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The Comparison of Diabetes Management and Follow-up by Family Medicine or Endocrinology

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ABSTRACT

Objectives: This study aimed to compare the disease management of type 2 diabetes mellitus (T2DM) patients followed up in family medicine (FM) or endocrinology outpatient clinics.

Methods: This descriptive study was carried out with T2DM patients who applied to endocrinology and FM outpatient clinics. When analyzing data, patients who only went to endocrinologists (Group 1) and patients who went to both endocrinology and FM or only FM (Group 2) were compared. A questionnaire form (sociodemographic characteristics, education, disease management status, and hemoglobin A1c [HbA1c] levels) was applied to participants.

Results: A total of 151 participants were enrolled in the study, with 49 (32.5%) in Group 1 and 102 (67.5%) in Group 2. The median value of HbA1c was 7.5% (2.1%) in Group 1 and 7.1% (2.2%) in Group 2 ($p=0.324$). Blood glucose measurement abilities and the ability to adjust the insulin dose were higher in Group 1 (47 [95.9%] vs. 75 [73.5%], $p=0.001$; 22 [44.9%] vs. 15 [14.7%], $p<0.001$, respectively). However, the frequency of blood pressure measurement, foot examination, and neurological examination was higher in Group 2 (17 [34.7%] vs. 64 [62.7%], $p=0.001$ for blood pressure measurement; 3 [6.1%] vs. 26 [25.5%], $p=0.005$ for the foot examination; and 2 [4.1%] vs. 24 [23.5%], $p=0.003$ for the neurological examination, respectively).

Conclusion: While no difference was found in HbA1c levels according to the clinics where the patients were followed, it is noteworthy that blood pressure measurements and foot and neurological examinations were performed more frequently in patients visiting their FMs.

Keywords: Diabetes complications, endocrinology, family practice, self-management, type 2 diabetes mellitus



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INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder that requires continuous medical care, in which carbohydrates, fats, and proteins cannot be adequately utilized due to insulin deficiency or disorders in the effect of insulin.^[1] Especially T2DM is a common chronic disease due to changes in lifestyle and nutritional habits, and there is an increase in diabetes mellitus (DM) and related complications all over the world. While the prevalence of DM aged 20 years and over was 7.2% in the TURDEP-I study conducted throughout Türkiye in 1997–1998, the incidence of DM was found to be 13.7% in the TURDEP-II study conducted in 2009–2010.^[2,3] Accordingly, the incidence of DM in Türkiye has increased by 100% in 10 years.

DM emerges as a major health problem for both the individual and the society, as it is a serious and progressive disease, and has negative effects on acute and chronic complications, morbidity, and mortality.^[1] There were approximately 422 million adults with T2DM in the world in 2017.^[4] It is estimated that the global amount spent on the treatment of DM and its

complications is 673 billion dollars. According to 2012 figures, the total cost of DM in Türkiye was approximately 4.34 billion USD. This corresponded to 22.6% of the total health expenditure.^[5]

The importance of patient motivation and knowledge in the good management of DM has been confirmed by many studies.^[6,7] It has been determined that patients with DM education have fewer complications, manage the disease better, and have lower weight and Hb1Ac levels. Therefore, DM education is important both during diagnosis and the course of the disease.

Family medicine (FM) has a central position in the follow-up of DM with its holistic and inclusive approach and the continuous care it offers.^[8] Since DM follow-up requires a multidisciplinary approach (annual controls, screenings, endocrinology, nephrology, cardiology follow-ups, nutritionist consultation, fundus examination, foot examination, etc.), and the inclusion and empowerment of patients in care, family physicians are expected to work as a team leader.^[1,8]

Family physicians play a role in the education of DM patients, compliance with lifestyle changes and medication, hemoglobin A1c (HbA1c) monitoring, taking precautions to prevent complications, screening them, and managing complications.^[9] However, patients' use of Family Health Centers (FHC) for chronic disease follow-up is not at the desired level. It has been reported that there are patients who use only tertiary health institutions for DM follow-up, as well as patients who have never met their family physician. In Türkiye, the follow-up of DM patients is carried out by family physicians in FHCs or FM clinics, and internal medicine, endocrinology, or DM clinics are managed by internal medicine specialists. There are also a small number of DM centers, which are established in the field and are multidisciplinary. Some studies are showing that the follow-up of patients with T2DM from different units leads to different results.^[10,11] In a study conducted in the USA, it was shown that in the endocrinology clinic, compliance with the clinical recommendations of the American Diabetes Association (ADA) was better and the HbA1c levels of the patients were significantly lower.^[10] In a study conducted in Saudi Arabia, although the average HbA1c levels of patients followed up by FM were higher than those followed up by endocrinology, no statistically significant difference was observed.^[11] However, no similar study has been found in Turkey, where the FHC system was introduced nationwide in 2010.

In this study, it was aimed to compare the blood glucose regulation and disease self-management of T2DM patients followed up in FM or endocrinology outpatient clinics.

METHOD

This descriptive study population consists of patients with T2DM who applied to Marmara University Training and Research Hospital's Internal Medicine, Endocrinology clinic, specialized DM outpatient clinic, FM outpatient clinic, and an Education FHC affiliated with that university in Istanbul, Türkiye. Patients over the age of 18 who applied to the University Education and Research Hospital Endocrinology or FM polyclinics or education FHCs and who have been diagnosed with T2DM for at least 6 months were included in the study. Those with hearing loss and those who did not have the cognitive capacity to understand the Turkish questions were excluded from the study. A sample was not selected, but the study was carried out with convenience sampling, among those who applied to those clinics within 1 month, the targeted population and volunteered to participate in the study were included. The response rates of the DM outpatient clinic, FM clinic, and FHC were 81.7, 78.3, and 65.8%, respectively. The research data were collected from each clinic for 1 month, for a total of three, between April 1st and June 31st, 2019.

The sociodemographic characteristics of the participants, the duration of DM, the center where the diagnosis was made and followed up, the education level about DM and its complications, the last HbA1c level and when it was checked, where the routine follow-ups and controls regarding the disease were made, which drugs they used, drug use compliance, adaptation to lifestyle changes, and some secondary preventive medicine practices (aspirin use, pneumococcal and influenza vaccination, etc.) were questioned. The survey asked whether the individual could use a blood pressure or blood glucose meter at home without assistance. The researchers investigated the patients' knowledge and attitude toward the disease, their ability to manage it, and routine follow-up status based on the information provided by the patients themselves. Furthermore, the researcher determined patients' adherence to the recommended lifestyle for effective DM management based on self-report. The researcher calculated the target HbA1c and target blood pressure levels in alignment with the values reported by the patients. For this, the questionnaire form was applied face to face to each participant by the researcher.

In the evaluation of the data, the patients who had their follow-up only from the endocrinology department and had never been to an FM clinic or an FHC for their DM management were determined as "Group 1;" and the patients who received service mostly from the FM outpatient clinic or FHC were considered "Group 2," regardless of whether they went to endocrinology or not. The deci-

sion to create two groups instead of three is based on the infrastructure of chronic disease management for T2DM. Managing DM and its complications through FM alone is neither appropriate nor practical for almost all DM patients. Sometime after diagnosis, patients with T2DM require tertiary health-care services, for screening, diagnosis, treatment, and rehabilitation. For effective disease management, it is recommended to consult with specialists in internal medicine, especially endocrinology, also cardiology, ophthalmology, and neurology. In cases of multi-drug or insulin use, it is advisable to seek consultation from specialists in endocrinology and internal medicine for health services and treatments. Because the family physician, whether an FM specialist or not, is unable to issue a report and prescribes most of the DM medication and insulins, not covered by the Social Security Institution. Therefore, consultation with specialists is necessary but not absolute. Although there were patients with newly diagnosed DM who had never seen an endocrinologist, they were a small minority in the overall sample. For this reason, it would not have been useful to create a separate group for them.

The data obtained from the study were analyzed with the Statistical Package for the Social Sciences Statistics v.25 statistical program. The assumption of normality of the data was tested with the Kolmogorov–Smirnov and Shapiro–Wilk tests. The mean and standard deviation of the normally distributed continuous data were given together, while the non-normally distributed continuous data were indicated with the median, quartiles. To determine the descriptive statistics of the categorical variables, frequencies and percentages were used. To compare the normally distributed continuous variables in independent groups, a student t-test was used. In determining the differences in quantitative variables between two independent groups that were not normally distributed, the Mann–Whitney U-test was used. The Chi-square test was used to compare sequential and nominal data. Statistical significance was determined by taking the significance level as 0.05 and the power level as 80% in all analyses.

RESULTS

A total of 151 participants were included in the study, 49 (32.5%) in Group 1 and 102 (67.5%) in Group 2. Total participants were 97 (64.2%) female, and the mean age was 57.9 ± 10.3 years. In addition, 23 (15.2%) of the participants had not previously consulted a family doctor in a lifetime. In Group 1, age mean was 57.4 ± 10.4 and 58.3 ± 10.4 in Group 2 ($p=0.621$). Sociodemographic characteristics and current disease status according to groups are summarized in Table 1.

The median value of HbA1c was 7.5% (2.1%) in Group 1 and 7.1% (2.2%) in Group 2 ($p=0.324$). The comparison of HbA1c levels between groups is shown in Figure 1.

The insulin users in Group 1 were 38 (77.6%) participants and 23 (22.5%) in Group 2 ($p<0.001$). The ability to adjust the insulin dose was 22 (44.9%) in Group 1 and 15 (14.7%) in Group 2 ($p<0.001$). In addition, blood glucose measurement ability was observed to be 47 (95.9%) in Group 1, whereas it was 75 (73.5%) in Group 2 ($p=0.001$). Self-reported status of DM management and related education are summarized in Table 2.

Self-reported status of having routine blood pressure measurement was detected 20 (40.8%) in Group 1 and 34 (33.3%) in Group 2 ($p=0.002$). Self-reported status of having routine examinations related to DM is summarized in Table 3.

Knowing the target HbA1c for their health status was 6 (12.2%) in Group 1 and 17 (16.7%) in Group 2 ($p=0.585$). Knowing the target blood pressure for their health status was 30 (61.2%) in Group 1 and 32 (31.4%) in Group 2 ($p=0.002$). Self-reported status of knowledge, attitudes, and skills related to DM is summarized in Table 4.

DISCUSSION

This study aimed to compare the effects of FM versus endocrinology follow-up on the management of T2DM. The inclusion of participants who exclusively received services from endocrinology outpatient clinics, and even those who had no prior interaction with their family physician, is a noteworthy discovery in itself. The comparison of two groups within this sample, those who solely received services from endocrinology outpatient clinics and those who received services from both endocrinology and predominantly FM outpatient clinics or FHC, was expected to yield more significant results.

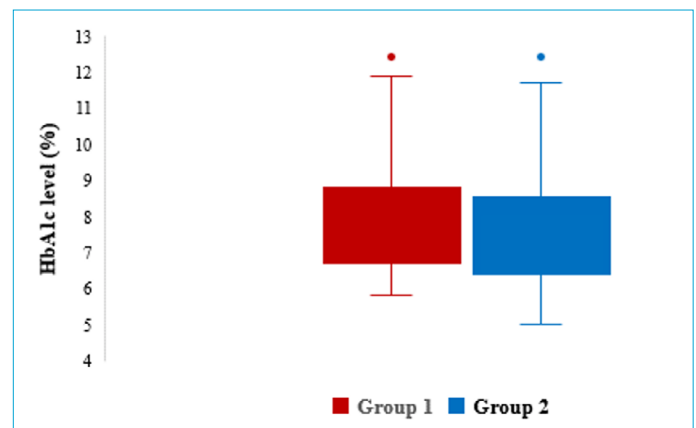


Figure 1. The comparison of hemoglobin A1c levels between groups.

Table 1. Sociodemographic characteristics and current disease status according to groups

	Group 1 (n=49)	Group 2 (n=102)	p
Age groups			
30-44 years	6 (12.2)	10 (9.8)	0.603
45-59 years	22 (45.0)	41 (40.2)	
60-74 years	20 (40.8)	44 (43.1)	
75 years and over	1 (2.0)	7 (6.9)	
Gender			
Male	30 (61.2)	67 (65.7)	0.592
Female	19 (38.8)	35 (34.3)	
Marital status			0.265
Single/widow	7 (14.2)	26 (25.5)	
Married	42 (85.8)	76 (74.5)	
Income			
Below minimum wage	0 (0.0)	37 (36.3)	<0.001
Moderate	42 (85.7)	59 (57.8)	
Good	7 (14.3)	6 (5.9)	
Education level			
Illiterate	7 (14.3)	16 (15.7)	0.005
Literate	0 (0.0)	11 (10.8)	
Primary school	31 (63.2)	34 (33.2)	
Secondary school	2 (4.1)	12 (11.8)	
High school	7 (14.3)	17 (16.7)	
University and more	2 (4.1)	12 (11.8)	
Employment status			
Unemployed	23 (46.9)	57 (55.9)	0.463
Employee	10 (20.4)	21 (20.6)	
Retired	16 (32.7)	24 (23.5)	
Atherosclerotic disease			
Yes	13 (26.5)	16 (15.7)	0.113
No	36 (73.5)	86 (84.3)	
Hypertension			
Yes	26 (53.1)	65 (63.7)	0.210
No	23 (46.9)	37 (36.3)	
Hyperlipidemia			
Yes	32 (65.3)	41 (40.1)	0.004
No	17 (34.7)	61 (59.8)	
Thyroid disease			
Yes	14 (28.6)	26 (25.5)	0.688
No	35 (71.4)	76 (74.5)	
Renal disease			
Yes	2 (4.1)	3 (2.9)	0.714
No	47 (95.9)	99 (97.1)	
Cancer			
Yes	0 (0.0)	2 (2.0)	0.324
No	49 (100.0)	100 (98.0)	
Other diseases			
Yes	12 (24.5)	38 (37.3)	0.119
No	37 (75.5)	64 (62.7)	

Data is presented as n (%).

Chi-square test.

Table 2. Self-reported status of DM management and related education

	Group 1 (n=49)	Group 2 (n=102)	p
Knowledge of measuring blood glucose	46 (93.9)	53 (52.0)	<0.001
Knowledge of adjusting insulin dose	40 (81.6)	35 (34.3)	<0.001
Knowledge of hypo/hyperglycemia	43 (87.8)	52 (51.0)	<0.001
Knowledge of possible consequences of diabetes	45 (91.8)	62 (60.8)	<0.001
Knowledge of appropriate exercise	45 (91.8)	62 (60.8)	<0.001
Knowledge of appropriate nutrition	47 (95.9)	73 (71.6)	0.001
Knowledge of blood pressure measurement	17 (34.7)	64 (62.7)	0.001
Knowledge of foot care	5 (10.2)	21 (20.6)	0.114

DM: Diabetes mellitus.
Data are presented as n (%).
Chi-square test.

Table 3. Self-reported status of having routine examinations related to DM

	Group 1 (n=49)	Group 2 (n=102)	p
Urine analysis	48 (98.0)	79 (77.5)	0.001
Cardiology examination	37 (75.5)	63 (61.8)	0.095
Eye examination	34 (69.4)	60 (58.8)	0.210
Foot examination	3 (6.1)	26 (25.5)	0.005
Neurology examination	2 (4.1)	24 (23.5)	0.003

DM: Diabetes mellitus.
Data are presented as n (%).
Chi-square test.

Table 4. Self-reported status of knowledge, attitudes, and skills related to DM

	Group 1 (n=49)	Group 2 (n=102)	p
Having to take a break in medication due to prescription problems	2 (4.1)	34 (33.3)	<0.001
Giving attention to the diet	25 (51.0)	50 (49.0)	0.818
Doing appropriate exercise	15 (30.6)	31 (30.4)	0.978
Pneumococcal vaccination	3 (6.1)	13 (12.7)	0.216
Influenza vaccination	6 (12.2)	14 (13.7)	0.802

DM: Diabetes mellitus.
Data are presented as n (%).
Chi-square test.

First, in this study, no statistical difference was found in HbA1c levels between the endocrinology outpatient follow-up patients and FM follow-up patients. However, in nearly all educational parameters, with the notable exceptions of blood pressure and foot care, the group that went only to the endocrinology clinic had better results. These results are in line with the results of the study conducted by Zoiberi et al.^[12] Similarly, in this study, insulin use was found

to be significantly higher in patients who were followed up from endocrine only, and metformin was mostly used in those who went to FM. In a study comparing an endocrinology clinic with a primary care clinic, adherence to ADA recommendations and HbA1C levels was significantly better in the endocrinology clinic.^[10] In multiple different studies comparing specialized DM clinics and general medicine clinics, the quality of care was found to be better in the spe-

cialized clinic than in the general medicine clinic.^[13-16] Out of these studies, Sone et al. and Shah et al. only compared HbA1c levels.^[15,16] In Ho et al.'s study, the endocrinology clinic was better in all ADA recommendations.^[13] In Sieng and Hurst study, the DM clinics were better in every parameter, except for blood pressure targets in the community setting, which is a similar result to this study.^[14]

There are also studies in which there are no demonstrable differences between specialized and general clinics. Alhabdan et al. found no statistically significant difference in HbA1c levels between DM clinics and FM clinics in their study.^[11] Honkasalo et al. concluded that the follow-up of most DM patients can be organized in primary care with the same quality of secondary care.^[17] Huang et al. did not find a definitive positive impact of specialized DM clinics over a 4-year period.^[18] Chou et al. suggest that family physicians may provide better care at a lower cost to DM patients.^[19]

In a study conducted by Satman et al., it was found that both endocrinologists and family physicians were insufficient to meet the disease management recommendations of guidelines, but in some areas, family physicians were significantly more inadequate in examination and laboratory testing.^[20] In this study, it was found that family physicians provided more services in routine DM-related examinations, but there was a distinct lack of patient education. The fact that there are nurses who only work and specialize in patient education in endocrinology clinics may have been one of the reasons for this situation. In addition, more specialized care and training can be structured with health-care professionals such as DM nurses, dietitians, and training nurses working with DM clinics in tertiary care. On the other hand, the patient education given in FM depends on the personal effort of the family physician/nurse.

One other reason for this might be the way primary care is set up in Türkiye.^[9] The FHC system has been implemented in Turkey since 2010 to strengthen the primary health care services. Although the FHC system has been in operation for more than 10 years, DM diagnosis, treatment, and follow-up are done less frequently in FHCs. It has been reported that there are patients who do not know that family physicians can monitor HbA1c, regulate their medications and insulin doses, provide necessary precautions against all complications, and provide education and related services regarding the disease. These studies were conducted shortly after the start of FM practice in Turkey, however, there has been little reason for change because the pay system has remained unchanged until recently. In this system, if there is inadequacy in any of the pregnancy follow-ups, neonate health-care follow-ups, child health-care follow-

ups, or mandatory vaccination schedule, physicians and nurses get pay cuts. The most common chronic diseases, such as DM and hypertension, were not subject to any difference in pay up until very recently. For this reason, successful field applications such as 98% coverage achieved by family physicians in childhood vaccination were not seen in terms of chronic disease screening and management. In the newly implemented system, common chronic diseases are meant to be rigorously screened and followed up in FHC from 2021.^[21] However, in its current form, not doing the follow-ups does not result in pay cuts, there are only pay raises for those who complete them. Therefore, there may not be the desired positive changes in the immediate future.

According to a study conducted in the İstanbul, Türkiye, vaccination prevalence in DM cases was found to be 6% for pneumococcus and 11.1% for influenza.^[22] In another study, it was reported that 10.7% of DM patients were aware of the pneumococcal vaccine and only 0.9% of them were vaccinated.^[23] In this study, although the vaccination rates in both groups were very low, they were found to be higher than these studies. The reason for this may be that the study was conducted in a university hospital setting. In another study conducted in Türkiye, 27% of DM patients had influenza and 9.8% had the pneumococcal vaccine.^[24] A reason for the relatively high influenza vaccination rate in this study may be the fact that the study was conducted soon after the H1N1 flu pandemic, as stated in its discussion. In another study, influenza vaccination rates of patients followed by endocrinologists, internists, and family physicians were similar.^[25]

It was observed that those who received service from FM interrupted their treatment more often because of not being able to get their medication prescribed, compared to patients who received service only from endocrinology. Having to interrupt treatment due to the inability to get prescribed medication is a type of treatment non-compliance.^[26] Studies on adherence to treatment have mostly been about factors related to patients.^[27] Factors related to the health system and health-care professionals in adherence to treatment have been relatively less studied. However, in the multicenter diabetes attitudes, wishes, and needs study, it was stated that the presence of a DM nurse increased both adherence to treatment and adaptation to lifestyle changes.^[28] Therefore, this difference may be due to the presence of personnel specialized in DM in the endocrinology clinic. Another reason may be in the Turkish health system, many of the oral anti-DM drugs and insulins are covered by the Social Security Institution only when they are prescribed by an endocrinologist or an internal medi-

cine specialist, and the insurance does not cover the bill when family physicians prescribe the same drugs and/or insulins. DM requires a multidisciplinary approach with an emphasis on primary, secondary, and tertiary prevention.^[1] FM could play a key role in the management of DM, especially regarding patient advocacy, patient empowerment, and coordination of health care in the context of person-centered care.^[7] However, FM does not have the expected role in terms of diagnosis, treatment, and follow-up in Türkiye, and there are deficiencies in applying the training and examinations recommended by the guidelines. The fact that routine blood pressure measurements, foot examination, and neurologic examination were performed more in patients with FM follow-up is one of the more encouraging findings of this study. Nevertheless, it is necessary to increase other follow-ups and especially patient education within the scope of DM management in FM. Necessary steps should be taken to ensure that some practices and counseling in endocrinology are also carried out in primary care. To reveal the role of FM and primary health-care services in DM management, multicenter, large-scale studies should be conducted, and necessary practices should be expanded to provide preventive health services and to empower patients.

The limitation of this study is the small sample size. Furthermore, some information collected from patients is self-reported and not measured by a validated method. There is also the possibility of recall bias. To increase the reliability of the data on a very common disease and generalize it to the whole society, it is necessary to reach a larger number of participants and to carry out a multicenter design.

CONCLUSION

There was no difference in HbA1c levels between the group followed up only in endocrinology and the follow-up group including FM, and also in patients receiving endocrinology care exhibited superior self-management abilities and received more comprehensive DM education. In contrast, FM follow-up, provided more frequent follow-up services, including blood pressure, foot, and neurological assessments. These results suggest that FM in Türkiye has the potential to expand its role in the management of DM, particularly in the areas of patient education and comprehensive follow-up. To realize this potential, increased resources and training opportunities in DM education and follow-up protocols for family physicians could be beneficial.

Disclosures

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REFERENCES

1. Society of Endocrinology and Metabolism of Turkey, Clinical Practice Guideline for Diagnosis, Treatment and Follow-up of Diabetes Mellitus and Its Complications. Ankara: TEMD Publisher; 2020.
2. Satman I, Yilmaz T, Sengül A, Salman S, Salman F, Uygur S, et al. Population-based study of diabetes and risk characteristics in Turkey: Results of the Turkish diabetes epidemiology study (TURDEP). *Diabetes Care* 2002;25(9):1551–6.
3. Satman I, Omer B, Tutuncu Y, Kalaca S, Gedik S, Dinccag N, et al; TURDEP-II Study Group. Twelve-year trends in the prevalence and risk factors of diabetes and prediabetes in Turkish adults. *Eur J Epidemiol* 2013;28(2):169–80.
4. Khan MAB, Hashim MJ, King JK, Govender RD, Mustafa H, Al Kaabi J. Epidemiology of type 2 diabetes-global burden of disease and forecasted trends. *J Epidemiol Glob Health* 2020;10(1):107–11.
5. Karaaslan YS. Diabetes responsible for a quarter of health expenditures. Available at: <https://www.aa.com.tr/tr/saglik/saglik-harcamalarinin-dortte-birinden-diyabet-sorumlu/103551>. Accessed Feb 20, 2024.
6. Wexler DJ, Nathan DM, Mulder JE. Initial management of hyperglycemia in adults with type 2 diabetes mellitus. Available at: <https://www.uptodate.com/contents/initial-management-of-hyperglycemia-in-adults-with-type-2-diabetes-mellitus>. Accessed Feb 20, 2024.
7. Bodenheimer T, Grumbach K. Improving primary care for patients with chronic diseases. In "Improving Primary Care: Strategies and Tools for Better Practice" in. Translation Ed. Bozdemir N, Saatçi E. Adana: Nobel Publisher; 2009. p.55-77.

8. Akman M. Strength of primary care in Turkey. *Türk Aile Hek Derg* 2014;18(2):70–8.
9. Çetinkaya F, Baykan Z, Naçar M. Adults perspective about family medicine and the status of service utilization. *TAF Prev Med Bull* 2013;12(1):417–24.
10. Leinung MC, Gianoukakis AG, Lee DW, Jeronis SL, Desemone J. Comparison of diabetes care provided by an endocrinology clinic and a primary-care clinic. *Endocr Pract* 2000;6(5):361–6.
11. Al Habdan MA, Al Ateeq MA, Al Jurbou FI. Level of control among patients with type 2 diabetes mellitus attending diabetic clinic under family medicine compared to diabetic clinic under endocrinology. *Diabetes Metab Syndr Obes* 2016;9:119–24.
12. Zoberi KA, Salas J, Morgan CN, Scherrer JF. Comparison of family medicine and general internal medicine on diabetes management. *Mo Med* 2017;14(3):187–94.
13. Ho M, Marger M, Beart J, Yip I, Shekelle P. Is the quality of diabetes care better in a diabetes clinic or in a general medicine clinic? *Diabetes Care* 1997;20(4):472–5.
14. Sieng S, Hurst C. A combination of process of care and clinical target among type 2 diabetes mellitus patients in general medical clinics and specialist diabetes clinics at hospital levels. *BMC Health Serv Res* 2017;17(1):533.
15. Shah BR, Hux JE, Laupacis A, Mdcn BZ, Austin PC, van Walraven C. Diabetic patients with prior specialist care have better glycemic control than those with prior primary care. *J Eval Clin Pract* 2005;11(6):568–75.
16. Sone H, Kawai K, Takagi H, Yamada N, Kobayashi M. Outcome of one-year of specialist care of patients with type 2 diabetes: A multi-center prospective survey (JDDM 2). *Intern Med* 2006;45(9):589–97.
17. Honkasalo MT, Linna M, Sane T, Honkasalo A, Elonheimo O. A comparative study of two various models of organising diabetes follow-up in public primary health care - the model influences the use of services, their quality and costs. *BMC Health Serv Res* 2014;14:26.
18. Huang ES, Gleason S, Gaudette R, Cagliero E, Murphy-Sheehy P, Nathan DM, et al. Health care resource utilization associated with a diabetes center and a general medicine clinic. *J Gen Intern Med* 2004;19(1):28–35.
19. Chou PL, Chiang IH, Lin CW, Wang HH, Wang HK, Huang CH, et al. Newly diagnosed type 2 diabetes care between family physicians, endocrinologists, and other internists in Taiwan: A retrospective population-based cohort study. *J Pers Med* 2022;12(3):461.
20. Satman I, Imamoglu S, Yilmaz C. A patient-based study on the adherence of physicians to guidelines for the management of type 2 diabetes in Turkey. *Diabetes Res Clin Pract* 2012;98(1):75–82.
21. Public Health Agency of Turkey. Performance Programme, 2017. Available at: https://dosyamerkez.saglik.gov.tr/Eklen-ti/9845/0/saglik-bakanligi-performans-programi-2017pdf.pdf?_tag1=C862AD0ECF5D29A633E7C39A393155C628AA7D42. Accessed February 20, 2024.
22. Apaydin H, Aydın A, Doğan B, Ahçı Yılmaz S, Pala E, Uçak Basat S. Influenza, hepatitis B and pneumococcal vaccination rates and factors influencing vaccination status in patients with diabetes. *Sakarya Med J* 2021;11(1):148–54.
23. Turhan O, Polat HH, Oncel S, Akcan A, Eravşar K, Yalçın AN. Pneumococcal vaccination status in adults sixty-five years and older. *KMJ* 2010;42:135–8.
24. Satman I, Akalin S, Cakir B, Altinel S, Comlekci A, Yurumez A. The effect of physicians' awareness on influenza and pneumococcal vaccination rates and correlates of vaccination in patients with diabetes in Turkey: an epidemiological Study "diaVAX". *Hum Vaccin Immunother* 2013;9(12):2618–26.
25. Chin MH, Zhang JX, Merrell K. Specialty differences in the care of older patients with diabetes. *Med Care* 2000;38(2):131–40.
26. Jimmy B, Jose J. Patient medication adherence: Measures in daily practice. *Oman Med J* 2011;26(3):155–9.
27. Fernandez-Lazaro CI, García-González JM, Adams DP, Fernandez-Lazaro D, Mielgo-Ayuso J, Caballero-Garcia A, et al. Adherence to treatment and related factors among patients with chronic conditions in primary care: A cross-sectional study. *BMC Fam Pract* 2019;14;20(1):132.
28. Rubin RR, Peyrot M, Siminerio LM. Health care and patient-reported outcomes: Results of the cross-national Diabetes Attitudes, Wishes and Needs (DAWN) study. *Diabetes care* 2006;29(6):1249–55.