence questionnaire

The analysis of dietary adherence using the PDAQ found that individuals with less than 5 years of diabetes had an average adherence score of 0.94 (SE=0.091), while those with more than 10 years of diabetes had an average score of 0.85 (SE=0.098). Table 2 shows the participants' perceived dietary adherence questionnaire responses.

Dietary adherence showed a positive correlation with age ($a=0.016$, $p<0.05$). Only 10 out of 142 having ages between 30 and 40 years were not adherent, as compared to 49 individuals in the 40-60 age groups. 57% of our participants were not adherent to the prescribed diet. Only 3.52% showed good adherence to diet. Dietary adherence showed no significant correlation with duration of diabetes ($a=0.469$, $p<0.05$) and duration since start of treatment ($a=0.805$, $p<0.05$).

However, duration of diabetes showed a significant correlation with age (a=0.00, p<0.05). the 28 participants aged 40-60 years had duration of diabetes, while 17 people had a different duration of diabetes. The 22 individuals over 60 years of age had duration of over 10 years of diabetes, in contrast to 15 people with less than 5-year duration of diabetes (Figure 1). The highest mean score obtained for the question" Following a healthful eating plan" was 0.86 (SE=0.143) for '1-2 days', and the second highest mean score was 0.25 (SE=0.083) for '7 days'.

Table 2: PDAQ score details.

Variables	0 days, N (%)	1-2 days, N (%)	3-4 days, N (%)	5-6 days, N (%)	7 days, N (%)
Following a healthful eating plan	21 (14.8)	21 (14.8)	31 (21.8)	33 (23.2)	36 (25.4)
Eating the number of fruit and vegetable	7 (4.9)	22 (15.5)	32 (22.5)	45 (31.7)	36 (25.4)
Eating carbohydrate containing foods with a low glycemic index	19 (13.4)	52 (36.6)	32 (22.5)	27 (19)	12 (8.5)
Eating food high in sugar	30 (21.1)	58 (40.8)	26 (18.3)	18 (12.7)	10 (7)
Eating food high in fiber such as oat meal, high fiber cereals and whole grain breads	49 (34.5)	39 (27.5)	34 (23.9)	12 (8.5)	8 (5.6)
Spacing carbohydrates evenly throughout the day	44 (31)	34 (23.9)	35 (24.6)	17 (12)	12 (8.5)
Eating fish or other food high in omega 3 fat	87 (61.3)	39 (27.5)	13 (9.2)	2 (1.4)	1 (0.7)
Eating foods that contained or was prepared with canola, walnut, olive or flax oils	85 (59.9)	15 (10.6)	13 (9.2)	10 (7)	19 (13.4)
Eating foods high in fat	45 (31.7)	46 (32.4)	32 (22.5)	15 (10.6)	4 (2.8)

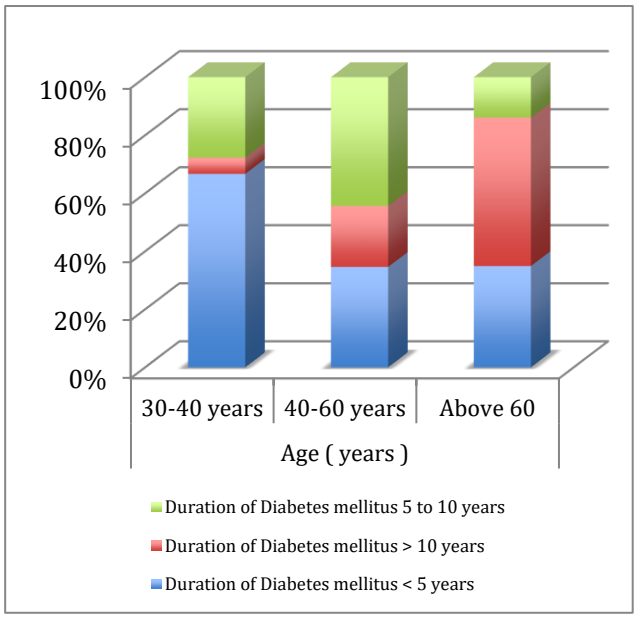

Figure 1: Relation of diabetes duration and age (in years).

Assessment of barriers to dietary recommendations

The 50.7% of individuals agreed to lack of knowledge as a barrier to the recommended diet. While other participants were having stress (38%), cost (35.2%), being busy (41.5%), being unable to remember (38%), lack of appetite (28.8%) and long time to cook (21.1%) acted as impediments to adhering to the prescribed diet. Chi-square analysis showed a positive correlation between dietary adherence and lack of knowledge as a barrier (a=0.036, p<0.05). The remaining barriers showed insignificant correlation: cost (a=0.97, p<0.05), being unable to remember (a=0.511, p<0.05), stress (a=0.63, p<0.05), being busy (a=0.224, p<0.05), lack of appetite (a=0.318, p<0.05), and long time to cook (a=0.961, p<0.05).

The 50.7% of total individuals agreed to have poor knowledge about the recommended wellness diet. 34 individuals were lacking knowledge and were non-adherent to the dietary guidelines, as compared to 48 individuals who disagreed to have poor knowledge about the guidelines but were still having poor adherence to the wellness diet.

The assessment of medication adherence and its relationship to dietary adherence is presented as follows

Table 3 displays the results of the Morisky medication adherence questionnaire (MMAQ-4). Chi-square analysis showed an insignificant correlation of medicine adherence with dietary adherence (a=0.588, p<0.05). Also, medicine adherence of participants showed an insignificant correlation with the duration of diabetes (a=0.72, p<0.05), the duration since starting treatment (a=0.282, p<0.05) and age (a=0.27, p<0.05).

Table 4 shows the mean scores of dietary adherence and medicine adherence.

Table 3: Medicine adherence questionnaire.

Variables	Yes, N (%)	No, N (%)
Do you ever have problems remembering to take your diabetes medication?	47 (33.1)	95 (66.9)
Do you ever forget to take your diabetes medicine?	56 (39.4)	86 (60.6)
When you feel better, do you sometimes stop taking your diabetes medicine?	56 (39.4)	86 (60.6)
Sometimes if you feel worse, when you take your diabetes medicine?	33 (23.2)	109 (76.8)

Table 4: Mean score comparison.

Dietary adherence, mean (SD)	Medicine adherence, mean (SD)
0.46 (0.471)	0.47 (0.626)

DISCUSSION

This descriptive study aimed to evaluate adherence and barriers to recommended diet among T2DM. The study included 142 diabetic patients attending the medicine outpatient department across Pakistan. Only 3.52% of our study participants had good adherence to a healthy diet.

This is contrary to the result of the study conducted in Egypt, which reported 2.5% of the patients have a high level of adherence, and a study of Ethiopia where 37.5% and 25.7% of participants had good adherence.[3,5,10] This difference supports the fact that cultural and social factors play a role in initiating and adhering to these guidelines,[2] and people receive different guidance shaping their food choice preference.[8] Also, a different type of diet plan is effective for T2DM, and there is a misconception about what a healthy diet constitutes that hinders adherence to a wellness diet in addition to their socioeconomic status and food availability.[11-13]

The 96.4% of our participants were non-adherent to the prescribed diet, while a study of Ethiopia reported that 74.3% of non-adherent T2DM.[3] A study of Ghana held in 2024 suggested that people with good diabetes related nutritional knowledge (DRNK) have better insight into the role of dietary restriction in the management of T2DM.[14] The health action process approach (HAPA) was used in Iran, and significant adherence to the diet (increased consumption of fruits and vegetables) and medication was observed after one month of intervention.[15] Effectiveness of HAPA had been proposed by previous studies.[16-18] So keeping in view the low levels of dietary and medicine adherence among our population, such strategies of action and coping plans must be part of the treatment to improve the adherence of the diagnosed patients.

The 52.1% of individuals had hypertension along with other co morbidities, out of which 29.5% had only hypertension as co morbidity. The study conducted by the American association of diabetes showed that the prediabetic patients are more at risk of hypertension.[4] Since T2DM and hypertension share common risk factors, the prevalence of hypertension is common in diabetics due to insulin resistance.[19] A better understanding of the nature of the disease and its long-term complications helps patients to engage in self-management practices and the role of education and counseling to reduce the associated risk factors.[14]

In the present study, 50.7% of the participants reported having a lack of knowledge as a significant barrier in showing adherence to the recommended diet, while the study of Egypt showed that 84% had a lack of knowledge in following the prescribed diet.[5] It suggests that the high prevalence of diabetes among our population had made them aware of food choices that should be avoided, but the level of people following the diet plan is concerning. This may be due to personalized food preferences and negative experiences making them less concerned to change their food consumption pattern.[8] Meta-analysis evidence indicated that religious practices such as Ramadan affect the food choices and ability to adhere to a healthy diet.[20] Since most of our participants were Muslims and the data collection duration included the month of Ramadan, in which participants preferred high-fat food to break their fast, this may have affected our study adherence levels along with patients' dietary adherence.

The other leading obstacle faced by 41.5% of the participants was the busy schedule, despite having the proper knowledge about the diet that is prescribed to T2DM patients. On the other hand, 38% of the participants were unable to remember to follow the prescribed diet. The study held in Iran in 2020 showed that social behaviors such as gestures of respect to guests, illness of family members, and certain eating habits were barriers in their study population.[21]

Contrary to the study assessing the barrier to the nutritional plan after a two-year follow-up, which suggested that 14.4% refused to change their diet even after the nutritional intervention was made to address the barrier.[22] This possible barrier was inconsistent with our cause barrier. Among the health belief model (HBM), self-efficacy plays a significant role in chronic disease management.[23,24] This suggests that interventions aimed at improving the self-efficacy of patients improve the health outcome of the population.[25]

Limitations

While analyzing the results of this study, limitations must be considered. Firstly, the study design hinders keeping

track of the events of disease severity and the effect of lifestyle and dietary modifications. Self-reported data itself may include bias, although the chance of this bias is lowered by using the validated questionnaire. The sample size of this study is small, and hence the results cannot be generalized to the whole population.

CONCLUSION

In the present study, non-adherence to dietary recommendations among T2DM is evidenced by 57% of our participants not being adherent to the prescribed diet and 50.7% of participants having poor knowledge about the recommended diet. Only 3.52% showed good adherence to diet. Inability to afford the recommended diet and stress were the most significant barriers responsible for non-adherence.

Recommendations

We need to conduct a longitudinal study to better understand the progression of this prevalent disease. Public health authorities should implement pre-emptive measures to identify and address barriers to health. The health department should launch an awareness campaign regarding the devastating outcomes of diabetes affecting the quality of life. Policymakers should make national dietary guidelines and assess the wellness diet where it is unavailable and to people who cannot afford it.

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