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Investigation of the effect of disease acceptance and action status of type 2 diabetes patients receiving oral antidiabetic and insulin treatment on their compliance to treatment

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ABSTRACT

Aims: This study aimed to determine the effect of disease acceptance and action status on treatment compliance in type 2 diabetes mellitus (DM) patients receiving oral antidiabetic and insulin treatment.

Methods: This study is a comparative cross-sectional study. A total of 122 patients, including 61 patients receiving oral antidiabetic treatment and 61 patients receiving insulin treatment, were included in this study. The data of the study were collected with the "Individual Introduction Form", "Acceptance and Action Diabetes Questionnaire", and "Type 2 DM Treatment Patient Compliance Scale".

Results: There is a significant and negative correlation between the total score of the acceptance and action diabetes questionnaire and the total score of the Type 2 DM Treatment Patient Compliance Scale ($r=-0.375$; $p<0.05$). The study observed that as the total score of the Acceptance and Action Diabetes Questionnaire increased, the total score of the type 2 DM Treatment Patient Compliance Scale decreased.

Conclusion: In our study, it was observed that the compliance level of type 2 DM patients using insulin or OAD was moderate, and their acceptance and action levels were above average.

Keywords: Diabetes, insulin, antidiabetic, compliance

INTRODUCTION

Diabetes mellitus (DM) is a wide-spectrum metabolic disease which affecting many organs. Medical nutrition therapy, exercise, physical activity, antihyperglycemic drugs, and insulin therapy treat diabetes.[1] The prevalence of type 2 DM has increased significantly in recent years.[2] It is important to focus on prevention, early diagnosis and initial management of macrovascular and microvascular complications of DM in adults.[3] For these reasons, patient compliance with treatment and acceptance of the disease is essential. The World Health Organization (WHO) defines medication compliance as "the degree to which a person's behavior conforms to the accepted recommendations of a health care provider".[4] Long-term adherence to pharmacotherapy in the treatment of chronic disease is considered crucial for treatment success.[5] Adherence to prescribed medication in DM is crucial to achieve metabolic control, as nonadherence to blood glucose-lowering or lipid-lowering medication is associated with higher HbA1c and cholesterol levels, respectively.[6]

People may have difficulty accepting lifestyle changes because they do not consider the disease's short- and long-term complications and may experience depression, anxiety, and similar psychiatric problems.[7,8] It is important to help individuals with DM to identify the most appropriate adaptive strategies to improve their quality of life.[9] DM has been associated with psychological problems, which in turn have been associated with poorer glycaemic control [glycosylated haemoglobin (HbA1c)].[10] Piotrkowska et al.[11] found that life satisfaction increased in patients who expressed a higher level of acceptance of their illness. Considering all these, this study aimed to determine the effect of disease acceptance and action status on treatment compliance of type 2 DM patients receiving oral antidiabetic (OAD) and insulin treatment.

METHODS

The Kastamonu University Clinical Researches Ethics Committee gave its written approval (Date: 30.01.2023,

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Decision No: 2023-KAEK) for the survey to be carried out. Data collection was authorized by the institution (dated 2 March 2023). Permissions were obtained via e-mail for the use of the scales. After informing the participants about the study, their informed consent was obtained. The Helsinki Declaration's guidelines were respected. A comparative cross-sectional study.

Study Design and Participant

The number of patients participating in the study was determined as 120 (OAD-treated=60 and insulin-treated=60) with G*Power 3.1 at 80% confidence level (significance level α=0.05), p=0.52.[13] A total of 122 patients (61 patients receiving OAD treatment and 61 patients receiving insulin treatment) were included in the study. Criteria for inclusion in the survey: agreeing to participate in the research and being a type 2 DM patient using insulin or OAD.

Data Collection

The data were collected by a face-to-face questionnaire at the Kastamonu Training and Research Hospital Diabetes Outpatient Clinic. "Individual Introduction Form," "Acceptance and Action Diabetes Questionnaire (AADQ)" and "Type 2 DM Treatment Patient Compliance Scale" were used to collect the data of the study.

Individual Introduction Form: It consisted of 11 statements, including socio-demographic characteristics and health status of diabetic patients.

Acceptance and Action Diabetes Questionnaire (AADQ): The scale was evaluated to measure the acceptance of thoughts and feelings about DM and how much they interfere with valuable actions. The Cronbach's alpha value of the scale, which consists of nine statements, is 0.836. The statements are evaluated as "1=never true" and "7=always true". All items except item 1 are reverse-scored. It is stated that as the score increases, psychopharmacology flexibility increases. The form has no cut-off score of.[14]

Type 2 DM Treatment Patient Compliance Scale: The Cronbach alpha value of this scale, which consists of 30 items and uses a 5-point Likert-type scale in scoring, is 0.77. The score range that can be obtained from the scale is between 30 and 150. Total scale scores are used in the interpretation of the scores obtained from the scale; scores in the 0-20% range (30-54) are interpreted as "good compliance to treatment," scores in the 20-80% range (55-125) as "moderate compliance to treatment" and scores in the 80-100% range (126-150) as "poor compliance to treatment." The scale consists of 7 subscales.[15]

Statistical Analysis

In the study, data were analyzed with the SPSS 21 package program. Since the data were not normally distributed, Mann-Whitney U test was used for comparisons between paired groups and Kruskall Wallis H test was used for comparisons between three or more groups. The relationship between categorical data was analyzed by Chi-square analysis. Spearman correlation analysis was used for the relationship between variables. Descriptive statistical method was used to evaluate the study data. The significance level is 0.05.

RESULTS

The socio-demographic characteristics of the patients participating in the study are shown in Table 1. It can be said that the two groups were homogeneous in terms of socio-demographic variables (Table 1). The average age of the patients and the time they were diagnosed with diabetes are in Table 2. There is no significant difference between treatment groups, age values, and duration of diabetes diagnosis (p>0.05) (Table 2).

Table 1. Socio-demographic characteristics of Type 2 DM patients using insulin and OAD treatment

		Treatment groups						Chi-square analysis	
		OAD		Insulin		Total			
Characteristics		n	%	n	%	n	%	Chi-square	p
Gender	Male	24	39.3	29	47.5	53	43.4	0.834	0.361
	Female	37	60.7	32	52.5	69	56.6		
Education status	Literate	9	14.8	9	14.8	18	14.8	0.58	0.748
	Primary school/ secondary school	44	72.1	41	67.2	85	69.7		
	High school and others	8	13.1	11	18.0	19	15.6		
Marital status	Single	8	13.1	12	19.7	20	16.4	0.538	0.463
	Married	53	86.9	49	80.3	102	83.6		
Income status	Low	11	18.0	14	23.0	25	20.5	0.201	0.654
	Middle/high	50	82.0	47	77.0	97	79.5		
Employment status	Yes	14	23.0	16	26.2	30	24.6	0.044	0.833
	No	47	77.0	45	73.8	92	75.4		
Participation in diabetes education	Yes	36	59.0	43	70.5	79	64.8	1.293	0.256
	No	25	41.0	18	29.5	43	35.2		
Regular visits to physician controls	Yes	41	67.2	47	77.0	88	72.1	1.019	0.313
	No	20	32.8	14	23.0	34	27.9		
Using medications regularly	Yes	54	88.5	57	93.4	111	91.0	0.4	0.527
	No	7	11.5	4	6.6	11	9.0		
Using alternative treatment methods	Yes	12	19.7	10	16.4	22	18.0	0.055	0.814
	No	49	80.3	51	83.6	100	82.0		

DM: Diabetes mellitus, OAD: Oral antidiabetic

Table 2. Mean age and duration of diabetes diagnosis of type 2 DM patients using insulin and OAD treatment

Characteristics	Treatment groups	Mean	Min	Max	SD	Mann-Whitney U test Mean ranks	U	p
Age	OAD	57.18	24.00	82.00	10.88	60.95		
	Insulin	57.02	20.00	78.00	13.75	62.05	1827	0.864
	Total	57.10	20.00	82.00	12.35			
Duration of diabetes diagnosis	OAD	5.90	1.00	30.00	6.75	62.30		
	Insulin	6.72	1.00	35.00	8.87	60.70	1812	0.784
	Total	6.31	1.00	35.00	7.86			

DM: Diabetes mellitus, OAD: Oral antidiabetic, Min: Minimum, Max: Maximum, SD: Standard deviation

For the OAD group, the Type 2 DM Treatment Patient Compliance Scale total score is 81.67±10.10, while the AADQ total score is 46.79±11.56. For the insulin group, the Type 2 DM Treatment Patient Compliance Scale total score is 84.75±13.56, while the AADQ total score is 47.59±10.69. In the study, there was no significant difference between the treatment groups in terms of all sub-dimensions, the AADQ, and the type 2 DM Treatment Patient Compliance Scale (p>0.05) (Table 3).

Table 3. Total scores of Type 2 DM Treatment Patient Compliance Scale and acceptance and action diabetes questionnaire according to treatment groups

Mean		Treatment groups				Mann-Whitney U test		
		Mean	Min	Max	SD	Mean ranks	U	p
Emotional difficulties in compliance	OAD	23.34	15.00	36.00	5.21	57.67	1627	0.231
	Insulin	24.48	8.00	40.00	6.05	65.33		
Physical difficulties in compliance	OAD	13.30	7.00	24.00	4.13	58.40	1671.5	0.332
	Insulin	13.82	6.00	23.00	3.97	64.60		
Changing difficulties in compliance	OAD	8.05	3.00	15.00	2.43	58.95	1705	0.421
	Insulin	8.48	3.00	15.00	2.43	64.05		
Acceptance difficulties in compliance	OAD	8.49	3.00	15.00	3.11	58.43	1673.5	0.335
	Insulin	9.08	3.00	15.00	3.14	64.57		
Awareness difficulties in compliance	OAD	7.92	4.00	14.00	2.82	61.07	1834.5	0.893
	Insulin	7.84	4.00	13.00	2.37	61.93		
Diet difficulties in compliance	OAD	11.10	3.00	15.00	2.58	59.98	1768	0.632
	Insulin	11.25	5.00	15.00	2.43	63.02		
Denial difficulties in compliance	OAD	9.48	3.00	15.00	2.95	58.87	1700	0.408
	Insulin	9.82	3.00	15.00	3.39	64.13		
Type 2 DM Treatment Patient Compliance Scale total score	OAD	81.67	57.00	103.00	10.10	55.92	1520	0.081
	Insulin	84.75	44.00	126.00	13.56	67.08		
Acceptance and Action Diabetes Questionnaire total score	OAD	46.79	15.00	59.00	11.56	60.85	1821	0.839
	Insulin	47.59	24.00	63.00	10.69	62.15		

DM: Diabetes mellitus, Min: Minimum, Max: Maximum, SD: Standard deviation, OAD: Oral antidiabetic

There is a significant and negative correlation between the total score of the AADQ and the emotional difficulties in compliance subscale score (r=-0.322; p<0.05), physical difficulties in compliance subscale score (r=-0.181; p<0. 05), changing difficulties of habits in compliance subscale score (r=-0.415; p<0.05) and acceptance difficulties in compliance subscale score (r=-0.288; p<0.05) (r=-0.322; p<0.05). As the total score of the AADQ increases, the emotional difficulties in compliance, physical difficulties in the compliance subscale score, changing difficulties of habits in the compliance subscale score, and acceptance difficulties in the compliance subscale score decrease. There was no significant relationship between the total score of the AADQ and the awareness difficulties in compliance subscale score, diet difficulties in compliance, and denial difficulties in compliance subscale score (p>0.05). There is a significant and negative correlation between the total score of the AADQ and the total score of the Type 2 DM Treatment Patient Compliance Scale (r=-0.375; p<0.05). As the total score of the AADQ increases, the total score of the Type 2 DM Treatment Patient Compliance Scale decreases (Table 4).

In the study, a significant and negative relationship was observed between the total score of the AADQ and the emotional difficulties in compliance subscale score (r=-0.303; p<0.05), changing difficulties of habits in compliance subscale score (r=-0.359; p<0.05), and acceptance difficulties in compliance subscale score (r=-0.279; p<0.05) in patients using OAD treatment. As the total score of the AADQ increases, the emotional difficulties in the compliance subscale score, changing difficulties of habits in the compliance subscale score, and acceptance difficulties in the compliance subscale score decrease. There was no significant relationship between the total score of the AADQ and the physical difficulties in the compliance subscale score, the awareness difficulties in the compliance subscale score, the diet difficulties in the compliance subscale score, and the denial difficulties in the compliance subscale score (p>0.05). There is a significant and negative correlation between the total score of the AADQ and the total score of the Type 2 DM Treatment Patient Compliance Scale (r=-0.352; p<0.05). As the total score of the AADQ increased, the total score of the Type 2 DM Treatment Patient Compliance Scale decreased (Table 5).

In the study, a significant and negative correlation was observed between the total score of the AADQ and the emotional difficulties in compliance subscale score (r=-0.341; p<0.05), changing difficulties of habits in compliance subscale score (r=-0.480; p<0.05), awareness difficulties in compliance subscale score (r=-0.262; p<0.05) and acceptance difficulties in compliance subscale score (r=-0.303; p<0.05). As the total score of the AADQ increases, the emotional difficulties in the compliance subscale score, changing difficulties of habits in the compliance subscale score, awareness difficulties in compliance, and acceptance difficulties in the compliance

Table 4. The relationship between the total scores of the Type 2 DM Treatment Patient Compliance Scale and the AADQ

		Correlation							
		Emotional difficulties in compliance	Physical difficulties in compliance	Changing difficulties of habits in compliance	Acceptance difficulties in compliance	Awareness difficulties in compliance	Diet difficulties in compliance	Denial difficulties in compliance	Type 2 DM Treatment Patient Compliance Scale total score
AADQ total score	r	-0.322**	-0.181*	-0.415**	-0.147	-0.288**	-0.074	0.055	-0.375**
	p	0.000	0.046	0.000	0.106	0.001	0.420	0.545	0.000

DM: Diabetes mellitus, AADQ: Acceptance and Action Diabetes Questionnaire

Table 5. The relationship between the total scores of the Type 2 DM Treatment Patient Compliance Scale and AADQ using oral antidiabetics

		OAD treatment							
		Correlation							
		Emotional difficulties in compliance	Physical difficulties in compliance	Changing difficulties of habits in compliance	Acceptance difficulties in compliance	Awareness difficulties in compliance	Diet difficulties in compliance	Denial difficulties in compliance	Type 2 DM Treatment Patient Compliance Scale total score
AADQ total score	r	-0.303*	-0.189	-0.359**	-0.029	-0.279*	0.070	0.074	-0.352**
	p	0.017	0.145	0.004	0.822	0.030	0.593	0.571	0.005

DM: Diabetes mellitus, AADQ: Acceptance and Action Diabetes Questionnaire

subscale score decreases. There was no significant relationship between the total score of the AADQ and the physical difficulties in the compliance subscale score, the diet difficulties in the compliance subscale score, and the denial difficulties in the compliance subscale score ($p>0.05$). There was a significant and negative correlation between the total score of the AADQ and the total score of the Type 2 DM Treatment Patient Compliance Scale ($r=-0.415$; $p<0.05$). As the total score of the AADQ increases, the total score of the Type 2 DM Treatment Patient Compliance Scale decreases (Table 6).

DISCUSSION

Identifying and resolving the factors that lead to non-compliance in patients diagnosed with DM can reduce complications, mortality, and economic burden.[16] In our study, patients with DM who use insulin and OAD have moderate compliance with treatment and good acceptance and action status. A study by Kim et al.[17] found that poorer medication adherence led to worsening health outcomes that needed to be addressed in previous studies. Therefore, this study found that as the disease acceptance and action score of DM patients using OAD therapy increased, attitudes and emotional factors, emotions, and behaviors suitable for lifestyle change compliance decreased. This may be because patients may get bored of doing the same practices over time. It was found that there are studies on different topics in the literature, and there are some similarities with our research. The survey conducted by Balkhi et al.[18] found that almost half of the patients had good adherence. In a study by Haskani et al.,[19] most participants reported nonadherence for various reasons. Eze et al.[20] found that 79.5% of the patients had poor glycemic control, and moderate medication adherence was predominant. A study conducted by Çorak et al.[21] found that 45.2% of the patients had a low level of adherence. Jiraporncharoen et al.[22] reported that symptoms at the time of diagnosis were associated with understanding and acceptance of medication intake, presence of family support, physician's perception of concern, and increased medication adherence. Our study also observed that as the total score of the AADQ increased, the emotional difficulties in adjustment subscale score, the difficulty in changing habits subscale score, and the difficulty in acceptance subscale score decreased.

Our study observed similar results in insulin replacement therapy users as in OAD users. Only differently, it was found that anger decreased as the disease acceptance and action scores of DM patients increased. This was thought to be because offense declined as the patients accepted the disease. Consoli and Formoso[23] found that only 25% of DM patients had high adherence, and 28% had low commitment. In the same study, in general, patients reported that they needed to remember the timing or dosage of their last injection an average of 2.4 times a week, and the most frequently cited reasons for this were difficulty following instructions and having too much information to manage. Chefik et al.[24] found that compliance with insulin treatment was low. It has also been determined that compliance with insulin therapy is affected by having a glucometer, regular hospital follow-up, knowledge, and positive attitude. In a survey conducted by Güleyyupoğlu et al.[25] to determine the effect of fear of finger pricking and insulin injection on adherence to treatment in individuals diagnosed with DM, it was determined that fear of self-testing in patients was effective on compliance to treatment.

In our study, it was observed that as the total score of the AADQ increased, the total score of the Type 2 DM Treatment Patient Compliance Scale decreased in patients using OAD and insulin. This was thought to be because patients got bored of doing the same practices over time. In the literature, similar to our study, Chin et al.[26] found that approximately 60.3% of the participants adhered to their medications, and increasing age was significantly associated with nonadherence to drugs. In a study conducted by Kara et al.[27] to investigate the relationship between depressive symptoms, quality of life, and treatment adherence in patients diagnosed with Type 2 DM and the type of treatment used and socio-demographic variables, patients with OAD + insulin had poorer treatment adherence, HbA1c, depression and quality of life scores. In the study conducted by In their research on family support in individuals with type 2 DM, Arı and Özdelikara[28] found the mean total score

Table 6. The relationship between the total scores of the Type 2 DM Treatment Patient Compliance Scale and the AADQ in patients using insulin

		Insulin treatment							
		Correlation							
		Emotional difficulties in compliance	Physical difficulties in compliance	Changing difficulties of habits in compliance	Acceptance difficulties in compliance	Awareness difficulties in compliance	Diet difficulties in compliance	Denial difficulties in compliance	Type 2 DM Treatment Patient Compliance Scale total score
AADQ total score	r	-0.341**	-0.141	-0.480**	-0.262*	-0.303*	-0.231	0.036	-0.415**
	p	0.007	0.278	0.000	0.041	0.018	0.073	0.783	0.001

DM: Diabetes mellitus, AADQ: Acceptance and Action Diabetes Questionnaire

of the Illness Acceptance Scale to be 24.97±5.00. The mean total score of the Type 2 DM Treatment Patient Compliance Scale was 82.77±9.19. In the study conducted by Şireci and Yılmaz Karabulutlu[29] to determine the disease acceptance status, self-efficacy levels, and affecting factors of patients with type 2 DM and to investigate the relationship between disease acceptance and self-efficacy, the disease acceptance scale score of the patients was found to be 27.82±5.70. The same study determined that some patients' descriptive and disease-related characteristics affected disease acceptance and self-efficacy. In the survey conducted by Alharbi et al.,[30] the critical analysis of 20 selected studies revealed the diversity of drug adherence levels in adults with type 2 DM. In the same survey, studies showed that older adults and women adhered to medications more than younger adults and male patients.

CONCLUSION

In our study, the treatment compliance of patients with DM using insulin and OAD was moderate. Their acceptance and action status were also good. This study observed similar results in patients with insulin treatment groups as in patients using OADs. Our research found that anger decreased over time as the acceptance and action scores of diabetic patients increased. In addition, our study observed that compliance decreased as acceptance and action rates increased in patients using oral antidiabetics and in patients using insulin. Therefore, it is essential to ensure continuous patient follow-up over time and the continuity of training. In addition to repeating this study to include different regions, it may be recommended to investigate patients' thoughts on this issue. Awareness of DM complications by patients provides excellent support in slowing and preventing the progression of the disease course and in protecting and improving the individual's health. Improving the self-care behaviors of DM patients and managing the disease are essential in preventing acute and chronic complications of DM. In conclusion, our study contributes to the literature.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of the Kastamonu University Clinical Researches Ethics Committee (Date: 30.01.2023, Decision No: 2023-KAEK).

Informed Consent

All patients signed and free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

REFERENCES

1. Diabetes Mellitus ve Komplikasyonlarının Tanı, Tedavi ve İzlem Kılavuzu 2022. Türkiye Endokrinoloji ve Metabolizma Derneği. 15. Baskı. 2022, Ankara. Available from: https://file.temd.org.tr/Uploads/publications/guides/documents/diabetes-mellitus_2022.pdf). [Cited 2023 22/06].
2. Diabetes. Available from: https://www.who.int/health-topics/diabetes#tab=tab_1. [Cited 2023 22/06].
3. Marshall SM, Flyvbjerg A. Prevention and early detection of vascular complications of diabetes. *BMJ*. 2006;333(7566):475-480.
4. Dobbels F, Van Damme-Lombaert R, Vanhaecke J, De Geest S. Growing pains: non-adherence with the immunosuppressive regimen in adolescent transplant recipients. *Pediatr Transplant*. 2005;9(3):381-390.
5. Al-Tarawneh F, Ali T, Al-Tarawneh A, et al. Study of adherence level and the relationship between treatment adherence, and superstitious thinking related to health issues among chronic disease patients in Southern Jordan: cross-sectional study. *Patient Prefer Adherence*. 2023;17: 605-614.
6. Wabe NT, Angamo MT, Hussein S. Medication adherence in diabetes mellitus and self management practices among type-2 diabetics in Ethiopia. *N Am J Med Sci*. 2011;3(9):418-423.
7. Kafes AY. An overview of depression and anxiety disorders. *J Int Psychol Counsel Guidance Res*. 2021;3(1):186-194.
8. Keskin N, Tamam L. Sleep in mental disorders. *Arch Med Rev J*. 2018;27(1): 27-38.
9. Hapunda G. Coping strategies and their association with diabetes specific distress, depression and diabetes self-care among people living with diabetes in Zambia. *BMC Endocr Disord*. 2022;22(1):215.
10. Pérez-Fernández A, Fernández-Berrocal P, Gutiérrez-Cobo MJ. The relationship between well-being and HbA1c in adults with type 1 diabetes: a systematic review. *J Diabetes*. 2023;15(2):152-164.
11. Piotrkowska R, Terech-Skóra S, Mędrzycka-Dąbrowska W, Jarzynkowski P, Król M. Factors determining acceptance of disease and its impact on satisfaction with life of patients with peripheral artery disease. *Nurs Open*. 2021;8(3):1417-1423.
12. Richardson A, Adner N, Nordström G. Persons with insulin-dependent diabetes mellitus: acceptance and coping ability. *J Adv Nurs*. 2001;33(66): 758-763.
13. Çapık C. Statistical power analysis and its use in nursing studies: basic information. *J Anatolia Nurs Health Sci*. 2014;17(4):268-274.
14. Karadere ME, Yavuz KF, Asafov EY, Küçükler FK. Reliability and validity of a Turkish version of the Acceptance and Action Diabetes Questionnaire. *Psychiatry Investig*. 2019;16(6):418-424.
15. Demirtaş A, Akbayrak N. Development of an assessment scale for treatment compliance in type 2 diabetes mellitus in Turkish population: psychometric evaluation. *Int J Nurs Sci*. 2017;4(3):244-251.
16. Fayyaz F, Aghamahdi F, Noorian S, et al. Associated factors to insulin adherence in type 1 diabetes in Tehran and Karaj, Iran. *J Diabetes Metab Disord*. 2022;21(2):1591-1597.
17. Kim YY, Lee JS, Kang HJ, Park SM. Effect of medication adherence on long-term all-cause-mortality and hospitalization for cardiovascular disease in 65,067 newly diagnosed type 2 diabetes patients. *Sci Rep*. 2018; 8(1):12190.
18. Balkhi B, Alwhaibi M, Alqahtani N, et al. Oral antidiabetic medication adherence and glycaemic control among patients with type 2 diabetes mellitus: a cross-sectional retrospective study in a tertiary hospital in Saudi Arabia. *BMJ Open*. 2019;9(7):e029280.
19. Muhammad Haskani NH, Goh HP, Wee DVT, et al. Medication knowledge and adherence in type 2 diabetes mellitus patients in brunei darussalam: a pioneer study in Brunei Darussalam. *Int J Environ Res Public Health*. 2022;19(12):7470.
20. Eze UIH, Akhumi TF, Iheanacho CO, Saka SA. Drug therapy and medication adherence in type 2 diabetes in a care facility: a cross sectional survey. *Explor Res Clin Soc Pharm*. 2022;8:100200.
21. Çorak B, Uysal N. The effect of health perception and family support on the level of adherence to treatment in individuals with type 2 diabetes mellitus. *Ankara Eğt Arş Hast Derg*. 2022;56(1):64-68.

22. Jiraporncharoen W, Pinyopornpanish K, Junjom K, et al. Exploring perceptions, attitudes and beliefs of Thai patients with type 2 diabetes mellitus as they relate to medication adherence at an out-patient primary care clinic in Chiang Mai, Thailand. *BMC Fam Pract*. 2020;21(1):173.

23. Consoli A, Formoso G. Patient perceptions of insulin therapy in diabetes self-management with insulin injection devices. *Acta Diabetol*. 2023;60(5): 705-710.

24. Chefik FH, Tadesse TA, Quisido BJE, Roba AE. Adherence to insulin therapy and associated factors among type 1 and type 2 diabetic patients on follow up in Madda Walabu University Goba Referral Hospital, South East Ethiopia. *PLoS One*. 2022;17(6):e0269919.

25. Güleyyupoğlu MD, Muz G, Çırpan R. The effect of the fear of finger punching and insulin injection on administration to the treatment in individuals with a diabetes *diagnosis. J Health Sci*. 2022;31:51-59.

26. Chin SS, Lau SW, Lim PL, et al. Medication adherence, its associated factors and implication on glycaemic control in patients with type 2 diabetes mellitus: a cross-sectional study in a Malaysian primary care clinic. *Malays Fam Physician*. 2023;18(1):1-11.

27. Kara AM, Kara T. Relationship of treatment method with medication adherence, quality of life and depression in patients diagnosed with type 2 diabetes. *Med Bull Haseki*. 2019;57(4):377-385.

28. Arı N, Özdelikara A. The effect of family support on acceptance and treatment adaptation in type 2 diabetes patients applied to internal medicine clinics: Ordu province sample. *Turk J Diab Obes*. 2022;1:39-48.

29. Şireci E, Yılmaz Karabulutlu E. Diabetes mellitus type ii patients' acceptance of illness and determination of self efficacy levels for their care. *Anad Hemşir Sağ Bil Derg*. 2017;20(1):48-55.

30. Alharbi S, Alhofaian A, Alaamri MM. Illness perception and medication adherence among adult patients with type 2 diabetes mellitus: a scoping review. *Clin Pract*. 2023;13(1):71-83.