Effect of Patient Understanding of Diabetes Self-Care on Glycemic Control-A Hospital Based Cross Sectional Analytical Study

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ABSTRACT

Objective: To study the effect of patient understanding of diabetes self-care on glycemic control.

Study Design: Hospital-based cross-sectional analytical study.

Place and Duration of Study: Department of Medicine, Pak Emirates Military Hospital, Rawalpindi Pakistan, from Jan to Jul 2019.

Methodology: A standardized questionnaire comprising nine questions to gauge understanding of diabetes self-care was applied to 216 patients with Diabetes Mellitus (DM) at Pak Emirates Military Hospital, Rawalpindi. Linear regression analysis was conducted to examine the effect of diabetes-related self-care understanding on glycemic control.

Results: 138 patients were males (64%) and 78 females (36%) with a mean age of 40 ± 8 years (range: 18-68 years). The mean duration of having diabetes mellitus was 12 ± 2 years. Patients with a high score on the self-care understanding questionnaire had better average glycemic control than those with lower scores.

Conclusion: Patients' understanding of self-care for diabetes has a significant impact on their glycemic control. This asks physicians to educate patients about their role in disease management for better clinical outcomes.

Keywords: Diabetes self-care, Glycemic control, Understanding of self-care.

INTRODUCTION

Diabetes mellitus (DM) is an incurable yet manageable disease on the rise. Pakistan ranks 10th in the world with 7.5 million adult cases of diabetes in the country as per the latest updates from International Diabetes Federation.[1]

The increasing disease burden and costs ask for improvement in disease management. The main goals of management are to prevent disease complications and decrease mortality and economic costs. This requires an optimized treatment plan but, more importantly, a commitment by patients to lifelong self-care. Self-care is described as "actions taken by individuals to care for themselves in their environmental conditions".[2] Self-care has an integral part of improving the health status of diabetic patients.[3] Studies have shown that diabetes-related self-care improves glycemic control.[4]

Limited literature is available on the understanding of self-care of diabetic patients in Pakistan. Therefore, we explored the correlation of understanding self-care with glycemic control to study the trends in our population and identify which self-care parameters have the strongest correlation with glycemic control. This can help develop a targeted approach to optimizing those parameters with the greatest likelihood of improving glycemic control and hence clinical outcomes. In addition, this study was done to highlight the understanding of diabetes self-care in the military setup.

METHODOLOGY

This hospital-based cross-sectional analytical study was done at the Department of Medicine, Pak Emirates Military Hospital, (PEMH) Rawalpindi Pakistan, from January 2019 to July 2019. Two hundred sixteen patients above 18 years were included in the study through the non-probability convenience sampling technique. Ethical approval was sought from the Ethical Review Board of PEMH (Dated 20 Mar 2019). Sample size calculation was done using Daniel's formula viz n=z2x(*p*) (1-*p*)/ α2 [n=population sample size, Z= constant for a defined confidence level (1.96 at CI 95%), *p*=expected proportion or prevalence= 16%, and a=precision 5%].[5] The minimum necessary sample size for this study was n=203, based on diabetes prevalence of 16% in Pakistan.[6]

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Inclusion Criteria: Patients with both insulin-dependent and non-insulin-dependent DM were included in the study.

Exclusion Criteria: Patients with dementia, dialysis-dependent chronic kidney disease, heart failure and blindness were excluded from the study.

HbA1c reading of the preceding three months was taken as the marker of glycemic control. A standardized questionnaire consisting of nine questions modified from a scale designed and validated by Heisler and associates was used to assess the understanding of diabetes self-care.[7] The questionnaire was administered in Urdu translation to 216 patients reporting to the outpatient department of Pak Military Hospital, Rawalpindi after seeking informed consent. It was filled in by most patients themselves and interviewed for those not literate. The response rate was 100%.

A scale for patients' understanding of diabetes self-care was the primary independent variable for our study's analysis. For nine independent areas of diabetes, self-care response options were recorded on a 4- point Likert scale as follows: not at all (0), somewhat (1), mostly (2) and completely (3). In addition, the total score for all questions was calculated for all participants ranging from 0 to 27, with greater scores meaning a higher understanding of diabetes self-care.

Interpretation of scores was dichotomized using the 50th percentile as a cut-off point. A better understanding was established as 50th percentile or higher. The dependent variable was patients' most recent recorded HbA1c before data collection. The odds ratio (OR) was calculated using Logistic regression models for diabetes self-care and glycemic control. Understanding of diabetes self-care and self-management practices were then assessed as separate models.

The data was analyzed using IBM SPSS 25.0 software. Descriptive statistics were analyzed as mean ± standard deviation or median values for continuous variables and percentages for nominal variables. The student's t-test was used to assess the significance of variation of means and medians, and Pearson's chi-squared test was utilized to assess nominal variables. Linear regression analysis was utilized to check the association of glycemic control with independent parameters of diabetic self-care. The p-value ≤ 0.05 was considered statistically significant.

RESULTS

Total 216 patients were recruited to participate in the study, incluing 138 males (64%) and 78 females (36%). The mean age was 40 ± 8 years (18-68 years). The mean duration of having diabetes mellitus was 8 ± 2 years (Table-I). Eighty-two patients (38%) out total were also on treatment for hypertension.

Table-I: Demographic details of patients and association with knowledge of diabetes self-care.

Demographic Variables	n (%) n=216	Mean Score	p-value
Gender			
Males	138 (64%)	19.75 ± 4.19	<0.001
Females	78 (36%)	15.39 ± 3.29	
Age (Years)			
18-40	69 (32%)	19.5 ± 4.3	0.104
41-60	91 (42%)	18 ± 4.0	
>60	56 (26%)	16.8 ± 4.9	
Education			
No formal education	30 (14%)	13.7 ± 3.68	<0.001
Primary level	39 (18%)	15.8 ± 2.54	
Secondary level above	147 (68%)	19.7 ± 4.05	

Collective mean scores for the understanding of diabetes self-care were higher for males than females (mean score 19.75 ± 4.19 vs 15.39 ± 3.29 p=0.0001). Education was an individual predictor for higher comprehension of diabetes self-care (p<0.001). Among domains of self-care, the domain of how to take medication was the strongest predictor of glycemic control (ß -0.616 <0.001). The Table-II showed mean scores in each of the nine questions on diabetes self-care.

Table-II: Diabetes related parameters of patients and association with self-care score.

Diabetes Related Parameters	n (%) n=216	Mean Score	p-value
Duration of DM (years)			
<5	9 (4.16%)	22 ± 4.24	0.017
6-9	138 (63.9%)	18.78 ± 4.50	
10-15	60 (27.78%)	17 ± 3.72	
>15	9 (4.16%)	13 ± 2.82	
Treatment			
Oral Anti-Diabetic Medications	112 (51.8%)	18.35 ± 4.6	0.964
Oral Medication and Insulin	91 (42.1%)	17.81 ± 4.2	
Insulin	13 (6.01%)	19.33 ± 5.5	
HbA1c (%)			
<7	26 (12%)	23 ± 1.4	<0.001
7.1-8.9	104 (48.1%)	19.8 ± 3.67	
9-10.9	65 (30.1%)	15.73 ± 2.96	
>11	21 (9.7%)	12 ± 2.45	

While assessing the nine aspects of understanding diabetes self-care (Table-III), a higher score in six areas was each independently linked with lower HbA1c levels. These included knowledge about management of low blood sugar, food choices, daily targets of blood glucose, management of high blood sugar, how to take medications and their HbA1c. Out of these, knowledge about how to take medications was associated with the highest odds of lower HbA1c (ß -0.616 <0.001). On the other hand, no significant association was identified between domains of foot self-care, how and when to test blood sugar, knowledge about complications of diabetes and HbA1c levels (Table-IV).

Table-III: Mean scores for questions of understanding of diabetes self-care.

Variables	Mean ± SD
How well can you appreciate how to take care of your feet?	1.28 ± 0.607
What do you do for low blood sugar symptoms?	1.74 ± 0.751
How to make food choices?	2.46 ± 0.613
When and how are you supposed to test blood sugar?	1.82 ± 0.629
What do you know about complications of diabetes?	2.01 ± 0.705
What are your daily target sugar levels?	2.22 ± 0.648
How to take your medication?	2.64 ± 0.563
Do you know your last HbA1c?	1.92 ± 0.634
What do you do for high blood sugar levels?	2.10 ± 0.707

Table-IV: Linear association between parameters of understanding of diabetes self-care with glycemic control.

Variables	R	F	β (95% CI)	p-value
How well can you appreciate how to take care of your feet?	0.380	8.11	-0.380	0.006
What do you do for low blood sugar symptoms?	0.428	10.79	-0.428	0.002
How to make food choices?	0.589	20.98	-0.589	<0.001
When and how are you supposed to test blood sugar?	0.219	29.41	-0.219	<0.001
What do you know about complications of diabetes?	0.280	25.53	-0.280	<0.001
What are your daily target sugar levels?	0.552	4.08	-0.552	0.049
How to take your medication?	0.616	15.85	-0.616	<0.001
Do you know your last HbA1c?	0.482	14.49	-0.482	<0.001
What do you do for high blood sugar levels?	0.467	13.357	-0.467	0.001

DISCUSSION

The interpretation of various DM parameters suggests that patient understanding of diabetes self-care is significantly associated with glycemic control. In patients with DM, self-care includes a string of behaviours related to diet, exercise, taking medication, self-monitoring of blood glucose and foot care.[3] The idea of self-care puts patients at the core of the management of DM. In comparison, health care professionals play their part by offering support and guidance to the patients. The application of self-report measures of diabetes self-care is an evolving area in medicine, and it has grown significantly in the last decade.[8]

The parameters of understanding diabetes self-care can significantly predict the glycemic control of patients. Similar results were deduced in a study by Buksh et al, that awareness of DM significantly corresponded to better HbA1c levels and self-care activities in diabetic patients in Pakistan ($p<0.01$).[9]

Similar to our study, trends were detected in two other studies performed in urban areas of Pakistan, demonstrating good glycemic control seen in less than one-third of participants.[10,11] The same tendency was observed in a study done in Ethiopia, with higher knowledge of disease notably correlating with patients' education and better self-care practices.[12] Studies have shown that diabetes-related self-care activities improve glycemic control.[13]

In contrast, disease knowledge in the Indian population with DM did not show an association with HbA1c levels, as Dussa et al.[14] In a study by Gao et al, in the Egyptian population, diabetes self-care had a direct effect on glycemic control (β =−0.21, p =0.007).[15] In another study assessing the influencing avenues of empowerment perceptions and health literacy in patients with type 2 DM, it was found that self-effectiveness and self-care behaviours did influence glycemic control in type II DM patients.[16]

Of the nine parameters to ascertain an understanding of diabetes self-care, how to take medicine was most strongly correlated with better glycemic control (ß -0.616 <0.001). A study to identify the relationship between patients' knowledge about oral anti-diabetes treatment and blood glucose control found a strong inverse association between knowledge score and HbA1c (r=-0.61; p<.001). A one-unit increase in knowledge score reduced glycosylated haemoglobin by one-half unit for men and 1.6 units for women.[17]

The choice of food was found to correlate with glycemic control in our study (ß -0.589, *p*-value <0.001). In another study by Beckerle *et al,* patients with well-controlled diabetes were assured of selecting suitable food options when hungry (*p*<0.009).[18] In our study, people with knowledge of their HBA1c values had better glycemic control than those unaware of their HBA1c values (ß -0.482, *p*<0.001).

A good understan-ding of HbA1c has been found related to specific aspects of diabetes-related self-care and self-efficacy and is a significant predictor of HbA1c levels.[19] Like the correlation for HbA1c, know-ledge of daily target blood sugar levels was signifi-cantly correlated with better glycemic control (ß -0.552, *p*<0.049).

Patients with better knowledge about the management of high blood sugar had better glycemic control than others (ß 0.467 *p*-value=0.001). However, in a qualitative study, participants with poor control had no understanding of the dynamics of glycemic control. As a result, they could not interpret serum glucose monitoring results, plan self-care regimens and recover from glucose imbalances.[20]

In our study, understanding of foot care was not correlated with glycemic control (ß-0.380, *p*-value =0.006). Likewise, understanding of complications of DM and the method of checking blood sugar had a slight effect on glycemic control, respectively (ß-0.219, *p*≤0.001 and ß-0.280, *p*-value≤0.001).

The study showed education to be an indepen-dent predictor of a higher understanding of diabetes self-care. The odds of better understanding were app-roximately six times more in those with higher than middle school education than those with lesser edu-cation (*p*<0.001). This may be related to a better educa-tional status with an increase in compliance score (*p*-value=0.016).[21] In addition, male patients scored an overall higher score regarding the understanding of self-care with a mean score of 19.75 ± 4.19 vs 15.39 ± 3.29 for the females (*p*=0.0001). Again, this may be due to male participants having higher education than females.

Based on the results of this study, self-care has a positive effect on glycemic control. It is, therefore, sug-gested that physicians invest the time at their clinics to impart awareness about self-care practices to the affected patient population. In addition, such inter-vention can be explored to guide further com-pre-hensive efforts for patient education at a larger scale, including educational centres for patients with DM at the departmental or institutional level.

Each of the nine self-care parameters studied affected HbA1c to a different extent. These findings can help physicians develop and assess targeted self-management involvements producing the highest pro-bability of improved glycemic control.

LIMITATIONS OF STUDY

There were a few limitations in the study design. First, it was a cross-sectional study, so independent variables' causal relationships and self-care understanding could not be established. The participants were being treated at a tertiary care hospital, so they may not represent the general diabetes population. Finally, patients' understanding of self-care depended on their understanding of the questionnaire and was not assessed by direct observation of skills.

CONCLUSION

Better patient understanding of diabetes self-care has a significant positive effect on glycemic control. In addition, education of diabetic patients about diabetes self-care can be simple and free of cost intervention in the management of this costly disease.

Conflict of Interest: None.

Author's Contribution

SR: Conception and design of study, article writing, data collection and interpretation, SN: Conception and design of study, peer review, WA: Conception and design of study, ARP: Article writing, statistical analysis and interpretation of data, FS: Peer review, MH: Statistical analysis.

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