

# Factors Associated with Non-Adherence among Type-2 Diabetes Mellitus Patients: Results from Primary Care Clinics in Faisalabad Pakistan

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## ABSTRACT

**Background:** The global increase in rates of type 2 diabetes has become a serious public health concern. Adherence to treatment is an important predictor of glycemic control. Poor adherence to treatment regimens is a major clinical problem in the management of diabetes. This study aims to identify the associated factors with non adherence to diabetes treatment among patients of type 2 diabetes.

**Study Design:** Cross-sectional study

**Place and Duration of Study:** Primary Care Clinics of Faisalabad, Pakistan from 1<sup>st</sup>December 2020 to 28<sup>th</sup>February 2021.

**Methodology:** Five hundred and forty nine adults (>18 years of age) confirmed cases of type 2 diabetes were consecutively approached.

**Results:** 56.6% were less than 50 and 43.4% were more than 50 years of age and 59.9% of the participants were females. About 42.7% of the participants were non-adherent to diabetes treatment. Participants aged less than 50 years were two times more at risk of being non-adherent (aOR: 1.88; 95% CI: 1.29-2.76). Level of education and duration to diagnosis of DM were marginally significant (p=0.07, p=0.06) to non-adherence respectively.

**Conclusion:** Adherence to treatment of diabetes and to achieve glycemic control is a challenging concern across countries including Pakistan. Therefore, aggressive counseling about benefits of regular exercise and diet with special emphasis on younger patients who recently diagnosed with diabetes should be implemented. Governments should reduce the costs of treatment to make it cheap and affordable and more parks, walking tracks should be introduced to make it accessible for population.

**Keywords:** Type 2 DM, Non-adherence, Physical activity, Pakistan

## INTRODUCTION

The prevalence of type 2 diabetes is increasing globally at an alarming rate and has become a serious public health concern. It is a major cause of morbidity, disability, and mortality among population worldwide.<sup>1</sup> The major causes of this increase in trend of type 2 diabetes are associated with unhealthy lifestyle such as poor dietary choices, lack of exercise, and inadequate physical activity.<sup>2-4</sup>

According to the International Diabetic Federation (IDF) report 2019, globally 463 million people are living with diabetes; this figure will rise to 700 million by the year 2045.<sup>5</sup> About 1 in 11 adults worldwide now have DM and it is the ninth major cause of death worldwide and was estimated to have caused 4.2 million deaths globally in 2019.<sup>5,6</sup> About 10% of the total global health expenditure, is spent on diabetes (\$760 billion) and approximately 79% people with diabetes are living in low and middle-income countries.<sup>5</sup>

Like in other developing countries Pakistan is also facing the surge in ever so increasing rate of diabetics. A large study in 16 districts of Pakistan, on 18,856 sample reported that the prevalence of type 2 diabetes across Pakistan was 16.98% and pre-diabetes was 10.91%.<sup>7</sup> Among Asian countries Pakistan ranks 2<sup>nd</sup> after India with 74.05 million diabetics.<sup>8</sup> Lack of health care resources and accelerating rate of diabetes in the country puts an immense pressure on the already fragile health care delivery system.

The management of diabetes multifaceted and is mainly based on life style modifications, dietary changes and pharmacotherapy, mainly aimed at preventing and controlling hyperglycemia.<sup>9,10</sup>

Adherence to treatment is an important predictor of glycemic control. Poor adherence to treatment regimens is a major clinical problem in the management of diabetes.<sup>11,12</sup> Adherence to lifestyle modifications have been shown to improve blood glucose levels and also reduce dyslipidemia and blood pressure which are key risk factors for the development of short and long complications of diabetes.<sup>11</sup>

Several studies have identified the factors associated with non-adherence to management of diabetes.<sup>13-16</sup> This includes age, gender, education, duration to diagnosis of diabetes, forgetting medications, fear of side effects, self-medication, poor follow-ups, relying on quacks etc.<sup>15,16</sup>

To maintain optimal glycemic levels it is necessary that diabetics should adhere to the treatment regimen. However, to understand the phenomenon of non-adherence to treatment it is imperative to identify the factors that play a role in it. Moreover, to the best of author's knowledge there is a paucity of data available on the same in Pakistan. Therefore, this study aims to identify the associated contributing factors with non adherence to diabetes treatment among type 2 diabetes patients. This can assist in preventing or significantly delay the diabetes-related complications and can minimize the burden on the health care delivery system.

## METHODOLOGY

This cross sectional study was conducted from December 2020 to February 2021 in Faisalabad, the third largest city of Pakistan. The data was collected from primary care clinics of Faisalabad. Confirmed type 2 diabetic patients >18 years of age and gave consent to participate in the study were included. However, patients suffering from serious co-morbid medical conditions like cancer, advanced heart failure or terminal renal failure etc. were excluded.

Eligible patients were consecutively taken from the outpatient primary hospitals till the data collection period. Trained data collectors identified eligible participants and verified their diabetes status and other co-morbid condition from the medical records. In all, 600 eligible type 2 diabetes patients were approached out of which 549 patients showed agreement to take part in present study.

A well-defined structured questionnaire was designed and used for data collection purpose. The questionnaire was developed in English and then was translated into Urdu (common dialect) and then was back translated into English to check for consistency. The questionnaire was pre-tested on small sample

size (5%). Questionnaire was composed of two sections. Section 1 included information regarding the participants' socio-demographic characteristics, past and present medical history, family history, duration to diagnosis of diabetes. Section 2 consisted of compliance scale formed after thorough literature search and experts of the field. The compliance scale had eight questions and assessed patients' non-adherence to medication, diet and physical activity. The responses were based on a 4-point Likert scale and each point was given a score. Digit 4 was assign to response 'Never'; A score of 3 was assigned to response 'sometimes'; a score of 2 was given to "Often (more than five times per month or more than two times per week)"; a score of 1 was assign to "Always". Total score for each patient was computed within the range of minimum (8) score to maximum (32) score. The cutoff for adherence was kept at 80% i.e. a score of 25 and non adherence was demarcated as score <25. Written informed consent was obtained from all study participants after explaining them about the study protocol. Ethical approval was also taken.

Data were analyzed and entered by using SPSS, version 19. Percentages and frequencies were also analyzed for categorical variables, Fisher' test or chi square test was used for group comparison. For the determination of associated factors with non-adherence, binary logistic regression models were. Variables which were significant at the univariate level (p<0.25) were then included in the multivariable regression model. The results were reported in the form of odds ratio, adjusted odds ratio along with their 95% confidence intervals. Statistical significance was set at p-value < 0.05.

**RESULTS**

Table 1 presents sociodemographic characteristics of the population. Out of the total 549 participants about 56.6% were less than 50 and 43.4% were more than 50 years of age. About three fifth (59.9%) were female participants. Approximately 28.2% could not read and write and the same proportion of the participants had studied till secondary level. Over half of the participants (52%) were home makers and 61.2%, < 10 years of age had diagnosed with type 2 diabetes. Over one third (37.2%) of the patients had not been tested for HbA1c for over a year.

Slightly under one fifth (19.1%) of the participants responded that they daily miss diet plan advised by their physician while 48.5% informed that they always miss the 30 minute daily physical activity regime. About 68.9% of the participants responded that they never forget their medicines when they are travelling away

from home. Moreover, one fourth (24.2%) of the participants said that they sometimes decide to take less number of medications (Table 2).

Table 1: Sociodemographic characteristics of the study participants (n=549)

Variables	n	%
<b>Age</b>		
Less than or equal to 50 years	311	56.6
More than 50 years	238	43.4
<b>Gender</b>		
Male	220	40.1
Female	329	59.9
<b>Living Arrangement</b>		
Urban	475	86.5
Rural	74	13.5
<b>Level of Education</b>		
Can read or write	155	28.2
Primary (0-5)	105	19.1
Secondary (6-10)	155	28.2
Intermediate (11-12)	59	10.7
Graduate and above (>12)	75	13.7
<b>Marital Status</b>		
Married	452	82.3
Never Married/Widow/Widower	97	17.7
<b>Occupational Status</b>		
Employed	213	38.8
Unemployed	46	8.4
Homemaker	290	52.8
<b>Duration of diagnosis of DM</b>		
less than 10 years	356	64.8
11 to 20 years	164	29.8
More than 20 years	29	5.2
<b>Family Members suffering from complications of DM</b>		
Yes	228	41.5
No	129	23.5
Not Applicable	192	35.0
<b>DM diagnosed by</b>		
Family Physician	146	26.6
GP	261	47.5
Specialist	60	10.9
Self	82	14.9
<b>Last HBA1c</b>		
Never Done	46	8.4
3-6 months	184	33.5
6-12 months	115	20.9
More than 12 months	204	37.2

Table 2: Patient responses on adherence level of diabetes management

Statements (How often do you miss/ forget/decide to)	Daily		Often		Sometimes		Never	
	N	%	n	%	n	%	n	%
Diet plan advised by HCP?	105	19.1	175	31.9	158	28.8	111	20.2
At least 30 min daily activity	266	48.5	120	21.9	80	14.6	83	15.1
Medicines due to high cost?	18	3.3	59	10.7	82	14.9	390	71
Carrying medicines when you travel?	15	2.7	42	7.7	114	20.8	378	68.9
Medicine due to side effects?	35	6.4	54	9.8	95	17.3	365	66.5
Taking medicine without any reason?	29	5.3	69	12.6	148	27	303	55.2
Medicine because you feel better?	27	4.9	65	11.8	90	16.4	367	66.8
Take less number of medicines?	33	6	89	16.2	133	24.2	294	53.6

Table 3 depicts the adherence specific characteristic of the participants. About 57.3% participants showed adherence to treatment while 42.7% were found to be non-adherent. Participants who were less than 50 years of age were found to be more non-adherent as compared to the older ones (49.2%/vs 34.0%, OR: 1.87 (1.32–2.65). Non-adherence was little more among females (41.3%) but insignificant. and level of education was significantly related to adherence level among study participants (p<0.01). Those diagnosed participants who had diabetes for >20 years were more non-adherent to treatment than the participants with comparatively lesser duration of ailment (p<0.03). Participants who were less than or equal to 50 years of age were two times more at risk of being no-adherent than the older participants (OR: 1.88;

95% CI: 1.29-2.76). Level of education and duration to diagnosis of DM were found to be marginally significant to non-adherence when adjusted for other variables in the model respectively. Participants who had never tested for HbA1c were more than two times at risk of being non-adherent (aOR: 2.59; 95%CI: 1.29-5.17, p<<0.001), while gender, marital status, occupational status and family history of DM were not significantly related with non adherence.

**DISCUSSION**

Cross-sectional study was designed and conducted at primary clinics of Faisalabad, Pakistan, about 43% of the participants were those who were non adherent, diet and physical activity as part of management of type 2 diabetes. The factors that were associated

with non-adherence included younger age, marital status and duration to diagnosis of diabetes, while level of education was found to have protective effect against non-adherence. Moreover, more than half of the study participants do not perform physical activity for 30 minutes daily and also do not follow diet plans as recommended by their physician.

In the current study 57% of the participants had shown adherence to treatment of diabetes including medications, diet and physical activity. This study results are congruent with a chart review of 323 patients in Bosnia and Herzegovina which reported that about 52% of the patients were adherent to diabetic medications.<sup>17</sup> Another study conducted in southern Bangladesh on 2032 type 2 diabetes patients showed similar results and found a 54% adherence to treatment.<sup>18</sup> In contrast a study from Ethiopia reported a very high adherence (85%) to anti-diabetic medication.<sup>19</sup> While, a study conducted in Islamabad Pakistan on

183 diabetics showed that only 38% of the participants were adherent to treatment.<sup>20</sup> This variation in the rates of adherence could be due to the differences in affordability, socio-economic status, measures used for assessment of adherence accessibility of the health care services.

The results of the current study reveals that about 19% of the patients are not adherent to dietary advice as compared to studies from other developing and developed countries.<sup>21,22</sup> Non-adherence to physical activity was reported to be 48.5% in our study which was comparable to other studies.<sup>23,24</sup> This could be attributable due to lack of walking, jogging tracks and parks in the country. Moreover, some females due to cultural and safety reasons do not go out alone for exercise and wait for males of the family to accompany them. These are some of the extraneous factors which could be responsible for non-adherence towards physical activity.<sup>25</sup>

Table 4: Associated factors with non adherence to treatment (n=549)

Variables	Non Adherent (n=234)	Adherent (n=315)	Univariate Odds ratio (OR)	Multivariable Adjusted Odds Ratio (aOR)
	n (%)	n (%)		
<b>Age</b>				
≤ 50 years	153(49.2)	158(50.8)	1.87 (1.32-2.65)	1.88 (1.29-2.76)
> 50 years	81(34.0)	157(66.0)	Ref	Ref
<b>Gender</b>				
Male	98 (44.5)	122 (55.5)	1.14 (0.81-1.61)	NA
Female	136 (41.3)	193 (58.7)	Ref	
<b>Level of Education</b>				
Can't read or write	63(40.6)	92(59.4)	1.07 (0.64-1.77)	0.99 (0.53-1.83)
Primary (0-5)	41(39.0)	64(61.0)	1.00 (0.63-1.57)	1.08 (0.56-2.08)
Secondary (6-10)	63(40.6)	92(59.4)	1.08 (0.61-1.91)	1.14 (0.62-2.08)
Intermediate (11-12)	38(64.4)	21(35.6)	0.38 (0.20-0.70)	0.44 (0.20-0.93)
Graduate and above (>12)	29(38.7)	46(61.3)	Ref	Ref
<b>Marital Status</b>				
Married	202 (44.7)	250 (55.3)	1.64 (1.03-2.60)	1.77 (1.46-2.89)
Never Married/Widow/Widower	32 (33.0)	65 (67.0)	Ref	Ref
<b>Occupational Status</b>				
Unemployed	20 (8.5)	26 (8.3)	1.04 (0.55-1.89)	NA
Private	24 (10.3)	29 (9.2)	1.03(0.55-1.96)	
Government	11 (4.7)	14 (4.4)	1.01(0.42-2.32)	
Homemaker	119 (50.9)	171 (54.3)	1.15 (0.43-2.40)	
Employed	60 (25.6)	75 (23.8)	Ref	
<b>Duration of diagnosis of DM</b>				
11 to 20 years	80 (48.8)	84 (51.2)	1.67 (0.93-1.96)	1.65 (0.86-3.15)
More than 20 years	7 (24.1)	22 (75.9)	1.36 (0.78-2.49)	2.02 (1.11-3.67)
less than 10 years	147 (41.3)	209 (58.7)	Ref	Ref
<b>Family History of DM</b>				
Yes	147 (43.8)	189 (56.2)	1.13 (0.79-1.59)	NA
No	87 (40.8)	126 (59.2)	Ref	
<b>Last HbA1c</b>				
6-12 months	68 (29.1)	47 (14.9)	0.63 (0.32-1.26)	0.72 (0.35-1.49)
More than 12 months	93 (39.7)	111 (35.2)	1.09 (0.58-2.07)	1.06 (0.54-2.04)
Never Done	22 (9.4)	24 (7.6)	2.39 (1.23-4.64)	2.59 (1.29-5.17)
3-6 months	51 (21.8)	133 (42.2)	Ref	Ref

The multivariable model of the study shows that participants less than 50 years were at twofold risk of being non-adherent to treatment as compared to older participants. This is consistent with other studies that have shown similar results.<sup>3,26,27</sup> This may be due to the fact that the younger patients have difficulties in accepting their diagnosis and are less knowledgeable with regard to their disease.<sup>27,28</sup> Moreover, they are burdened with their professional work and family responsibilities, so to maintain a regular regimen is difficult for them. On the other hand, older age patients were well aware regarding associated complications and importance of glycemic control.<sup>29</sup> Diabetes care model should be implemented in the hospital and importance should be placed on regarding adherence treatment and importance of glycemic control.

A marginally significant association (p=0.07) between non adherence and education level of the respondent was observed on multivariate analysis. Several studies have demonstrated

protective effect of education and adherence to achieve optimum level of glycemic control.<sup>15,17,24</sup>

Duration of DM was predicted to be an important factor related to adherence to type diabetes treatment. However it was not statistically significant, when adjusted with other variables in the multivariate model (p=0.07). Some researchers have contrasting views over relation of duration of DM and adherence, that is the longer the patients have diabetes history, the more likely they will be adherent to the prescribed regimens.<sup>13,30</sup> Nonetheless in our study we found that having DM for longer period of time puts patient two times more at risk of being non-adherent as compared to newly diagnosed patients (aOR:2.02, 95% CI:1.11-3.67). This could be because patients with longer duration of disease may require increase in the number and dosage of medications required to achieve optimal glycemic control.<sup>2,14</sup> The complexity of regimens and increase in medications and its related side effects might limit the willingness of patients to take their medicines and treatment.

It is well-evident that patient who do not take their medicine at their time were at more risk of non adherence to treatment.<sup>25,28</sup>

This study has several potential limitations. In this study we relied on self-report for assessing glycemic control instead of HbA1c marker. This might have underestimated the rate of non-adherence for the diabetic treatment. This was a cross sectional study therefore, we cannot comment on the temporal associations between variables. Moreover, since the study was conducted in primary care clinics therefore the results may not be generalizable to the general population.

## CONCLUSION

Adherence to treatment of diabetes and to achieve glycemic control is one of the most challenging concerned across countries including Pakistan. The results of the current study revealed that a substantial number of DM patients are leading a sedentary life and do not follow dietary restrictions. Moreover, the factors that were present to be linked with non adherence were young age, low level of education and duration to diagnosis of DM. Therefore, interventions to improve adherence should include aggressive counseling about benefits of regular exercise, diet and special emphasis on younger type 2 diabetic patients should be executed. Though, governments and policy makers should consider reducing the costs for cost effective treatment to the community at large. Additionally, more parks and jogging/walking tracks should be introduced to make it accessible for a wide range of population.

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