Adherence of Diabetic Patients to the Recommendations on Diabetes in Kayseri

Kayseri'deki Diyabet Hastalarının Diyabet Bakımı ile İlgili Tavsiyelere Uyumu

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Geliş Tarihi/*Received:* 22.05.2009
Kabul Tarihi/*Accepted:* 21.06.2010

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ABSTRACT Objective: This study was performed in order to determine the adherence of diabetic patients to the diabetic care rules, factors affecting the adherence, and diabetic care results in Kayseri. **Material and Methods:** The study was performed in Kayseri. Eight of 99 primary health centers in the province were chosen randomly. A survey was performed through a questionnaire among the population aged 30 and over. A total of 555 self-reported diabetic patients were included in the study. A questionnaire containing 40 items was applied to each individual with diabetes via face-to-face interview method. **Results:** It was determined that 82.3% of the subjects were on antidiabetic drugs, 20.0% consulted the physician periodically, 71.4% measured their blood glucose level regularly, 59.5% consumed an appropriate diet, 16.8% did exercise regularly, and 25.2% performed food care. There was a positive correlation between general health rating and diabetic care scores. According to multiple regression analysis, duration of diabetes was negatively correlated, while health insurance, duration of education, and education about diabetes was positively correlated with diabetic care scores. **Conclusion:** When developing clinical management programs for patients with diabetes, duration of diabetes, health insurance and educational level should be considered and the patients must be educated in diabetes.

Key Words: Diabetes mellitus; quality of health care; patient compliance

ÖZET Amaç: Bu çalışma diyabetik hastaların diyabet bakımı ile ilgili kurallara uyma durumu, bu durumu etkileyen faktörler ve Kayseri ilinde diyabet bakımının sonuçlarını değerlendirmek için yapılmıştır. **Gereç ve Yöntemler:** Araştırma, Kayseri'de yürütüldü. Bölgedeki 99 sağlık ocağından rastgele sekizi seçildi. Otuz yaş üzerindeki grupta araştırma yapılması planlandı. Diyabetli olduklarını ifade eden 555 kişi araştırma kapsamına alındı. Toplam 40 soru içeren bir anket diyabetli kişilere yüz yüze görüşme ile uygulandı. **Bulgular:** Çalışma grubunun %82.3'ü anti-diyabetik ilaç kullandığını, %20'si düzenli olarak hekime kontrol olduklarını, %71.4'ü düzenli olarak kan şekeri ölçümü yaptırdıklarını, %59.5'i diyet uyguladıklarını, %16.8'i düzenli olarak egzersiz yaptıklarını ve %25.2'si ayak bakımı uyguladıklarını belirtmişlerdir. Genel sağlık algısı ile diyabet bakım puanları arasında pozitif yönde ilişki bulundu. Çoklu regresyon analizine göre, diyabetik bakım skoru ile diyabet süresi arasında negatif yönde, sağlık güvencesi, öğrenim süresi ve diyabet konusunda eğitim alma arasında pozitif korelasyon bulunmuştur. **Sonuç:** Diyabetli hastalarda klinik tedavi programları hazırlanırken, diyabet süresi, sağlık güvencesi, eğitim düzeyi gibi faktörler göz önünde bulundurulmalı ve hastalar diyabet konusunda eğitilmelidir.

Anahtar Kelimeler: Diabetes mellitus; sağlık hizmeti kalitesi; hasta uyumu

Turkiye Klinikleri J Med Sci 2010;30(6):2004-10

The incidence and prevalence rates of diabetes mellitus are rapidly increasing all over the world. According to the World Health Organization (WHO) recent global estimates, there will be 366 millions people with diabetes by the year 2030.[1]

Diabetes mellitus is caused by both environmental and genetic factors. The environmental factors that may lead to the development of diabetes mellitus include an idle life style and physical inactivity. Since there is an increase in the trend at which diabetes prevails, it is evident that environmental factors are playing a more increasing role in the etiology of diabetes mellitus. Therefore, effective self-care is an essential component of diabetes care: diabetic individuals must manage medication, diet, blood glucose monitoring, exercise, foot care, and routine visits to physicians. There is evidence supporting an association between improvements in self-care behavior and improvements in glycemic control.[2] The American Diabetes Association, in its 2004 Clinical Practice Recommendations, recognizes self-management as an integral component of the therapeutic care plan.[3]

Effective treatment and follow up of diabetic cases is very important in order to prevent complications of diabetes.[4,5] Routine visits to physicians, blood-glucose monitoring, regular utilization of anti-diabetic drugs, consumption of an appropriate diet, regular physical exercise and foot care are important elements of diabetic care.[6,7]

In order to maintain lifelong diabetic care sufficiently, it is necessary to expand diabetic patients' knowledge of diabetic care.[8] It has been shown that the education and knowledge of diabetic patients have significant effects on self-care and management of the disease.[9,10]

This study was performed in order to determine the adherence level of diabetic patients to the diabetic care rules, factors affecting this adherence level, and the results of diabetic care.

MATERIAL AND METHODS

This study was performed in Kayseri in 2006. Study was performed after the approval of Erciyes University Medical Faculty Ethical Committee. There are 99 primary health care centers in Kayseri. Of these health centers, 30 are in the provincial capital and 69 are in the districts and rural areas. The overall population of the province is approximately one million.

In order to calculate sample size, adherence level of the diabetic patients to various diabetes care rules was assumed as 60 %. Tolerance value and confidence level were taken as 0.06 and 0.95 respectively, and minimum sample size was calculated as 513. For this reason, approximately 600 self-reported diabetic patients were planned to be taken into the study. In a previous survey in the same region, the prevalence rate of self-reported diabetes mellitus in the population aged 30 and over was reported to be 4.2%.[9] Thus, the frequency of self-reported diabetes mellitus in the study area was assumed to be 4%. In order to reach at least 600 self-reported diabetic patients, it was planned to interview approximately 15000 people. It was assumed that two people aged 30 and over were living in each household. Thus, 7500 households were planned to be included in the study.

Eight primary health care centers were chosen randomly, four in rural and four in urban areas. Total population of the catchments area of these health centres was 142450, and 61200 of the total population were aged 30 and over. Samples were selected from health center records by using random numbers table. Selected households were visited, and all people aged 30 years and over were asked if they had diabetes mellitus. The individuals who reported that they had diabetes mellitus were enrolled in the study group and a questionnaire prepared by the investigators containing 40 items was applied. The individuals who were not at home during the visit but reported to have diabetes mellitus were revisited one week later. Those who were not present at home despite two visits were excluded. Nobody refused to participate in the study. A total of 14026 individuals from 7346 households were questioned and 576 of them reported that they had diabetes mellitus. Twenty-one people could not be found at home. Thus, the data compiled from 555 self-reported diabetic patients were evaluated.

General health perceptions of the patients were evaluated as "very good, good, fair, bad or very bad". For the statistical analysis, "very good and good" ratings were combined as "good", and the other ratings were combined as "poor".

In order to evaluate the adherence of the subjects to the diabetic care rules, the questionnaire contained items regarding medication, diet, physician control, monitoring of blood glucose, physical exercise and foot care. The adherence of the patients was evaluated according to their statements. The adherence status of the subjects were scored as seen in Table 1. Total score of diabetes care was calculated between 0 and 100 and than the scores were classified as poor (0-40 points), fair (50-80 points) or good (90-100 points).

The data were evaluated using SPSS version 11.0 (Chicago, IL). The differences between the groups were analyzed by Chi square test. Multiple linear regression analysis was used to evaluate the effects of some factors on diabetes care score. Kendall's tau-b coefficient was calculated in order to determine the correlation among general health rating and diabetic care score categories. Probability level of 0.05 was accepted as statistically significant. Means were reported with standard deviations.

TABLE 1: Criteria for evaluation of self-care of diabetes.

Criterion	Answers	Point
Drug use	Regular	20
	Irregular	10
	Not at all	0
Adherence to diet	Regular	20
	Irregular	10
	Not at all	0
Visit to physician	Regular	20
	Irregular	10
	Never	0
Monitoring of blood glucose	Regular	20
	Irregular	10
	Never	0
Physical exercise	Yes	10
	No	0
Foot care	Yes	10
	No	0
Total score		100

TABLE 2: Characteristics of subjects.

Characteristics (n= 555)	Groups	Number	%
Age (year) (mean ± SD)		56.6 ± 11.8	
Gender	Male	230	41.4
	Female	325	58.6
Residence	Rural	285	51.4
	Urban	270	48.6
Marital status	Not married	106	19.1
	Married	449	80.9
Duration of education (year) (mean ± SD)		8.8 ± 7.07	
Household income	Poor	143	25.8
	Medium	277	49.9
	High	135	24.3
Health insurance	No	79	14.2
	Yes	476	85.8
Duration of diabetes (year) (mean ± SD)		5.02 ± 4.71	
Family history of diabetes	No	372	67.0
	Yes	183	33.0
Education on diabetes	No	173	31.2
	Yes	382	68.8
Use of insulin and antidiabetics	Oral anti diabetics only	331	59.6
	Insulin only	121	21.8
	Insulin and oral antidiabetics	5	0.9
	No medication	98	17.7

RESULTS

The prevalence rate of self–reported diabetes mellitus was 4.1%; 325 women (58.6%) and 230 men (41.4%) were included in the study. The mean age ± standard deviation (SD) of the participants was 56.6±11.8 years, whereas the mean duration (±SD) of diabetes was 5.02 ± 4.71 years (Table 2). Approximately 30% of the study group had family history with diabetes and 30% had had no education about diabetes.

It was determined that only 71.4% of diabetic patients tested their glucose levels regularly, 69.4% took their medication regularly, 59.5% were on an appropriate diet, 25.2% performed foot care, 20% visited a physician regularly and 16.8% adhered to an exercise program (Table 3).

Table 4 shows the effects of some factors on the total score of diabetes care. Age, gender, marital status, household income, residence and family history of diabetes were not significantly associated with the total score of diabetes care. According to multiple regression analysis, duration of diabetes was negatively correlated, while duration of education, health insurance, and education about diabetes were positively correlated with diabetes care score. Multiple regression analyses suggested that

TABLE 3: Diabetic care in the study group.

Elements of diabetic care (n = 555)		Number	%
Drug use	Regular	385	69.4
	Irregular	72	12.9
	Not at all	98	17.7
Adherence to diet	Regular	330	59.5
	Irregular	129	23.2
	Not at all	96	17.3
Visit to physician	Regular	111	20.0
	Irregular	289	52.1
	Never	155	27.9
Glucose monitoring	Regular	396	71.4
	Irregular	104	18.7
	Never	55	9.9
Physical exercise	Yes	93	16.8
	No	462	83.2
Foot care	Yes	140	25.2
	No	415	74.8

education on diabetes of patients increased the total score of diabetes care by 5.5 points (Table 4).

Moreover, there was positive correlation between the categories of general health ratings and total scores of diabetes care (Table 5). When total score of diabetic care decreases, general health rating goes to poorer.

DISCUSSION

Diabetes mellitus is one of the most common endocrine disorders affecting almost 6% of the world's population. The projected increase in the number of diabetic patients will strain the capabilities of healthcare providers worldwide.[1] Prevalence rate of diabetes was found as 4.1%, which is similar to a study conducted in the same area previously.[11] However, in the present study, the rate of

TABLE 4: The effects of some factors on the total score of diabetic care.

Dependent variable: Total score of diabetic care

Independent variables	B	SE	Beta	t	P
Constant	38.916	6.806		5.717	< 0.001
Age (years)	-0.004	0.064	-0.003	-0.066	0.948
Gender (1. Male, 2. Female)	0.738	1.392	0.024	0.530	0.590
Duration of education (years)	0.622	0.196	0.158	3.173	0.002
Marital status (1. Unmarried, 2. Married)	1.495	1.712	0.039	0.873	0.380
Household income (1. Poor, 2. Medium or high)	0.652	0.958	0.023	0.681	0.497
Residence (1. Rural, 2. Urban)	1.812	1.286	0.060	1.409	0.163
Health insurance (1. No, 2. Yes)	5.642	1.714	0.121	3.292	0.002
Duration of diabetes (years)	-0.304	0.099	0.136	3.071	0.002
Family history of diabetes (1. No, 2. Yes)	1.915	1.336	0.058	1.433	0.152
Diabetes education (1. No, 2. Yes)	5.658	1.402	0.168	4.036	< 0.001

N= 555; F= 7.568; R = 0.351; p< 0.001.

TABLE 5: The relationship between total score of diabetic care and self-reported health rating.

Total Score of Diabetic Care	General Health Rating					
	Good		Poor		Total	
	Number	%	Number	%	Number	%
Good	21	50.0	21	50.0	42	100.0
Fair	176	46.8	200	53.2	376	100.0
Poor	48	35.0	89	65.0	137	100.0
TOTAL	245	44.1	310	55.9	555	100.0

Chi square= 6.28, p< 0.05.

Kendall's Tau b= 0.100, p< 0.05.

diabetes is found lower than the study of Satman et al.[12] They found total prevalence rate of diabetes in Turkey as 7.2%, and reported that 2.3% were diagnosed during the laboratory examination. It is known that approximately 32% of diabetes cases may be undiagnosed.[12] In the present study, only self–reported cases were considered to have diabetes, and the possible cause of difference in the present study may be due to the difference of methods used.

It has been known that quality of life of diabetic patients are worse than the general population.[13] Patient education and enhancement of the role of health care providers improve the clinical outcomes and process of care in diabetic patients.[13,14] It has been found that education about the disease increases the well-being and life quality of patients.[8,10,13] As can be seen in Table 2, 69% of the study group was educated about diabetes mellitus. That means 31% of patients have less chance to increase their life quality.

As shown in Table 3, a great majority of the diabetic patients do not adhere to general principles of diabetes care, such as drug utilization, diet, visiting a physician, monitoring of blood glucose, physical exercise and foot care. In this study, only 69.4% of diabetic patients took their medication regularly. It has been known that even only glycemic control is effective on quality of life and it reduces long term diabetic complications.[15] A study on the systematic review of adherence to medication for diabetes reported that the adherence rate in three retrospective studies ranged from 36 to 93%.[16-18] In the present study, 59.5% of the patients reported adherence to an appropriate diet, whereas other studies stated adherence to an appropriate diet as 37-52%.[19,20]

Effective self–management is considered the cornerstone of successful diabetes control, and monitoring of blood glucose may have a role in this situation. Self monitoring of blood glucose is correlated with better control of diabetes.[21] In our study, approximately 70% of diabetic patients monitored their blood glucose. Vincze et al. reported that 52% of the diabetic patients in his study followed the rules for blood-glucose monitoring.[22] The reason for the high percentages in the present study may be due to the fact that most of the participants in the study with diabetes had health insurance.

It has been shown that the importance of regular exercise on increment insulin sensitivity; in addition it reduces cardiovascular risk factors in diabetic patients.[7,23,24] The physical activity adherence rate in some studies varied between 37 and 52%.[20,25] The rates of regular visits to a physician, physical exercise and foot care were low in the study group (Table 3).

Diabetic foot problems are late complications of diabetes and may occur in 2-3% of diabetic patients.[26] Foot ulcers decrease life quality and impair physical, social and emotional functions of diabetic patients.[26,27] Stressing and patient education by the physicians and other health professionals giving education to the patients not only will increase the life quality of patients but also will be beneficial for the national economy. Foot care, which requires inspecting feet thoroughly to check for abrasions, lesions and early infections may be thought of as a relatively solitary activity. However, we found that adherence to foot care was significantly low among our patients (25%) when in other studies were taken info consideration.[28-30] These results have implications for further evaluation, planning and management of patient care for prevention of diabetic foot disease.

Total score of diabetes care was higher in the patients who had a health insurance. This situation may be due to the fact that a person who does not have health insurance has to pay for medical care. When duration of the disease increases, the total score of diabetes care significantly decreases.

Bonds et al. found that patients had a higher level of trust to their care provider when they were engaged as an active participant in the health care decisions.[31] Additionally, education of patients about their medical care brings higher level of trust to care provider and also better self care activities. Similar to this result, we found that when the pa-

tients were educated about diabetes their diabetes care score increased significantly (Table 4).

Şenol et al. found 56 % good health status in a healthy study group.[32] In our study general health rating was classified as good in 44.1% of the study group. It has been known that, subjects with diabetes or any other chronic disease have poorer health status.[33] The difference between studies may be due to this situation. There was a significant correlation between total diabetes care score and general health rating. The patients whose diabetes care score were good reported better general health rating than the others (Table 5).

This study has some limitations. Study was performed in Kayseri and results cannot be generalized to whole country. The diagnosis was made depending on self-reports and any laboratory analysis was not performed. Data on adherence to recommendations depended on self evaluation of the patients.

CONCLUSION

Duration of education and having a social security have positive effects while duration of diabetes have negative effects on diabetes care.

The patients' education on diabetes has increased the adherence level to the rules of diabetes care.

During developing clinical management programs for patients with diabetes; factors about the patients, such as duration of education, social security and duration of diabetes must be considered.

REFERENCES

1. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. Diabetes Care 2004;27(5):1047-53.
2. Jones H, Edwards L, Vallis TM, Ruggiero L, Rossi SR, Rossi JS, et al. Changes in diabetes self-care behaviors make a difference in glycemic control: the Diabetes Stages of Change (DiSC) study. Diabetes Care 2003;26(3):732-7.
3. American Diabetes Association. Standards of medical care in diabetes. Position statement. Diabetes Care 2004;27 Suppl 1:15-35.
4. Heine RJ. Diabetes in the next century: challenges and opportunities. Neth J Med 1999; 55(6):265-70.
5. Clark M, Hampson SE. Implementing a Psychological intervention to improve lifestyle self-management in patients with type 2 diabetes. Patient Educ Couns 2001;42(3):247-56.
6. Hänninen J, Takala J, Keinänen-Kiukaaniemi S. Good continuity of care may improve quality of life in type 2 diabetes. Diabetes Res Clin Pr 2001;51(1):21-7.
7. Tessier D, Ménard J, Fülop T, Ardilouze JL Roy MA, Dubuc N, et al. Effects of aerobic exercise in the elderly with type 2 diabetes mellitus. Arch Gerontol Geriatr 2000;31(2):121-32.
8. Bruce DG, Davis WA, Cull CA, Davis TME. Diabetes education and knowledge in patients with type 2 diabetes from the community. J Diabetes Complicat 2003;17(2):82-9.
9. Jiang YD, Chuang LM, Wu HP, Shiau SJ, Wang CH, Lee YJ, et al. Assessment of the function and effect of diabetes education programs in Taiwan. Diabetes Res Clin Pr 1999; 46(2):177-82.
10. Tankova T, Dakovska G, Koev D. Education and quality of life in diabetic patients. Patient Educ Couns 2004;53(3):285-90.
11. Öztürk Y, Aykut M, Keleştimur F, Günay O, Çetinkaya F, Ceyhan O, et al. Prevalence of diabetes mellitus and affected factors in the district of Kayseri Health Group area. Turk J Med Sci 2000;30(2):181-6.
12. Satman I, Yılmaz T, Sengül A, Salman S, Salman F, Uygur S, et al. Population-based study of diabetes and risk characteristics in Turkey. Diabetes Care 2002;25(9):1551-6.
13. Rubin RR. Diabetes and quality of life. Diabetes Spectrum 2000;13(1):21.
14. Rabbone I, De Vito B, Sacchetti C, Cerutti F. Role of health care providers in educational training of patients with diabetes. Acta Biomed 2005;76 Suppl 3:63-5.
15. Testa MA, Simonson DC. Health economic benefits and quality of life during improved glycemic control in patients with type 2 diabetes mellitus: A randomized, controlled, double-blind trial. JAMA 1998;280(17): 1490-6.
16. Boccuzzi SJ, Wogen J, Fox J, Sung JC, Shah AB, Kim J. Utilization of oral hypoglycemic agents in a drug-insured U.S. population. Diabetes Care 2001;24(8):1411-5.
17. Dailey G, Kim MS, Lian JF. Patient compliance and persistence with antihyperglycemic drug regimens: evaluation of a medicaid patient population with type 2 diabetes mellitus. Clin Ther 2001;23(8):1311-20.
18. Spoelstra JA, Stolk RP, Heerdink ER, Klungel OH, Erkens JA, Leufkens HG, et al. Refill compliance in type 2 diabetes mellitus: a predictor of switching to insulin therapy? Pharmacoepidemiol Drug Saf 2003;12(2):121-7.
19. Shobhana R, Begum R, Snehalatha C, Vijay V, Ramachandran A. Patients' adherence to diabetes treatment. J Assoc Physicians India 1999;47(12):1173-5.
20. Shultz JA, Sprague MA, Branen LJ, Lambeth S. A comparison of views of individuals with type 2 diabetes mellitus and diabetes educators about barriers to diet and exercise. J Health Commun 2001;6(2):99-115.
21. Franciosi M, Pellegrini F, De Berardis G, Belfiglio M, Cavaliere D, Di Nardo B, et al. The impact of blood glucose self-monitoring on metabolic control and quality of life in type 2 diabetic patients. Diabetes Care 2001;24(11):1870-7.
22. Vincze G, Barner JC, Lopez D. Factors associated with adherence to self-monitoring of blood glucose among persons with diabetes. Diabetes Educ 2004;30(1):112-25.
23. Braun B, Zimmermann MD, Kretchmer N. Effects of exercise intensity on insulin sensitivity in women with non-insulin dependent diabetes mellitus. J Appl Physiol 1995; 78(1):300-6.
24. Balducci S, Zanuso S, Massarini M, Corigliano G, Nicolucci A, Missori S, et al. The Italian Diabetes and Exercise Study (IDES): Design and methods for a prospective Italian multicentre trial of intensive lifestyle intervention in people with type 2 diabetes and the metabolic syndrome. Nutr Metab Cardiovasc Dis 2008;18(9):585-95.

25. Swift CS, Armstrong JE, Beerman KA, Campbell RK, Pond-Smith D. Attitudes and beliefs about exercise among persons with non-insulin-dependent diabetes. Diabetes Educ 1995;21(6):533-40.

26. Reiber GE, Lipsky BA, Gibbons GW. The burden of diabetic foot ulcers. Am J Surg 1998;176(2A Suppl):5-10.

27. Arıcan Ö, Şaşmaz S. [Foot care in patients with diabetes]. Turkiye Klinikleri J Med Sci 2004;24(5):541-5.

28. Ciechanowski P, Russo J, Katon W, Von Korff M, Ludman E, Lin E, et al. Influence of patient attachment style on self-care and outcomes in diabetes. Psychosom Med 2004;66(5): 720-8.

29. Khamseh ME, Vatankhah N, Baradaran HR. Knowledge and practice of foot care in Iranian people with type 2 diabetes. Int Wound J 2007;4(4):298-302.

30. Gürsel Y, Kamanlı A, Ulus Y, Tuncer S, Erdoğan MF, Arasıl T, et al. Foot deformities and correlation with diabetic foot in diabetics. Turkiye Klinikleri J Med Sci 1998;18(3): 170-5.

31. Bonds DE, Camacho F, Bell RA, Duren-Winfield VT, Anderson RT, Goff DC. The association of patient trust and self-care among patients with diabetes mellitus. BMC Fam Pract 2004;5:26.

32. Şenol V, Çetinkaya F, Ünalan D, Balcı E, Öztürk A. [Determinants of self-rated health in general population in Kayseri, Turkey]. Turkiye Klinikleri J Med Sci 2010;30(1):88-96.

33. Wee HL, Cheung YB, Li SC, Fong KY, Thumboo J. The impact of diabetes mellitus and other chronic medical conditions on health-related Quality of life: Is the whole greater than the sum of ist parts? Health and Quality of Life Outcomes 2005;3:2. doi: 10.1186/1477-7525-3-2.