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Association between Obedience to Nutritional Recommendation and its Associated Factors among Type 2 Diabetes Patients: A Study from Pakistan

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Abstract: *Diabetes mellitus (DM) is defined by chronically elevated glucose levels due to abnormalities in insulin production, activity, or even both. This causes major damage to the heart, blood vessels, eyes, kidneys, and nerves with time. The objective of the research was to evaluate the relationship between dietary recommendations and associated factors among Pakistani adults with Type 2 Diabetes Mellitus (T2DM) Patients. A cross-sectional research was conducted at the Hayatabad Medical Complex from Jan 2022 to June 2022. There were 120 patients suffering from T2DM were included. Only 23 (19.17%) out of 120 patients showed satisfactory dietary adherence. People involved who lived in a single-family household had an AOR of 2.6 (95% confidence interval: 1.2–7.6), the participant who could afford the recommended diet had an AOR of 2.8 (95% confidence interval: 1.2–8.4), participants had self-control over their eating habits had an AOR of 4.2 (95% confidence interval: 1.3–14.2), participants engaged in moderate-to-intense physical activity had an AOR of 3.6 (95% confidence interval: 1.3–9.4), Persons with T2DM have inadequate obedience to dietary recommendations. Family background, accessibility of the suggested diet, food self-control, exercise, and medication are all strongly linked to how well T2DM patients follow dietary recommendations.*

Key Words: Dietary Recommendations, Factors, Diabetes Mellitus, Insulin

Introduction

Due to abnormalities in insulin production, activity, or even both, diabetes mellitus (DM), a group of metabolic disorders, is defined by chronically elevated glucose levels. Over time, this leads to serious damage to the heart, blood vessels, eyes, kidneys, and nerves (Mahesh, T. R., Kumar, D., Vinoth, K. V., 2022). A person dies from diabetes-related problems every six seconds, as evidenced by the fact that diabetes caused 5 million fatalities in 2015 (Cho, N. H. 2016). Two kinds of diabetes, type 1 diabetes mellitus (T1DM) and type 2 diabetes mellitus (T2DM), can influence the global population (Diab, C. 2015). Children and teenagers are more likely to have T1DM, which accounts for 5–10% of individuals. Since more than 90-95 per cent of T2DM patients are adults, it is

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one of the leading causes of disease and mortality worldwide. (Kharroubi, A. T, & Darwish H. M. 2015). Ageing, being overweight, poor diet, and a lack of exercise all raise the chance of having T2DM (Fletcher, B., Gulanick, M., & Lamendola, C. 2002).

One of the non-communicable illnesses that are spreading quickly and is a significant global public health issue is diabetes (Habib, S. H., & Saha, S. 2010). The proportion of persons with diabetes is expected to increase from 451 million in 2017 to 693 million by 2045 on a global scale (Adnan, M., & Aasim, M. 2020). Pakistan is ranked 10th out of 221 nations by the International Diabetes Federation (IDF) in 2017, with 7.5 million cases of the disease (Cho, N. H., Shaw, J. E., 2018). In Pakistan 33 million adults are expected to have diabetes by 2021, which is an upsurge of 70% from the previous year. This places Pakistan behind China (141 million) and India (74 million)in terms of the number of individuals with diabetes worldwide (Steinmetz, J. D., Bourne, R. R., Briant, P. S., 2021).

Numerous studies have demonstrated the importance of a healthy diet in controlling type 2 diabetes. Taking enough calories and nutrients will help to lower high blood sugar levels and cease the disease's development (Mann, J., DeLeeuw, I., 2004); Broadbent, E., Donkin, L., 2011). One of the key components of treatment is diet, which can reduce glycated haemoglobin (HbA1c) concentrations by approximately 1% to 2% (Watson, L. E., Phillips, L. K., 2019). The prevalence of type T2DM could be improved by 58% with an effective lifestyle modification that includes diet obedience. (Diabetes Prevention, 2002). Diet with less CHO and glycemic index, a high-fibre diet, fruits, vegetables, and foods rich in omega-3 fatty acids can lower the level of glucose in T2DM patients while saturated fats and trans fats reduce insulin sensitivity (Kani, A. H., Alavian, S. M., 2014). Lower fat, greater fibre, reduced salt, and even more foods with health-supporting qualities e.g. vegetables, fruits, fish, and soy products, should be consumed by T2DM patients (Sami, W., Ansari, T., Butt, N. S., 2017). Although dietary counselling is essential for controlling diabetes, there has been a lack of practical adherence (Ranasinghe, P., Pigera, A. S. A. D., Ishara, M. H., 2015). Long-term treatment and control of diabetes and its co-morbidities are influenced by the quality and amount of nutrition (Ley, S. H., Hamdy, O., Mohan, V., & Hu, F. B. 2014).

The objective of the research was to analyze the relationship between dietary recommendations and associated factors among Pakistani adults with T2DM.

Material and Methods

In the Hayatabad Medical Complex, institution-based cross-sectional research was carried out from Jan 2022 to June 2022. There were 6529 T2DM patients that underwent follow-up in the hospital at the time of collection of data. The study's sample consisted of T2DM people who came to the diabetic referral centre for follow-up treatment during the duration of the study. For the purpose of gathering data, two senior nurses and one laboratory technician were hired. The nurses were in charge of conducting patient interviews, while the laboratory technician's job was to measure levels of blood glucose. A public health expert was also designated as their supervisor.

Expecting and lactating women, adults with T2DM that had only recently been identified, and people who need ongoing medical care and monitoring were all to be disqualified from this research. Using a standardized questionnaire, we performed a face-to-face interview with volunteers. Additionally, we examined the individuals' height and weight using stadiometers and weighing scales, respectively. With a Cronbach's alpha value of 0.718, the reliability of the questionnaire was determined to be satisfactory. There were two sections to the questionnaire. The first section consists of a structured questionnaire about anthropometry, medication adherence, disease-related variables, personal characteristics, and socio-demographic factors. We evaluated the dietary obedience assessment in the second section. The repeated 24-hour dietary recall of T2DM patients was used to validate this technique. This tool's intraclass correlation (0.78) shows good accuracy.

From every participant, a blood sample was taken. Using the aseptic method, a trained laboratory technician takes a blood sample by finger puncture. The sample was taken early in the morning before the participants ate breakfast (after 8 h of fasting). Using a Roche/Hitachi kit and a 902 Automatic Analyzer, a fasting blood glucose test was performed.

The gathered information was added to MS Excel (v.2016) and then exported to IBM SPSS (v.23) to ensure consistency. Logistic regression analysis (adjusted for education, employment, family size, diet choice, accessibility of healthy diet, self-control over food, physical exercise, and medicinal adherence) was performed to investigate the characteristics related to dietary obedience. AP-value of 0.05 at a 95% confidence interval was considered statistically significant.

Results

There were 120 volunteers in total, with 68 participants (57.5%) of them being female. The majority of those involved (n=65; 54.17%) were aged between the ages of 45 and 65, while the minority (n=21; 17.5%) were patients older than 65. Focusing on the education level 34.17% of patients (n=41) were uneducated and 77.5% of patients (n=93) were married. In our survey, there were more urban residents (n=81; 67.50%) than rural residents (n=39; 32.5%). More than 50 % of participants (n=68; 56.66%) were engaged in non-income-producing activities, and the majority were members of nuclear families (n=71; 59.17%) (Table 1).

There were 67 individuals, or 55.83%, who had the disease for 5 years. In contrast to 19 participants (15.84%) who were taking both oral and insulin, the majority of the individuals (n=101; 84.16%) were taking oral hypoglycemic medications. More than 50% of the individuals (n=69; 57.5%) had comorbidity, but the majority (n=89; 74.17%) were no family history of DM. More than half (n=67; 55.83%) did not consume beverages with added sugar. The recommended diet could be afforded by around half of the participants (n=63; 52.5%). The majority of individuals (n=81; 67.5%) reported having self-control when it came to foodThe BMI ranged from 25 to 29.9 kg/m² for more than half of the subjects (n=53; 44.16%). Male participants made up the bulk (n=71; 59.17%) and had abnormal waist measurements of more than 85 cm. The majority of female subjects (n=83; 69.17%) had abnormal waist measurements of greater than 80 cm. Medication non-adherence affected nearly half (n=59; 49.17%) of the participants. Only 23 participants, or 19.17%, displayed superior diet adherence. (Table 2).

According to the regression analysis, individuals who lived in single-family households were about three times more likely than those who could not follow nutrition (AOR 2.6, 95% CI 1.2-7.6). Nearly three times as many individuals who could afford the suggested diet were able to stick to it as opposed to those who couldn't (AOR 2.8, 95% CI 1.2-8.4). Similarly to this, those who could manage their eating were vulnerable to sticking to nutrition (AOR 4.2, 95% CI 1.3-14.2). Physically active participants were 3.6 times more likely to stick to their diets (AOR 3.6, 95% CI 1.3-9.4). Diet adherence was 3.6 times more likely in participants who took their medication as prescribed (AOR 3.6, 95% CI 1.3-10.2) (Table 3).

Table 1. Individuals' Socioeconomic and Demographic Features are Distributed (n = 120).

Character Traits	Patients in Number	Percentage
Gender		
Men	52	42.50
Women	68	57.50
Age		
25-44 years	34	28.30
45-65 years	65	54.17

Character Traits	Patients in Number	Percentage
Gender		
>65 years	21	17.50
Mean SD (in years)	52.05 12.80	
Education Level		
Illiterate	41	34.17
Primary Level	28	23.33
Secondary Level	23	19.18
Higher secondary level	17	14.16
Above	11	9.16
Status of Marriage		
Single	27	22.50
Married	93	77.50
Residence		
Urban	81	67.50
Rural	39	32.50
Profession		
Non-income-generation	68	56.66
Income-generation	52	43.34
Family		
Single/nuclear	71	59.17
Joint	49	40.83
Family Members		
5	79	65.83
>5	41	34.17

Table 2. Dispersion of Individuals according to Morphological, Nutritional, Medication-related, and Disease-related Parameters

Disease-Related Complications	Patients in Number	Percentage
Disease Progression		
5 years	67	55.83
>5 years	53	44.17
Mean SD (in years)	5.19 3.43	
Type of Treatment*		
OH	101	84.16
OHI	19	15.84
Comorbidity		
No	52	42.50
Yes	68	57.50
Family Diabetes Etiology		
Yes	31	25.83
No	89	74.17
Diet-related Variables		
No	67	55.83
Yes	53	44.16

Disease-Related Complications	Patients in Number	Percentage
Disease Progression		
Affordability of a Nutritious Diet		
Affordable	63	52.5
Not Affordable	57	47.5
Self-control on Diet		
Yes	81	67.5
No	39	32.5
Food Consumption		
Home	112	93.3
Outside Home	8	6.7
Body Mass Index		
18.5-24.9 (normal)	44	36.67
25-29.9 (overweight)	53	44.16
30-34.9 (obese I)	14	11.67
35-39.9 (obese II)	9	7.5
Waist Circumference for Male		
Abnormal > 85 cm	71	59.17
Normal 85 cm	49	40.83
Waist Circumference for Female		
Abnormal > 80 cm	83	69.17
Normal 80 cm	37	30.84
Medication Adherence		
Adherent	61	50.83
Non Adherent	59	49.17
Dietary Adherence		
Good adherence	23	19.17
Low adherence	97	80.83

** OH: Oral hypoglycemic drug. OHI: Oral hypoglycemic drug and insulin*

Table 3. Factors that Affect Dietary Adherence

Research Variables	Adjusted Odds Ratio (OR) (95% CI)	P-value
Education		
Below secondary	0.6 (0.2-3.1)	0.453
Secondary or above	1.3 (0.6-4.2)	
Occupation		
Non-income-generating work	0.9 (0.6-3.7)	0.648
income-generating work	1.3 (0.3-3.4)	
Type of Family		
Joint family	1.6 (0.8-2.1)	0.052
Single family	2.6 (1.2-7.6)	
Affordability to the Recommended Diet		
Not affordable	1.3 (0.4-5.1)	0.032
Affordable	2.8 (1.2-8.4)	
Self-control on Food		
No self-control over food	1.2 (1.1-8.1)	0.023

Research Variables	Adjusted Odds Ratio (OR) (95% CI)	P-value
Education		
self-control on food	4.2 (1.3-14.2)	
Physical Activity		
No	2.1 (0.7-8.1)	0.017
Yes	3.6 (1.3-9.4)	
Medication Adherence		
Medication non-adherent	2.3 (0.5-4.1)	0.023
Medication adherent	3.6 (1.3-10.2)	

Discussion

According to our research, one-seventh of individuals follow their diets religiously. We discovered that adherence to a dietary is more closely associated with the variables, one's self-control with food, one's affordability with a diet, one's adherence to physical activity, and one's adherence to medication among the various components evaluated for dietary adherence, including socio-demographic factors, illness factors, nutritional habits, anthropometry, and adherence to medication.

According to our analysis, only 19.17% of people followed a diet. Both Dhaka, Bangladesh, and Kathmandu, Nepal, had adherence rates of 12% and 14.29%, respectively (ClinCalc, L. 2019); Mumu S. J., Saleh, F., Ara, F., 2014). This consistency in the outcomes may be the result of a comparable sociocultural environment. However, just 50% of Kolkata residents followed the diet advice, compared to 84.6% of Delhi residents (Demirbilek, H. 2009); Basu, S., Garg, S., Sharma, N., 2018). The employment of several tools to gauge adherence may be the cause of such inconsistent results.

In our study, there is a strong relationship between diet adherence and family type, with participants from single-parent households having 2.6 times the likelihood of diet adherence as participants from joint households. The research conducted in South India and Nepalgunj came to a similar conclusion (Parajuli, J., Saleh, F., Thapa, N., & Ali, L. 2014); Kapur, K., Kapur, A., & Ramachandran, S. 2008). Identical sample sizes, sampling methods, and sociocultural contexts could explain why the results are identical. In our case, the fact that nuclear families may be able to eat a wider variety of foods for a longer period of time may explain why they adhere to their diets more closely. Additionally, individual preferences and nutritional needs can be met in a nuclear family situation, whereas they might not be in a combined family.

With a P-value of 0.453, our research confirms that people with formal education are more likely to stick to a diet than individuals without formal education. Bivariate analysis revealed a similar result: Illiterates were more noncompliant than educated youth [24]. This connection appears logical given that people receiving formal education look for in-depth knowledge on the illness and the significance of nutrition by themselves. The type of treatment and diet compliance have no relationship. Nevertheless, the Saudi Arabian study demonstrates that people who ingested oral meds follow their diets more consistently than those taking insulin and oral medications together. (Khan, A. R., Lateef, Z. N. A. A., 2012).The low percentage of study participants who took combined insulin and oral hypoglycemic medications (15.84%) may be the cause of this discrepant outcome.

Individuals who could purchase the suggested diet were nearly three times as likely to stick to it as those who couldn't. Similar results were found in the Ethiopian trial (Uchenna, O., E., Pauline, E., & Sylvester, O. 2010), where low adherence was attributed to high food costs. Given that individuals who have means may choose what they eat, the connection appears to be probable. Similarly to this, individuals in our study were 4

times more likely to stick to their diets than those who lacked self-control over eating. The study by. Ganiyu, A. B., Mabuza, L. H., 2013) lends credence to this conclusion. This could be because all of these researches used self-reported information instead of programs to measure self-control habits. Additionally, our research demonstrates that those who participated in physical activity were 3.3 times more likely to stick to a diet plan than those who did not. According to research by Klinovszky et al., individuals who tried to incorporate the diet recommended for diabetes patients were more likely to follow the physical exercise programme. This was because they were more inclined to stick to their diet (Klinovszky, A., Kiss, I. M., 2019).

In our research, 63.33% of individuals were overweight or obese, whereas 36.67% had a BMI that was within the normal range. 46.4% of individuals in research in Addis Abeba were overweight or obese (Worku, A., Mekonnen Abebe, S., & Wassie, M. M. 2015). Waist circumference, co-morbidity, and dietary obedience did not appear to be correlated with one another. We discovered that nearly 50% of the individuals (50.83%) continued to take their insulin injections. A similar result was noted in the research carried out in Kathmandu, where the percentage of medication therapy was 40.52%. According to our research, the few who take their medications as prescribed are approximately 3.5 times more likely to follow their diet than those who do not. According to the research, individuals quickly lose interest to follow a healthy diet the more frequently they take anti-diabetics. The necessity for adequate patient counselling regarding medication compliance and food compliance may thus become apparent as a result of this.

Conclusion

Our research demonstrates that persons with T2DM have inadequate obedience to dietary recommendations. Type of family, accessibility of the suggested diet, food self-control, physical activity, and medication compliance are all strongly linked to how well T2DM patients follow dietary recommendations. Physicians and healthcare professionals should take the initiative to address these related issues while providing dietary recommendations and sufficient counselling. Further research is advised to determine the efficacy of nutrition counsellors' counselling in order to evaluate the supply side of this issue because nutrition counsellors' methods for counselling have not been the subject of research.

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