Original Article

Self-Reported Treatment Adherence in Patients of Diabetes Mellitus Type 2: A Cross-Sectional Study in Lahore, Pakistan

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Abstract

Objectives: Suboptimal adherence to therapy due to neglected self-care behavior in chronic diseases is a global crisis. The aim of this research was to gauge the prevalence of adherence and to assess the effect of age, sex, education level and socioeconomic status on adherence to self-care strategies.

Methods: A cross-sectional study was conducted at Diabetes Management Centre, Services Hospital Lahore. 357 patients were administered a standardized questionnaire, the Diabetes Self-Management Questionnaire. A cut off value of 7 on a 0-10 scale was labeled as good adherence. The influence of age, sex, education and income on adherence was examined by multiple logistic regression analysis.

Results: The mean age of the sample was 49.76±12.5 years, 64.52% were female, 37% had no formal education, and 47.39% had monthly household income > Rs. 45000. The prevalence of good adherence as a marker of good selfcare behavior was 42%. The mean Sum Scale scores were 6.63±1.48. Glucose Management subscale showed the highest mean score i.e. 6.65±2.07 while Physical Activity subscale showed mean lowest score i.e. 5.26±2.75. The sociodemographic factors being measured did not influence adherence significantly.

Conclusion: This study provides insight into the self-care behaviors of diabetic patients. This research highlights the immediate need to take steps to improve adherence among individuals. The sociodemographic factors were not found to influence adherence to self-care activities significantly in this sample. Further research is required to explore other factors that may increase the risk of suboptimal adherence among diabetics.

Key Words: Diabetes mellitus, adherence, factors, Pakistan

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Introduction

Over last few decades, diabetes has emerged as a pandemic. From developed to developing nations, its prevalence is increasing rapidly, with approximately 463 million cases reported globally in 2019 and a projected rise to 700.2 million cases till 2045. In 2019 alone, it claimed 4.2 million lives.[1]

In recent years burden of diabetes has rapidly increased in both developed and developing countries. In 2019, there were a dismal 19.4 million cases of diabetes and 159,000 diabetes related deaths in Pakistan.[1]

Diabetes is a chronic disease, and its management is a lifelong commitment. While a physician is responsible to draft a treatment plan, the onus of the execution is on the patients. 95% of the day-to-day management is carried out by the patient themselves,[2] which means that between clinic appointments there is very little a physician can do. The efficacy of the treatment relies on the personal resolve of the patients alone.

Diabetes requires a complex, multifaceted treatment including lifestyle modifications, often as a first-line defense, and pharmacotherapy. The selfcare behaviors have several domains: blood glucose measurement, dietary control, exercise, medication and keeping appointments with the physician. The primary

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outcome is glycemic control i.e. maintaining HbA1C at <7%.[3] Adherence to therapy is a significant predictor of treatment outcomes.[4-6] WHO defines adherence as: "The extent to which a person's behavior – taking medication, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a health care provider."[7] Several international studies have shown adherence to be suboptimal.[8-11] Regional research on this topic is limited, however non-adherence appears to plague patients in Pakistan as well. Studies conduc-ted in Karachi[12] and Multan[13], for example, found only 20% of participants fully adherent. Non adherence leads to poor glycemic control[6,14] and greater morbidity[15]. According to UKPDS 35, 1 percent decrease in HbA1c decreased risk of microvascular complic-ations by 37%.[16] Predictors of non-adherence are classified as modi-fiable and unmodifiable factors. The latter include sociodemographic factors, including age, sex, educa-tion and socioeconomic status.[7] Literature provides conflicting reports on association of these factors with non-adherence, both national[12,17,18] and interna-tional.[11,19,20] These demographic characteristics can help physi-cians to forecast non-adherence in individuals. This can enable physicians to provide better attention to patients at risk of non-adherence and create perso-nalized treatment plans for ideal outcomes. Local research on adherence is deficient, and to draw conclusions or comparisons a larger pool of data is required. In the present research, we attempted to determine the level of adherence in a local diabetic population sample and the effect of sociodemo-graphic factors on adherence.

Methods

A cross-sectional questionnaire-based study was con-ducted at an urban government tertiary care insti-tution, over a period of 1 month, from 1st to 30th of September 2019. Participants included in this study were older than 30 years, with a diagnosis of Diabetes Mellitus Type 2 for a duration of at least 1 year, who had received a full treatment plan from their health provider. Patients taking oral medication only, insulin only as well as combination therapy as a part of their treatment were included. Participants were chosen by convenience sampling and each gave informed consent to take part in the study. Exclusion criteria included the inability to understand Urdu, mental

incapacitation and type I or gestational diabetes. The sample size selected for this study was 357, for a confidence level of 95% and margin of error ±5%. The research involved the collection of two sets of data: the demographic characteristics of the popula-tion (Table 1), and the assessment of adherence. The demographic characteristics that were measured included age, sex, education and income as shown in Table 1. These were reported by the patient in a preliminary face-to-face interview. Treatment adherence was measured by a pre-valida-ted and reliable questionnaire (Cronbach's α= 0.96), the Urdu-version of Diabetes Self-Management Questionnaire (DSMQ) made by Schmitt[21] et al and translated by Bukhsh et al.[22] It was comprised of 4 sub-scales, namely Glucose Management, Dietary Control, Physical Activity and Health-care Use.[21] There was one additional question relating to overall selfcare. Patients rated their adherence using a Likert scale of 0-3 to, where 0 was 'does not apply to me' and 3 was 'applies to me very much'. The sub-scale scores and sum scale scores were compiled separately and each was converted to a 0-10 scale. Adherence was considered as a dichotomous variable; a score of 7 or above was considered "good adherence". The DSMQ was administered in paper form and as an intervie-wer-assisted questionnaire. In the latter case, it was read out to the illiterate participants verbatim and no further description was provided, to ensure validity. Data was analyzed using SPSS 25.0. Prevalence of non-adherence in the population was calculated and represented as a percentage of the total population. Data was analyzed by multiple logistics regression analysis to forecast the trends and predict the asso-ciation between the independent variables i.e. the demographic characteristics, and the dependent vari-able i.e. adherence. The results were adjusted for employment status, duration of diabetes, type of treatment and presence of comorbidities. Value of p less than 0.05 was considered significant.

The purpose and components of the research were explained to each participant and informed consent was obtained. Ethical approval was obtained from the institution's ethical review board, Ref. No IRB/ 2019/ 570/SIMS.

Results

In September 2019, 357 patients were administered the DSQM at the Diabetes Management Center, SHL.

The mean age of respondents was 49.76±12.5 years. 231 (64.5%) were female and majority i.e. 133 (37.3 %) of the respondents had no education. 168 (47.3 9%) respondents had income > Rs. 45000 while 91 (25.49 %) had income between Rs. 35001 to Rs. 45000. The demographic and clinical characteristics of the population are summarized in **Table 1**.

Good adherence to therapy (sum scale score ≥7) was seen in 150 (42%) participants. The mean sum scale score was 6.63 ±1.48. **Table 2** shows the mean scores for the individual sub-scales and sum scale; it also records the scores corresponding to the demographic variables. Sum scale scores were highest for 60-70 years age group followed by > 70 years; 51-60 age group showed lowest scores. Females had higher scores than males, i.e. 6.67±1.26 and 6.56±1.82 res-pectively. There was an overall increase in the scores with an increase in the level of education. The lower income groups obtained higher sum scale scores.

Glucose management, Dietary and Healthcare Use sub scales showed increased adherence with increa-sing age. Physical activity sub scale showed the oppo-site. Males demonstrated better glucose management and health care use but poorer physical activity and dietary management scores. Higher education showed an overall better glucose management and physical activity scores. Those with middle school education showed highest health care use scores. Lowest dietary control and physical activity scores were observed in the FSc./Class[11-12] category. Better physical activity scores were seen in higher income groups. In contrast there was a decrease in dietary control and health care use scores with an increase in income level. Glucose management was highest in lower income groups. Dietary control and physical activity were poor across all variables. Socio demographic factors affecting adherence are reported in **Table 3**. Good adherence was highest in 41-50 and 51-60 age groups. More males were adherent than females. 34.67% of the adherent individuals had no formal education. Good adherence was highest in highest income group. A multiple logistic regression model was used to predict the influence of the demographic characteristics on the dependent variable i.e. adherence. The p values for all variables were greater than 0.05 and hence the variables were insignificant. The pvalues are reported in **Table 3**.

Discussion

Two out of five patients were found to have good adherence. This is a concerning statistic, as poor adherence is a major factor that contributes to poor glycemic control[8] and, consequently, complications[24] and mortality. Suboptimal adherence is pervasive in previous litera-ture. A study conducted in Islamabad in 2015 reported 62% non-adherence in patients.[17]

Table 3: *Demographic Profile of the Sample*

Demographic Characteristics	Frequency (n)	Percentage (%)
Age (years) 49.76±12.5		
31-40	59	16.53
41-50	132	36.97
51-60	117	32.77
60-70	35	9.8
>70	14	3.9
Gender		
Male	126	35.29
Female	231	64.52
Education		
No formal education	133	37.25
Primary school/class 1 -5	52	14.57
Middle school/class 6–8	41	11.48
Matric/class 9-10	81	22.69
FSc../class 11-12	23	6.4
undergraduate	27	7.56
Monthly household income (Rs.)		
< 5000	1	0.28
5000-15000	19	5.32
15000-25000	39	10.92
25000-35000	38	10.64
35000-45000	91	25.49
>45000	169	47.39
Employment		
Employed	117	32.77
Unemployed	240	67.23
Locality		
Urban	242	67.79
Rural	115	32.21
Duration of diagnosis (years):	7.58 ± 6	
Type of treatment		
Oral hypoglycemics	166	46.50
Insulin	125	35.01
Combination	66	18.49
Co-morbidities		
Yes	240	67.23
No	117	32.77

The ENTRED study in France found suboptimal adherence to prescribed medications in almost 60% of the 3637 participants.[25] A study in Kerala, India found 74% of the rural population to be non-adherent.[26] Out of 257 patients in Karachi, 79.4% were reported to have low adherence.[12] A mere 20% of

Table 2: *Mean Scores and Standard Deviation of the Sub-scales and Sum Scale Across the Categories of Sociodemographic Variables. Mean Score of the Sample in each Subscale and Sum Scale is also Shown*

Demographics	Glucose Management Sub-Scale	Dietary Control Sub-Scale	Physical Activity Sub-Scale	Health-Care Use Sub-Scale	Sum Scale
Age					
31-40	6.88 ±1.75	5.63 ±1.05	5.44 ±2.64	6.16 ±1.96	6.75 ±1.26
41-50	6.47 ±1.97	5.45 ±1.16	5.35 ±2.48	5.85 ±1.84	6.54 ±1.40
51-60	6.56 ±2.27	5.41 ±1.35	5.00 ±2.92	6.02 ±2.29	6.50 ±1.62
60-70	7.07 ±2.34	5.91 ±1.23	5.75 ±3.04	6.48 ±2.40	7.10 ±1.47
>70	7.19 ±1.85	5.82 ±1.39	4.44 ±3.51	7.30 ±2.34	6.98 ±1.66
Gender					
Male	6.69 ±1.92	5.47 ±1.51	4.90 ±3.10	6.61 ±2.73	6.56 ±1.82
Female	6.63 ±2.33	5.56 ±1.05	5.45 ±2.53	5.78 ±1.60	6.67 ±1.26
Education					
No Formal Education	6.46 ±2.23	5.44 ±1.25	5.05 ±2.67	5.91 ±2.04	6.53 ±1.50
Primary School/Class 1 -5	6.72 ±1.75	5.62 ±0.91	5.34 ±2.58	6.11 ±1.70	6.74 ±1.10
Middle School/Class 6–8	6.59 ±2.01	5.51 ±1.14	5.34 ±2.91	6.61 ±2.34	6.61 ±1.37
Matric/Class 9-10	6.88 ±2.03	5.69 ±1.20	5.57 ±2.92	6.27 ±2.31	6.83 ±1.44
FSc./Class 11-12	6.87 ±2.42	5.19 ±1.66	4.78 ±2.10	5.46 ±2.04	6.23 ±1.99
Undergraduate	6.74 ±1.87	5.56 ±1.46	5.43 ±3.27	5.97 ±2.12	6.67 ±1.75
Monthly Household Income (Rs.)					
< 5000	8.33 ±0.47	6.77 ±0.49	5.00 ±2.56	10.00 ±0.40	8.13 ±0.59
5000-15000	7.47 ±2.11	5.77 ±1.57	4.85 ±3.94	8.01 ±2.61	6.92 ±1.88
15000-25000	7.47 ±2.25	5.76 ±1.57	5.13 ±3.48	7.29 ±2.84	6.92 ±1.89
25000-35000	6.19 ±2.03	5.32 ±1.34	5.32 ±2.74	6.11 ±2.14	6.39 ±1.62
35000-45000	6.27 ±2.12	5.34 ±1.12	5.08 ±2.50	5.54 ±1.83	6.41 ±1.35
>45000	6.68 ±1.96	5.57 ±1.12	5.42 ±2.54	5.81 ±1.70	6.69 ±1.34
Mean Score of the sample	6.65 ±2.07	6.39 ±1.71	5.26 ±2.75	6.08 ±2.10	6.63 ±1.48

Table 3: *Distribution of Frequency of Good Adherence Across the Categories of each Variable and Multiple Logistic Regression Significance Values. Comparison of Frequency of Good vs Poor Adherence in each Category is also shown.*

Demographics	Good Adherence (n)	p Value	Poor Adherence (n)
Age		.962	
31-40	25		34
41-50	50		82
51-60	49		68
60-70	19		16
>70	7		7
Gender		.674	
Male	97		73
Female	53		134
Education		.720	
No Formal Education	52		81
Primary School/Class 1 -5	23		29
Middle School/Class 6–8	19		22
Matric/Class 9-10	35		46
Fsc./Class 11-12	8		15
Undergraduate	13		13
Monthly Household Income (Rs.)		.684	
< 5000	2		0
5000-15000	11		8
15000-25000	19		20
25000-35000	15		23
35000-45000	36		55
>45000	67		101

the population was found to be adherent at Nishtar Hospital, Multan.[13] 45.4% of the sample at the rural health training center of Tamil Nadu showed low adherence, which is lower than that observed in our sample.[23] Similarly, 42.3% were non-compliant in a study at Kolkata.[27] However, most of these studies measured adherence using instruments different from that used in the present research, hence, comparison is difficult to make.

Lowest adherence was reported for physical activity, which is an observation reported frequently in literature.[27–29] The sample population showed better glucose management. Among the self-care behaviors measured glucose management, dietary control and health care use were found to be better in older individuals, which could be explained by the availability of family support as well as time. There was a decrease in the adherence to physical activity with increasing age, probably due to comorbidities which limit mobility. However, in the multiple logistic regression model, age was not a significant factor (p>0.05). Surveys at Islamabad,[17] Tamil Nadu, India[23] and France[25] all demonstrated the effect of age on adherence to be insignificant. A positive relationship has, however, been found in others.[11,13,24,30]

In this sample population males had better adherence to therapy; 64.71% of the adherent individuals were males. Males showed better healthcare use but poorer physical exercise levels, confirming the results of a Saudi Arabian study.[31] Sex did not significantly modify adherence in our regression model. There have been mixed reports in the past regarding the association of sex with adherence. Some local[13,17] and global studies[20,32,33] have shown similar results to ours. Others have commonly shown males to have better adherence.[11,30,34] 37.25% of the sample had no education, corresponding to the literacy statistics of Pakistan.[35] This population scored lower in all self-care activities. 34% of the adherent population had no formal education. The number of adherent vs non-adherent patients improved as the education level increased, however, there was no significant relationship found between the two variables. Researches at Aga Khan University Hospital, Karachi[28] and Rawal Institute of Health Sciences, Islamabad[17] demonstrated a neutral relationship. This was observed in Kenya[8] and Tamil Nadu, India[23] as well. Many regional surveys have found a positive relationship between education level and adherence, including studies at Quetta city,[18] Islamabad[17] and Dhaka city,[29] Bangladesh. The adherence for < 5000 income group was seen to be unusually high, which could be due to the very small sample. 44.64% of the adherent patients earned Rs. 45000 or more, however this result could be influenced by the fact that almost half the patients belonged to this income group. The adherent and nonadherent patients in each income bracket, other than <5000, were approximately the same, indicating that income had no effect on adherence. Multiple logistic regression also confirmed this finding. Increase in adherence with better socioeconomic status has been overwhelming in past research.[11,13,25,27,36] A neutral relationship has been observed as well, for example in Quetta city[18] and Turkey,[33] which agrees with the findings of this study. This study presented local data regarding adherence in patients of Diabetes Mellitus. It showed that over-all adherence is sub-optimal among patients, high-lighting the necessity to address this issue. The non-modifiable demographic factors were not predictors of adherence. There is an urgent need for further research to explore other factors that could impede adherence, so that targeted treatment strategies can be developed to combat non-adherence and improve glycemic control and treatment outcomes. The instrument was a self-reported questionnaire, which could lend a recall and social desirability bias, leading to underestimation of poor adherence.[37] However, self-reported questionnaires have been shown to be a reliable and convenient method to measure adherence related to clinical outcomes.[38] Our results have been derived from a sample chosen by convenience sampling. This could impart some level of sampling bias to our results. However, our results agree with several regional and global which contributes to its credibility. This study was conducted in a central government tertiary care hospital, however, as the sample was chosen from only one institution, it may not be suitable to generalize these results to the national population.

Conclusion

This study provides insight into the self-care behaviors of diabetic patients. Patients were most diligent about glucose management. Adherence to physical activity was seen to be the lowest. The sociodemographic factors were not found to influence adherence significantly in this population sample. There is a strong need to carry out further research on the barriers to adherence to therapy in order to improve compliance, self-care behaviors and treatment strategies.

Conflict of Interest: None

Reference

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Authors Contribution

RS: Methodology, Literature Review, Data Collection, Article Writing

AA: Data Collection

IF: Supervision, Methodology

RA: Drafting Revising, Analysis

HA: Methodology and Statistics