Self-reported Glycemic Control and Associated Factors Among Diabetic Outpatients: A Cross Sctional Analysis

**Syed Muhammad Zulfiqar Hyder Naqvi[1], Syed Imtiaz Ahmed Jafry[2],
Mudassir Hussain[3], Shazia Sarwat Iqbal[4]**

Abstract

A cross-sectional survey was carried out to determine the factors associated with self-reported glycemic control among outpatients with diabetes mellitus type 2 visiting a private tertiary care hospital of Karachi, from July to October, 2018. A total of 185 participants of either gender, aged ≥30 years, with obesity and a self-reported diagnosis of diabetes mellitus type 2 for at least 1 year were included in the study and interviewed using a structured questionnaire. Data were analyzed on statistical package for social sciences version 21 whereas chi-square test and binary logistic regression were used for inferential analysis. The study results showed that regular medicine intake, regular exercise and weight change during the previous year were significantly associated with self-reported glycemic control of the patients ($p < 0.05$ for all). The importance of patient related factors therefore should not be overlooked while managing patients of diabetes type 2 to achieve a better glycemic control.
Keywords: Blood Glucose, Outpatients, Diabetes Mellitus, Cross Sectional Analysis

Introduction

Diabetes is a broader domain of illnesses consisting of a spectrum of metabolic diseases in which defects in insulin secretion and/or insulin action lead to hyperglycemia. The pathogenic activities resulting in diabetes range from autoimmune destruction of pancreatic β-cells with resultant deficiency of insulin to abnormalities in metabolism that culminates in resistance to insulin action[1]. Both environmental factors and genetic predisposition are implicated in etiology of diabetes mellitus[2], and efforts are being made to evaluate gene-environment interactions[3].

According to a recent estimate, 1 in 11 adults now have diabetes mellitus worldwide, 90% of whom have type 2 diabetes mellitus, with Asia be-ing a major area of its rapidly emerging global epidemic[4]. Locally in Pakistan 6.3 million people were estimated to have diabetes mellitus in 2011, a figure projected to reach 11.4 million by 2030[5].

According to World Health Organization, diabetes mellitus can be classified into following main categories: diabetes mellitus type 1, diabetes mellitus type 2, hybrid forms of diabetes, other specific types such as resulting from genetic abnormalities, pancreatic diseases, endocrine disorders, drug or chemical induced diabetes, infection related diabetes etc. and hyperglycemia first detected during pregnancy[6].

The definition of glycemic control differs with various guidelines. The American Diabetes Association recommends an HbA1c level of less than 7.0% as the standard glycemic treatment goal, whereas the International Diabetes Federation recommends a level of less than 6.5%[7]. The significance of adequate glycemic control in patients of diabetes mellitus is already established. Literature suggests that glucotoxicity and lipotoxicity that occur before prolonged hyperglycemia and dysfunction of beta-cell are reversible occurrences and prompt management of blood glucose level may therefore alter the

[1-2] Department of Community Medicine,
Baqai Medical University.
[3-4] Karachi Medical and Dental College.

Correspondence: **Dr. Syed Muhammad Zulfiqar Hyder Naqvi**
Department of Community Medicine,
Baqai Medical University
Email: dr.smzhnaqvi@gmail.com
Date of Submission: 26th August 2019
Date of Acceptance: 18th March 2020

course of hyperglycemia and delay or altogether prevent long-term diabetes related complications[8].

In order to develop evidence-based strategies to achieve better glycemic control in diabetic individuals, an evaluation of factors influencing blood glucose level in such patients is must. Although a number of previous studies have evaluated the factors associated with glycemic control among patients with diabetes mellitus type 2[9-11], to the best of authors' knowledge, the recent local data is limited at best. In the given context, this study was conducted with the objective of determining the factors associated with self-reported glycemic control among outpatients with diabetes mellitus type 2 visiting a private tertiary care hospital of Karachi.

Subjects and Methods

After taking ethical approval, a cross-sectional survey was carried out at the outpatient department of Fatima Hospital, Baqai Medical University, Karachi, from July 2018 to October, 2018. The inclusion criteria of the study were being aged 30 years or above, of either gender, obese, and a self-reported diagnosis of diabetes mellitus type 2 for at least 1 year whereas the exclusion criteria were being a known case of hybrid form of diabetes mellitus and refusal to give verbal informed consent. The lower age limit was set in accordance with previous published literature[12].

For maximum sample size estimation, the percentage frequency of the study outcome was taken as 50%, with 95% confidence level and 7.5% precision, a minimum of 171 participants were required to be included in the study. Systematic random sampling technique was employed and after a random start every third patient coming to the outpatient department was approached and checked for eligibility. After checking eligibility, all data were collected by interviewing the study participants using a structured questionnaire by the investigators. The questionnaire was initially developed in English but was later translated to Urdu for the purpose of interview and had earlier been tested for face validity. It consisted of two sections; the first section comprised of 5 questions regarding socio-demographic characteristics of the study participants while the second section consisted of 9 questions

regarding the glycemic control of the study participants and its associated factors.

Statistical package for social sciences version 21 was used for data analysis. For descriptive analysis frequencies and percentages of categorical variables and means and standard deviations of continuous variables were calculated. Chi-square test and binary logistic regression were used to check for associations of various patient related factors with self-reported blood sugar control, with the latter also serving to control for potential confounders. The significance level was kept at 0.05.

Table 1. Bivariate analysis of patient related factors and self-reported glycemic control

| Variables (n=185) | Blood Sugar Under Control | | |
	Yes Count (%)	No Count (%)	P
Duration since Diagnosis			
1 Year	26 (76.5)	8 (23.5)	0.035
2 to 9 Years	66 (67.3)	32 (32.7)	
10 Years or More	27 (50.9)	26 (49.1)	
Regular Medicine Intake			
Yes	99 (70.2)	42 (29.8)	0.003
No	20 (45.5)	24 (54.5)	
Regular Exercise			
Yes	65 (87.8)	9 (12.2)	<0.001
No	54 (48.6)	57 (51.4)	
Meals / Day			
< 3 Times	32 (66.7)	16 (33.3)	0.842
3 Times	65 (62.5)	39 (37.5)	
> 3 Times	22 (66.7)	11 (33.3)	
Frequent Consumption of Sweet Substances			
Yes	32 (55.2)	26 (44.8)	0.079
No	87 (68.5)	40 (31.5)	
Medication Adjustment after High Sugar Intake			
Yes	65 (70.7)	27 (29.3)	0.074
No	54 (58.1)	39 (41.9)	
Weight Change during the Previous Year			
No Change	63 (75.9)	20 (24.1)	0.001
Increased	15 (40.5)	22 (59.5)	
Decreased	41 (63.1)	24 (36.9)	

Table 2. Multivariable analysis of patient related factors and self-reported glycemic control

| Variables (n=185) | | AOR | 95% C.I. | | p |
			Lower	Upper	
Regular Medicine Intake	Yes	2.331	1.047	5.19	0.038
Regular Exercise	Yes	7.688	3.349	17.65	<0.001
Weight Change	Increased	4.931	1.923	12.643	0.001
during the Previous Year	Decreased	2.601	1.166	5.8	0.02

Results and Discussion

The total data analyzed were of 185 patients with 100% response rate. The mean age of the study participants was 51.12 ± 11.52 years, 103 (55.7%) of them were males, 70 (37.8%) were illiterate whereas 54 (29.2%) were able to read and write, 97 (52.4%) had monthly household income <25000 rupees whereas 57 (30.8%) were Sindhi speaking. The study results revealed that 98 (53.0%) of them had their diabetes diagnosed for 2 to 9 years, 141 (76.2%) of them regularly took medication for diabetes and out of them, 84 (59.6%) were on oral medication, 74 (40.0%) did regular exercise, 104 (56.2%) took 3 meals per day, 127 (68.6%) did not consume sweet substances regularly, 92 (49.7%) adjusted their medication after high intake of sugar, 83 (44.9%) did not experience any change in weight during the previous year whereas 119 (64.3%) had their blood sugar under control.

The results of bivariate analysis revealed that duration since diagnosis (p=0.035), regular medicine intake (p=0.003), regular exercise (p<0.001) and weight change during the previous year (p=0.001) were all significantly associated with self-reported glycemic control of the patients where patients with duration of 1 year since diagnosis, who regularly took medicine, did regular exercise and did not experience any change in weight during the previous year were more likely to have their blood sugar under control than those who did not (Table 1).

The results of multivariable analysis showed that regular medicine intake (AOR 2.331; p=0.038), regular exercise (AOR 7.688; p<0.001), and an increase or decrease in weight during the previous year (AOR 4.931; p=0.001 and AOR 2.601; p=0.020 respectively) were all significantly associated with self-reported glycemic control of the patients where patients who regularly took medicine, did regular exercise and experienced either an increase or a decrease in their weight during the previous year had significantly higher odds of having their blood sugar under control than those who did not (Table 2).

As per study findings 76.2% patients regularly took medication for diabetes whereas 40.0% of them exercised regularly. Similarly, Ahmad NS et al., in 2014 reported 53.4% of the patients to be compliant with their diabetes medication while 44.7% of them did regular exercise[9].

The study results further showed that patients in whom the duration of diabetes was longer were more likely to have high blood sugar, a finding that supports the existing literature. Juarez DT et al., in 2012 found a significant association between longer duration of diabetes and poor glycemic control[10]. Likewise, Ahmad NS et al., in 2014 reported that diabetic patients with longer duration of illness were less likely to have good glycemic control[9].

The results of the study revealed, as expected, that patients who regularly took medicine and exercised regularly had significantly higher odds of having their blood sugar under control. Sanal TS et al., in a meta-analysis published in 2011 also reported non-adherence to medication and exercise to be among the factors related with poor control of diabetes[11].

Conclusion

Based on the study findings, it can be concluded that a majority of patients had their blood sugar under control and that certain patient related factors like duration since diagnosis, regular intake of medicine, regular exercise and weight change during the previous year do play a role in it. It is therefore suggested that such factors should not be overlooked by the physicians if they are targeting a better glycemic control in their patients. Moreover, it is recommended that any patient awareness program in the given context must be devised while keeping the aforementioned factors in mind for a desirable outcome.

It is acknowledged that relying on self-reported glycemic control was the prime limitation of the study. Moreover, a larger sample size would have resulted in more accurate assessment of the study outcomes.

Conflict of Interests

Authors have no conflict of interests and received no grant/funding from any organization.

References

1. American Diabetes Association. Diagnosis and Classification of Diabetes Mellitus. [Online] Diabetes Care. 2013; 36:S67. Available from:https://care.diabetesjournals.org/content/36/Supplement_1/S67. Accessed on: 10 February 2020.

2. Prevalence of Diabetes Mellitus [Online]. World Health Organization 2017. Available from: www.who.int/diabetes/country-profiles/pak_en.pdf. Accessed on: 10 February 2020.

3. Ley SH, Meigs JB. Epidemiology and Risk Factors of Type 2 Diabetes [online]. Diabetes Epidemiology, Genetics, Pathogenesis, Diagnosis, Prevention, and Treatment 2018:55-80. Available from:file:///C:/Users/DC/Downloads/DIA_Ch13.pdf Accessed on: 10 February 2020

4. Zheng Y, Ley SH, Hu FB. Global aetiology and epidemiology of type 2 diabetes mellitus and its complications [online]. Nat Rev Endocrinol 2018; 14:88. Available from: https://www.nature.com/articles/nrendo.2017.151. Accessed on: 10 February 2020.

5. Whiting DR, Guariguata L, Weil C, Shaw J. IDF diabetes atlas: global estimates of the prevalence of diabetes for 2011 and 2030. Diabetes Res Clin Pract. 2011; 94:311-21.[DOI:10.1016/j.diabres.2011.10.029]

6. Classification of Diabetes Mellitus 2019: World Health Organization; 2019 [online]. Available from: https://www.who.int/publications-detail/classification-of-diabetes-mellitus. Accessed on: 10 February 2020.

7. Hemmingsen B, Lund SS, Gluud C, Vaag A, Almdal T, Hemmingsen C, Wetterslev J. Intensive glycaemic control for patients with type 2 diabetes: systematic review with meta-analysis and trial sequential analysis of randomized clinical trials [online]. BMJ. 2011; 343:d6898. [DOI:10.1136/bmj.d6898]

8. Stolar M. Glycemic control and complications in type 2 diabetes mellitus. Am J Med. 2010; 123:S3. [DOI: 10.1016/j.amjmed.2009.12.004.]

9. Ahmad NS, Islahudin F, Paraidathathu T. Factors associated with good glycemic control among patients with type 2 diabetes mellitus. J Diabetes Investig 2014; 5:563. [DOI:10.1111/jdi.12175]

10. Juarez DT, Sentell T, Tokumaru S, Goo R, Davis JW, Mau MM. Peer Reviewed: Factors Associated With Poor Glycemic Control or Wide Glycemic Variability Among Diabetes Patients in Hawaii, 2006-2009. Prev Chronic Dis 2012;9.[DOI: 10.5888/pcd9.120065]

11. Sanal TS, Nair NS, Adhikari P. Factors associated with poor control of type 2 diabetes mellitus: a systematic review and meta-analysis. J Diabetol. 2011; 3:1-0. [DOI: 10.1155/2016/2109542]

12. Mohammadi S, Karim NA, Talib RA, Amani R. Knowledge, Attitude and Practices on Diabetes Among Type 2 Diabetic Patients in Iran: A Cross-Sectional Study [online]. Science. 2015; 3:520-4. Available from:https://diabetes research.ajums.ac.ir/_diabetes-research/Documents/8_20190128_095118.pdfAccessed on: 10 February 2020.