Physicians' Empathy and Its Effect on Adherence to Treatment of Diabetic Patients in Al-Qassim region, Saudi Arabia

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Abstract

Background:
Diabetes is one of the most common and costly chronic diseases worldwide and improving its outcome is very important in enhancing Quality of life. Physician empathy is important to feel at ease with your doctor, One of the most frequent tasks and back bone of patient-physician communication with diabetic patients.

Objective: Assessment of the frequency of medication adherence and the relationship between physicians' empathy and adherence to treatment among diabetic patients receiving health care in Primary Health Care centers (PHCC) in Al-Qassim, Saudi Arabia

Methods: A cross-sectional study was conducted among diabetic patients involved in primary health care centers in Buraydah, Al-Qassim, Saudi Arabian in the period from April to September 2019. Physicians' empathy score was assessed using the Consultation and Relational Empathy (CARE) Measure and General Medication Adherence Scale (GMAS) to document medication adherence.

Results: Adherent to treatment was 56.01%, factors affecting adherence were sex and marital status, complications showed significance increase in low adherent group, Physicians' empathy score was significantly higher in adherent group, there was a significant negative correlation between Physicians' empathy score and Adherence Score and Physicians' empathy score was significantly higher in non-complicated patients.

Conclusion:
Empathy affects diabetic patients' adherence to treatment, the more the physicians' empathy score the better the adherence to treatment and the lesser the complication so better quality of life of the diabetic patients.

Keywords: Physicians, Adherence, Empathy, Diabetes Mellitus

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Introduction

The proper contact between the doctor and the patients is very important element of treatment procedure so every doctor should have essential communication skills. One of these skills is empathy, it is the building block of the physician-patient relationship and it is proven to benefit both physicians and patients (1).

Empathy refers to care that includes the understanding of the patient perspective, shared decision-making between patients and physicians, and consideration of the broad context in which illness is experienced. The patients' experiences of physician empathy could lead to a better positive influence on health outcomes (2).

The physicians' accurate understanding of their diabetic patients' beliefs about their illness which is an indicator of understanding physician-patient empathy. It also was associated with better self-care among diabetic patients as improved diet and increased blood glucose self-testing. It is recommended that empathy could also increase patients' satisfaction, which has independent association with the diseases consequences. So empathetic patient-centered care might play an important role in improving managing of chronic diseases like diabetes mellitus (3).

Diabetes mellitus is one of the major and increasing public health problems that can affect all people of all ages globally in which there is abnormally elevated blood glucose either due to deficiency in insulin or decreased receptors sensitivity for insulin action or both (4). There are three major classifications of diabetes mellitus which are type 1 diabetes, type 2 diabetes and gestational diabetes (5).

Diabetes is recognized as an important cause of premature death and disability. World leaders Political Declaration on the Prevention and Control of non-communicable diseases (NCDs) demonstrated diabetes as one of the priorities that its incidence and health impacts cam be decreased by adoption of affordable, cost effective population-wide and multisectoral interventions (6).

People with diabetes and chronic hyperglycemia have an increased risk of developing several serious health problems and complications such as retinopathy, nephropathy, peripheral neuropathy, and lower limb amputation, which affect their quality of life (7).

Diabetes is a complex chronic challenging disease to success management. With its increasing prevalence, optimizing its management is a public health priority. Although the care regimen is complex, patients with good diabetes self-care adherence can control. However, many

patients do not meet good diabetic control and continuing suffering from diabetic complications. The physician knows that if only their patients adhere to their ideal treatment, they could do well and reduce diabetes complications (8).

The doctor-patient relationship in its historical context depends on respect, and if the doctor also displays compassion, it sets the scene for the development of trust. It is meant in a medical situation, the technical task at hand and the available means to cope with it. Most patients are feeling anxious and fearful. Physicians should instill confidence and reassurance. Empathy plays a crucial role in the doctor-patient relationship. It demands physicians must never forget that patients are individual human beings with problems that all too often transcend their physical complaints (9).

Diabetic patients′ compliance to treatment is directly correlated with doctor-patient relationship. Promising outcomes of patients have established to be affected with verbal and nonverbal behaviors of these patient during their interaction with doctors (10).

The aim of this study was to assess the frequency of medication adherence and the relationship between physicians' empathy and adherence to treatment among diabetic patients receiving health care in Primary Health Care centers (PHCC) in Al-Qassim, Saudi Arabia.

Methods

Study design: A cross-sectional study with analytical component was conducted among diabetic patients involved in primary health care centers in Buraydah, Al-Qassim, Saudi Arabian in the period from April to September 2019.

Study participants:

Patients were selected from diabetic patients who had their care and follow up in primary health care centers (PHCC) in Buraydah, Al-Qassim region. Male and female either T1D or T2D patients, aged more than 18 years old who were on drug treatment and accepted to participate were included in the study however who are less than 18 years old, recently diagnosed (1 month ago), severely ill, pregnant diabetics and who refused to participate were excluded from our study

Sample size:

The total diabetic patients who make follow up in PHCC centers in Buraydah was 17939, Sample size was calculated using Epiinfo 7 at a 95% confidence interval and 50% expected frequency and accepted margin of error 5%. The sample size was 376 participants to be included in the study, we increase 10% of the of calculated sample size to overcome problems in data collection so the targeted number of diabetics to collect data from them was 414 participants.

Recruitment of the study participants

There are forty-one primary health care center in city involved in follow up and patient care for diabetics, five primary health care centers (PHCC) were chosen randomly by simple random method technique, these five PHC were (Alrafiah, Al ethcan, Aldahy, Ash-shimasiyah, Alshoka)

During the study period, data were collected by some of the researchers or trained interviewers (trained by some of the researchers) randomly by a systemic random method through choosing patients came for follow up every Wednesday, the diabetic patients who accepted to share in the study were attending a subsequent private personal meeting about 5-10 minutes to fill up a questionnaire aiming to assess the physician-patient relationship and their adherence to treatment among diabetic patients.

A total 423 diabetic patients filled the questionnaire after that the incomplete forms were excluded and the total number of participants became 391 after exclusion of 32 responses.

Tools of study

The questionnaire was composed of the following parts:

Part 1: Socio-demographic and clinical related data:

Age, gender, nationality (either Saudi or non-Saudi), marital status, income, type of DM and its duration, long term complication as retinopathy, neuropathy, nephropathy, and food ulcer and HbA1C

Part 2: Measurement of physicians' empathy score:

It was done using the Consultation and Relational Empathy (CARE) Measure which is a person-centered process measure that was developed and researched at the Departments of General Practice at Glasgow University and Edinburgh University. The CARE was validated in many studies. The CARE Measure is a quick (10 questions), clear and easy to complete the patient-completed questionnaire. It measures empathy in the context of the therapeutic relationship during a one-on-one consultation between a clinician and a patient. The scoring system for each item is 'poor'=1, 'fair' = 2, 'good' = 3, 'very good' = 4, and 'excellent'= 5. All ten items are then added, giving a maximum possible score of 50, and a minimum of 10. Up to two 'Not Applicable' responses or missing values are allowable and are replaced with the average score for the remaining items. Questionnaires with more than two missing values or 'Not Applicable' responses are removed from the analysis (11).

Part 3: Assessment of adherence to anti diabetic medication

The study used the General Medication Adherence Scale (GMAS) to document medication adherence in this population. The GMAS was validated in Saudi patients with chronic illness. Patient adherence to treatment was assessed using four questions, Q1: Do you ever forget to take your diabetic medication?"; Q2: Do you ever have problems remembering to take your diabetic medication?"; Q3: When you feel better, do you sometimes stop taking your diabetic medication?"; and Q4: Sometimes if you feel worse when you take your diabetic medication, do you stop taking it?". Patient responded "yes or no" one point was given to for each yes response and zero for no answer so the lower the score the more the adherence, total score equal or more than 3 is considered low adherent, less than 3 is considered adherent to treatment (12)

The questionnaire was designed by the researchers. Its contents were revised by a jury of consultants of Community Medicine, Family Medicine and internal Medicine to assess its validity, and pre-tested on 30 diabetics among selected PHC as a pilot study before the study data collection to ensure the clarity and easy handling of the questions, their results were not included in the results. Relevant modifications were instituted prior to commencement of actual data collection. The reliability of the questionnaire was measured using Cronbach's alpha and the value was 0.783

Ethical consideration

Ethical approval was granted by the Research Ethical Committee of the General directorate of health, Al-Qassim region, Ministry of Health, Saudi Arabia (H-04-Q-001-1440-1513492 on 25-March-2019) and written consent was also obtained from each participant, it was included in the first part of the questionnaire. Participants were informed that the obtained information was confidential.

Data management

Data were tabulated, coded and analyzed using the Statistical Package for the Social Sciences (SPSS) software version 20.0 for Windows. Quantitative data was summarized with mean and standard deviation or median and Inter Quartile Range (IQR). Qualitative data was expressed in frequencies and percentage. Chi square "X^2" test was used to compare categorical data. Normality was verified and the significance of difference was tested using Student's t-test to compare between mean of two groups of numerical (parametric) data, for non- parametric data, Mann-Whitney U- test was used. Correlation coefficient was used to detect the association between different variables. A p value of <0.05 was considered significant.

Results:

Table (1): Socio-demographic and clinical characteristics of the study participants (n = 391)

Variables		No.	%
Sex	Male	177	45.3
	Female	214	54.7
Nationality	Saudi	305	78.0
	Non-Saudi	86	22.0
Income	Regular	233	59.6
	Irregular	158	40.4
Marital status	Single	22	5.6
	Married	285	72.9
	Divorcee	7	1.8
	Widowed	77	19.7
Type of DM	DM1	48	12.3
	DM2	343	87.7
Diabetes complications	Eye complications	190	48.6
	Neurological problems	188	48.1
	Kidney diseases	80	20.5
	Diabetic foot	66	16.9
Age (in years) (Mean ± SD)		53.4 ± 13.2 (18.0 – 79.0)	
Duration of illness Median (IQR)		10 (5.0 - 15.0)	
HbA1C (Mean ± SD)		8.5 (6.5 – 10.5)	
Physician empathy score Median (IQR)		30.0 (20.0 – 40.0)	
Adherence Score Median (IQR)		3.0 (2.0-3.0)	

Regarding socio-demographic data of the study participants (n=391), their age ranged from 18 to 79 years old with mean of 53.4 ± 13.2, Males represented 45.3%, 78% were Saudi, regular income was detected in 59.6% of the studied patients, 72.9% were married, according to type of DM, 87.7% of the study participants had type 2 DM, the median of duration of illness was 10 and its interquartile range (IQR) from 5-15 years old, considering Diabetes complications which occurred in the last year for the study participants, eye complications occurred in 48.6% of them, 48.1% showed neurological problems, 20.5% complained from Kidney diseases and Diabetic foot occurred in 16.9% of them. As regards HbA1C, it was ranged from 6.5 to 10.5 and its mean was 8.5, The median of physicians' empathy score was 30 with 20-40 interquartile range, while patients' Adherence Score median was 3 and its interquartile range from 2 to 3.

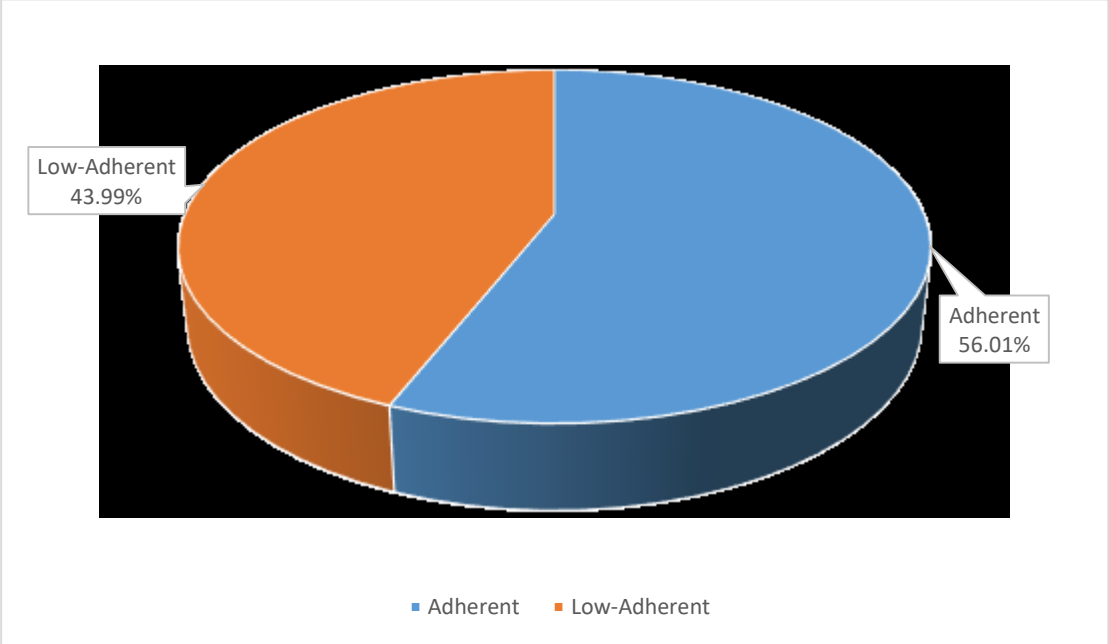

Figure (1): study group regarding adherent to treatment

Figure 1 states that the percent of studied patients who were adherent and Low-adherent to treatment was 56.01% and 43.99% respectively.

Table (2): Comparison between Adherent and Non-Adherent to treatment regarding Demographic characteristics of the study participants (n = 391)

Variables		Adherent to treatment (n=219)		Low-Adherent to treatment (n=172)		P
		N	%	N	%	
Female sex		111	64.5%	103	47.0%	0.001*
Saudi		166	75.8%	139	80.8%	0.23
Regular income		138	63.0%	95	55.2%	0.12
Married		142	64.8%	143	83.1%	<0.001*
Type of DM	DM1	21	9.6%	27	15.7%	0.07
	DM2	198	90.4%	145	84.3%	
Diabetes complications						
Eye complications		91	41.6%	99	57.6%	0.002*
Neurological problems		95	43.4%	92	54.1%	0.04*
Kidney diseases		25	11.4%	55	31.9%	0.000*
Diabetic foot		31	14.2%	35	20.4%	0.1
Age (in years) (Mean ± SD)		53.7 ± 11.8 (18.0-79.0)		53.01 ± 14.7 (18.0-78.0)		0.6
Duration of illness Median (IQR)		11.0 (6.0-14.0)		10.0 (5.0-15.75)		0.057
Physicians' empathy score Median (IQR)		34.0 (30.0-44.0)		30.0 (25.0-33.0)		0.000*

Table 2 shows that On comparison of Physicians' empathy score between adherent and non-adherent to treatment, significantly higher median empathy score of adherent to treatment compared to non- adherent to treatment (34 versus 30, p <0.001).

There was a statistically significant difference between adherent and non- adherent to treatment regarding: sex (p =0.001), marital status (p <0.001), but there was non-significant difference regarding age (p=0.6), nationality (p=0.23), regular income (p=0.12), type of DM (p=0.07) and duration of illness (p=0.057).

Regarding Diabetes complications in the studied group; the percentage of occurrence of complications was more in non-adherent to treatment group, there was a statistically significant difference between adherent and non- adherent to treatment regarding eye complications (p=0.002), neurological problems (p=0.04) and kidney diseases (p<0.001) however there was no statistically significant difference regarding Diabetic foot (p=0.1).

Table (3): Correlation between Physicians' empathy score, Adherence Score and HbA1C

	Physicians' empathy score		**Adherence Score**	
	r	p-value	r	p-value
Physicians' empathy score	---	---	-0.408	<0.001*
Adherence Score	-0.408	<0.001*	---	---
HbA1C	-0.471	<0.001*	0.29	<0.001*

Correlation analysis between Physicians' empathy score, Adherence Score and HbA1C revealed that; there was a significant negative correlation between Physicians' empathy score and Adherence Score (r = -0.408; p<0.001) and there was a significant negative correlation between Physicians' empathy score and HbA1c (r = -0.471; p<0.001), however there was a significant positive correlation between Adherence Score and HbA1c (r = 0.29; p<0.001) (Table 3).

Table (4): Physician empathy score and Diabetes Complications

		Physicians' empathy score Mean ± SD	p-value
Eye problems	**Yes**	32.62 ± 7.79	0.002*
	No	35.00 ± 6.93	
Neurological problems	**Yes**	31.24 ± 7.08	<0.001*
	No	34.51 ± 7.4	
Kidney diseases	**Yes**	31.94 ± 7.26	<0.001*
	No	35.61 ± 7.19	
Diabetic foot	**Yes**	30.00 ± 6.54	<0.001*
	No	34.62 ± 7.38	

Table 4 revealed that, on comparison of Physicians' empathy score according to diabetes complications, diabetics with no complications stated a higher Physicians' empathy score than diabetics with complications and that differences were statistically significant in eye complication ($p=0.002$), neurological problems ($p<0.001$), kidney diseases ($p<0.001$) and diabetic foot ($p<0.001$).

Discussion

Empathy is an important part in physician-patient relationship and it is supposed to improve the health outcomes of the patients. This study aims at assess the frequency of medication adherence and the relationship between physicians' empathy and adherence to treatment among diabetic patients receiving health care in Primary Health Care centers (PHCC) in Qassim, Saudi Arabia.

Our study reported that the diabetic patients' adherence to treatment was 56.01%, while low-adherence was 43.99%. This is in accordance with other study in Saudi Arabia in which the overall treatment adherence was low in 45.3% (13) however in other Saudi studies, it was 21.4% (8) and 31.5% (14). A study in Egypt stated that 47.9% and 26% of its participants had a fair and poor adherence respectively (15). These findings are less than the percentages that reported in

Mexico (73.0%) (16) and higher than that of Pakistan study (23.7%) (10). While it is comparable to study in Cameroon where non-adherence to antidiabetic medication was 54.4% (17). So it is very important to detect diabetic patients who not adherent to treatment for improving and preventing complications. A finding in the present study was a significant association between sex and adherent & low-adherent to diabetic treatment. This finding is contrary to that reported in other studies (10,17). Nationality and regular income were insignificant association with degree of adherence to treatment, that may give a clue that adherence to treatment can be achieved with availability of treatment whatever the socioeconomic status of the patient. A significant association was detected between marital status and adherence to diabetic treatment. Similarly, in other studies (8,18–20). Regarding diabetes type the adherence was high among type 2 diabetes but the difference between the two types in adherence was statistically non-significant. This finding are in agreement with a study done in Saudi Arabia in which there was non-statistically significant difference in different adherence degrees regarding Diabetes type (8). The long duration of diabetes illness is insignificantly associated with adherence to treatment. These findings are similar to reported Thapar et al., 2020 who states that disease duration were found to be statistically not associated with good adherence behavior (19). There is a great diversity in factors affecting the medication adherence among diabetic patients from country to country this may be attributed to difference in culture, socio-economic and environmental factors.

Our study found an association between low-adherent to treatment and some diabetic complications (eye complication, neurological problems, and kidney diseases). Previous studies had similar findings (21–23). This finding highlights that adherence to treatment, reducing diabetes complications through following care in primary health care to improved outcomes with Diabetes patients

The current study revealed that there was a significant association between physicians' empathy score among diabetic patients and adherence to the treatment regimen. This finding is consistent with a study done at the diabetes center at Madinah, KSA (24), and in study held in Italy (3) in which the higher empathy score was associated with more adherence to treatment. A good and kind relationship between the diabetic patients and their physicians is a cornerstone to adherence and it became higher. Physicians should be responsive to the culture of the diabetic patient and also good listening and interacting with patients to trust physicians to follow their

instructions. Physicians in PHC provide the first direct care and follow for diabetic patients so adherence to anti-diabetes treatment regimen is essential for improving complications, improving adherence can be attained through empathy with these patients.

Finding in this study provides a significant negative correlation between physicians' empathy score and adherence score and also between physician empathy score and HbA1c. These findings are in agreement with those reported in previous studies in USA in which there was significant correlation between Patient Perceptions of Physician Empathy and compliance rates (25), and also Milky and Thomas who concluded that the higher the shared decision and empathy between patients and their health care providers the more the adherent to treatment (26), in contrast to a study held in Cleveland Clinic where the authors didn't detect correlation between physicians' empathy score and HbA1c in primary care although patient-centered care was improved by improvement in physician empathy (27), in our finding There is a significant positive correlation between adherence score and Hb1Ac. Similarly, in Malaysian study which reported that the Poorer the adherence to antidiabetic drugs the more HbA1c (28).

Our findings, Suggest that the significant association between physicians' empathy and diabetic complications (eye problems, neurological problems, kidney problems and diabetic foot). Similar to the finding in a UK study which reported that the higher of empathy score the less the rates of cardiovascular complications and all-cause mortality (2). Physician empathy is a "gold way" to prevent and reduce diabetic complications through better communication and follow plan of treatment. In PHC requires long-term continuity of care.

Study limitations:

This study, which illustrated the physician empathy and adherence and low adherence to anti-diabetes treatment in Buraydah city had some limitations, the design was a cross-sectional, which does not allow for a causal relationship of physician empathy with treatment adherent but this was due to time. So further large follow-up studies should be done to explore the importance, health effects of physicians' empathy on patients' health and quality of life in different specialties.

Conclusion:

Empathy is an important component of doctor patient relationship, it affects diabetic patients' adherence to treatment, the more the physicians' empathy score the better the adherence

to treatment and the lesser the complication so better quality of life of the diabetic patients. Higher physicians' empathy score was detected in non-complicated patients. It is recommended to improve this part in field work of physicians through either introducing it in their curricula or specialized training courses. Also there should be more health education sessions with diabetic patients to clarify the importance of adherence to treatment in control of their blood glucose level and decrease complications.

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References:

1. Platis C. Evaluation of the Physicians ' Empathy by their Patients : A Study among the Population of Evia Island , Greece. 2020;13(1):620–6.
2. Dambha-Miller H, Feldman AL, Kinmonth AL, Griffin SJ. Association between primary care practitioner empathy and risk of cardiovascular events and all-cause mortality among patients with type 2 diabetes: A population- based prospective cohort study. Ann Fam Med. 2019;17(4):311–8.
3. Canale S Del, Louis DZ, Maio V, Wang X, Rossi G, Hojat M, et al. The relationship between physician empathy and disease complications: An empirical study of primary care physicians and their diabetic patients in Parma, Italy. Acad Med. 2012;87(9):1243–9.
4. ADA. Diagnosis and classification of diabetes mellitus. Diabetes Care. 2013;36(1):S67.
5. Alanazi FK, Alotaibi JS, Paliadelis P, Alqarawi N, Alsharari A, Albagawi B. Knowledge and awareness of diabetes mellitus and its risk factors in Saudi Arabia. Saudi Med J. 2018;39(10):981–9.
6. WHO. Global Report on Diabetes. Vol. 978. 2016. Available from: http://www.who.int/about/licensing/

7. Diaz-Ĺopez A, Babio N, Martinez-González MA, Corella D, Amor AJ, Fitó M, et al. Mediterranean diet, retinopathy, nephropathy, and microvascular diabetes Complications: A post Hoc analysis of a randomized trial. Diabetes Care. 2015;38(11):2134–41.

8. Alqarni AM, Alrahbeni T, Al Qarni A, Al Qarni HM. Adherence to diabetes medication among diabetic patients in the Bisha governorate of Saudi Arabia – a cross-sectional survey. Patient Prefer Adherence. 2019;13:63–71.

9. Mohanty A. Doctor- patient relationship. In: Beyond Medicine. 2017. p. 1011–1013.

10. Zahid A, Ayub MA, Saeed M, Pasha N, Dar AJ, Javed H, et al. Treatment Compliance in Diabetics: Physician-Patient Relationship. Ann King Edward Med Univ. 2017;23(4):503–7.

11. Mercer S, and Murphy D. Validity and reliability of the CARE Measure in secondary care. Clin Gov An Int J. 2008;13:261–83.

12. Naqvi AA, AlShayban DM, Ghori SA, Mahmoud MA, Haseeb A, Faidah HS, et al. Validation of the general medication adherence scale in Saudi patients with chronic diseases. Front Pharmacol. 2019;10:1–10.

13. AlQarni K, AlQarni EA, Naqvi AA, AlShayban DM, Ghori SA, Haseeb A, et al. Assessment of Medication Adherence in Saudi Patients With Type II Diabetes Mellitus in Khobar City, Saudi Arabia. Front Pharmacol. 2019;10:1306.

14. Alshehri KA, Altuwaylie TM, Alqhtani A, Albawab AA, Almalki AH. Type 2 Diabetic Patients Adherence Towards Their Medications. Cureus. 2020;12(2):e6932.

15. Heissam K, Abuamer Z, El-Dahshan N. Patterns and obstacles to oral antidiabetic medications adherence among type 2 diabetics in ismailia, egypt: a cross section study. Pan Afr Med J. 2015;20:177.

16. Prado-Aguilar CA, Martínez Y V., Segovia-Bernal Y, Reyes-Martínez R, Arias-Ulloa R. Performance of two questionnaires to measure treatment adherence in patients with Type-2 Diabetes. BMC Public Health. 2009;9:1–8.

17. Aminde LN, Tindong M, Ngwasiri CA, Aminde JA, Njim T, Fondong AA, et al. Adherence to antidiabetic medication and factors associated with non-adherence among patients with type-2 diabetes mellitus in two regional hospitals in Cameroon. BMC Endocr Disord. 2019;19(1):19–35.

18. Lin LK, Sun Y, Heng BH, Kwang Chew DE, Chong PN. Medication adherence and glycemic control among newly diagnosed diabetes patients. BMJ Open Diabetes Res Care. 2017;5(1)::e000429.

19. Thapar R, Holla R, Kumar N, Aithal S, Karkera S, Rao C, et al. Factors influencing adherence to anti-diabetes medications among type 2 diabetes patients attending tertiary care hospitals in Mangaluru. Clin Epidemiol Glob Heal. 2020 Mar;Article In press.

20. Habtu M, Uwingabire S, Mureithi C GM. Knowledge and Attitude of Diabetes Mellitus and Adherence to Treatment Regimen among Diabetic Patients Attending Kirehe District Hospital, Rwanda. J Diabetes Clin Pract. 2019;2(2):109–15.

21. Alduraywish AA, Alanazi FM, Alharbi A, Al-rasheed FM, Alaithan LT. Correlation among the Glycemic Control and Lipogram Indices with Chronic Complications in Saudi Diabetic Patients : Al-Jouf Status. AUMJ. 2015;2(3):9–24.

22. Leasher JL, Bourne RRA, Flaxman SR, Jonas JB, Keeffe J, Naidoo K, et al. Global estimates on the number of people blind or visually impaired by diabetic retinopathy: A meta-analysis from 1990 to 2010. Diabetes Care. 2016;39(9):1643–9.

23. Kayar Y, Ilhan A, Kayar NB, Unver N, Coban G, Ekinci I, et al. Relationship between the poor glycemic control and risk factors, life style and complications. Biomed Res. 2017;28(4):1581–6.

24. Ibrahim HM, Abousada HJ, Alsharif RH, Alshanqiti NM. Association of Physicians ' Empathy with Adherence to Treatment among diabetic patients at King Fahd Hospital ,. World Fam Med. 2020;18(1):194–202.

25. Hojat M, Louis DZ, Maxwell K, Markham F, Wender R, Gonnella JS. Patient perceptions of physician empathy, satisfaction with physician, interpersonal trust, and compliance. Int

J Med Educ. 2010;1:83–7.

26. Milky G, Thomas J. Shared decision making, satisfaction with care and medication adherence among patients with diabetes. Patient Educ Couns. 2020;103(3):661–9.

27. Chaitoff A, Rothberg MB, Windover AK, Calabrese L, Misra-Hebert AD, Martinez KA. Physician Empathy Is Not Associated with Laboratory Outcomes in Diabetes: a Cross-sectional Study. J Gen Intern Med. 2019;34(1):75–81.

28. Hammad MA, Azri D, Noor M, Azhar S, Sulaiman S, Hammad MA. The Effect of Patient'S Adherence on HbA1C Control. Arch Med Pharm Sci Res. 2017;01(01):30–5.