Glycemic Control in Type 2 Diabetes Mellitus Patients Visiting KIST Medical College and Teaching Hospital, Lalitpur

Ashok Raj Joshi[1], Mahima Bataju[1], Suman Simkhada[2], Elina Mulmi[2] , Binita Bhattarai[1]

[1] Department of Biochemistry, KIST Medical College and Teaching Hospital, Lalitpur

[2] Department of Medicine, KIST Medical College and Teaching Hospital, Lalitpur

ABSTRACT

Introduction: In developing countries like Nepal, the prevalence of type 2 Diabetes Mellitus is increasing by geometric progression due to modernization, changes in food habits and absence of physical activity. Recognizing the determinants of poor glycemic status may contribute to the clearer understanding of modifiable antecedents of diabetes-related complications that may help to achieve improved patient function and outcome.

Methods: The study was conducted from 16th November 2020 to 28th April, 2021. The variables included were age, sex, marital status, education level, smoking habit, body mass index, duration of diabetes mellitus fasting and postprandial blood sugar level and glycosylated hemoglobin ($HbA1_C$). In the descriptive statistics, frequency, percentage, mean and standard deviation (SD) were calculated while in the inferential statistics, chi-square was used for qualitative variables and unpaired T- test for quantitative variables. Multiple binary logistic regressions were used to determine factors associated with poor glycemic control. A P-value of<0.05 was considered statistically significant

Results: Out of the 175 patients mean age is 53.7 ± 11.39 years with female dominance. Mean HbA1c is 8.07± 2.25%. Majority (55.5%) have poor glycaemic control denoted by $HbA1_C$ >7%. Patients with duration of more than 5 years had higher odds of poor glycemic control (OR=1.97; 95% CI: 1.078, 3.62) compared to those with the duration of 5 years and less. More than 12 years of formal education was associated with decreased odds of poor glycemic control (OR=0.47; 95% CI: 0.22, 1.02).

Conclusion: Increasing the literacy rate and implementing programs that emphasize lifestyle modification to delay the onset of development of diabetes mellitus should be encouraged to achieve good glycemic control in diabetic patients.

Keywords: Type 2 diabetes mellitus; Diabetes control; Glycosylated hemoglobin

Correspondence:
Dr. Ashok Raj Joshi
Professor,Department of Biochemistry
KIST Medical College and Teaching Hospital, Lalitpur, Nepal
Email: ashokrajjoshi15@gmail.com
Mobile: 9851097705
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INTRODUCTION

Type 2 Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia that results from defects in insulin secretion, or action, or both.[1]The prevalence of type 2 diabetes mellitus is rapidly increasing all over the world.[2] Likewise, in developing countries like Nepal, the prevalence of it is increasing by geometric progression due to modernization, changes in food habits and absence of physical activity. Gywali B et al. puts the incidence of diabetes mellitus in Nepal to 8.5%. [3]

The goal of the treatment is to keep the blood sugar levels withing normal limits all the time and modalities used for this are weight reduction, diet control, use of different drugs like sulphonylureas, biguanides, meglitinides, thiazolidinediones, DPP-4 inhibitors, GLP-1 receptor agonists and SGLT2 inhibitors and sometimes even parental insulin administration. Blood sugar estimation at any time will give us the blood sugar value at that stipulated time whereas glycosylated hemoglobin will underscore the blood sugar status within the previously three to four months. Uncontrolled diabetes leads to the onset of complications like nephropathy, neuropathy, retinopathy, diabetic foot, circulatory abnormalities etc.

Recognizing the determinants of poor glycemic status may contribute to the clearer understanding of modifiable antecedents of diabetes-related complications and achieve improve patient function and outcome.

METHODS

This is a cross sectional study conducted among patients with type 2 diabetes mellitus attending outpatient clinics of internal medicine- endocrine department at KIST Medical College and Teaching Hospital, Lalitpur Nepal. The study was conducted over a period of 5 and half months from 16th November 2020 to 28th April, 2021. A convenient sample of 175 patients willing to participate was taken for the study. Written consent was taken from the participants. Ethical approval was obtained from institutional review committee before commencing the study.

The diagnosis of Diabetes mellitus was done by endocrinologist according to American Diabetic Association (ADA) criteria. Detailed history and complete physical examination were done in all the participants and the pro forma structured for the study was meticulously filled in by the clinician in the outdoor The variables included were age, sex, marital status, education level, smoking habit, body mass index, duration of diabetes mellitus fasting and postprandial blood sugar level and glycosylated hemoglobin (HbA1$_C$). Patient with HbA1$_C$7%   were considered good glycemic control while those with >7% were considered poor glycemic control. Patients with type 2 Diabetes Mellitus taking Insulin therapy were excluded from the study. Fasting and post prandial blood sugar was analyzed by enzymatic Hexokinase method using fully automated analyzer (Siemens Dimension) which works on the principle of spectrophotometry.HbA1$_C$ was measured in whole EDTA ed blood in Erba Mannheim- Hb-Vario by ion-exchange high performance liquid chromatography method.

The data was entered and analysed in Statistical Package for Social Sciences (SPSS) 20.0.   In the descriptive statistics, frequency, percentage, mean and standard deviation (SD) were calculated while in the inferential statistics, chi-square was used for qualitative variables and unpaired T- test for quantitative variables. Multiple binary logistic regressions were used to determine factors associated with poor glycemic control. P-value of<0.05 was considered statistically significant.

RESULTS

The age of the patient ranges from 32 to 86 years, mean age 53.7 ± 11.39 years with female dominance 89(50.9%), male 86 (41.1%). The HbA1C ranges from 4.9% to 17.2% with mean 8.07± 2.25. Majority 69.7% are non-smokers. 55.4% had duration of diabetes mellitus less than 5years. (Table1)

Table 1. The Socio-Demographic and Clinical Characteristics of Patients with Type 2 Diabetes Mellitus

Variable	N	%
Sex		
Male	86	41.1%
Female	89	50.9%
Age		
< 40 years	18	10.3%
40-49 years	54	30.9%
50- 59 years	50	28.6%
>60 years	53	30.3%
Marital status		
Married	161	92.0%
Unmarried	14	8.0%
Formal education		
< 6 years	59	33.7%
7-12 years	72	41.1%
>12 years	44	25.1%
Smoking		
Yes	53	33.3%
No	122	69.7%
Body Mass Index		
Normal	70	40.0%
Overweight	79	45.1%
Obese	26	14.9%
HbA1c		
7%	78	44.6%
>7%	97	55.4%
Diabetes duration		
>5 years	78	44.6%
5 years	97	55.4%

Out of 175 patients, majority (55.5%) had poor glycaemic control while others had good glycaemic control. It also showed that glycaemic control was better in patients who had more than 6 years of formal education compared to those who had less than 6 years of formal education. 62.9 % of patient with poor glycaemic control had duration of diabetes mellitus >5 years. (Table2)

Table 2. The Rate of Glycaemic Control According to Socio-Demographic and Clinical Characteristics of Patients

Variable	HbA1C 7% N	HbA1C 7% %	HbA1C >7% n	HbA1C >7% %	p-value
Sex					
Male	39	50	47	48.5	0.839
Female	39	50	50	51.5	
Age					
<40	9	11.5	9	9.3	
40-49	21	26.9	33	34.0	0.422
50-59	20	25.6	30	30.9	
>60	28	35.9	25	25.8	
Marital Status					
Married	70	89.7	91	93.8	0.412
Unmarried	8	10.3	6	6.2	
Formal education					
<6 years	20	25.6	39	40.2	
7-12 years	31	39.7	41	42.3	0.020
>12 years	27	34.6	17	17.5	
Smoking					
Yes	21	26.9	32	33.0	0.385
No	57	73.1	65	67.0	
Diabetic duration					
5 years	42	53.8	36	37.1	0.027
>5 years	36	46.2	61	62.9	
BMI					
Normal	33	42.3	37	38.1	
Obese	35	44.9	44	45.4	0.747
Overweight	10	12.8	16	16.5	

In the multivariate binary regression analysis (Table 3), the variables that were significantly associated with poor glycemic control were duration of diabetes and education. Patients with duration of more than

5 years had higher odds of poor glycemic control (OR=1.97; 95% CI: 1.078, 3.62) compared to those with the duration of 5 years and less. More than 12 years of formal education was associated with decreased odds of poor glycemic control (OR=0.47; 95% CI: 0.22, 1.02).

Table 3. Multi-variate Analysis of Factors Associated With Poor Glycemic Control among Patients with Type 2 Diabetes Mellitus

Variable	OR (95%, CI)	p-value
Duration of diabetes		
<5 years	1	
>5 years	1.97 (1.078, 3.62)	0.028
Education		
<6	1	
7-12	1.47 (0.72, 3.00)	0.286
>12	0.47 (0.22, 1.02)	0.057

DISCUSSION

In our study the majority of patient (55.5%) with diabetes mellitus type 2 had poor glycemic control denoted by the HbA1c value of more than 7.0%. which is similar to a study done in Jordan in a teaching hospital like ours where 51.6% had poor glycemic control.[4] Similar finding was observed in a study of 500 diabetic patients conducted in Karnataka, India in 2012, where 78.6% showed poor glycemic control.[5] This finding is also similar to that reported in Saudi Arabia where half of the studied populations had poor glycemic control.[6] Similarly in studies done to assess glycemic control status in various countries worldwide like the USA, UK, India [7,8,9,10,11] also found out that more than 50% of type 2 Diabetes Mellitus patients had poor diabetic control. However in a study of assessment of glycemic control in type 2 diabetes in a slum in Kolkata it was found the poor glycemic control group constituted 37.5%.[12]

The education status of the enrolled patients in this study was categorized as less than 6 years, 7 to 12 years and more than 12 years of formal education. In the patients with education of less than 6 years 33.8% and 7 to 12 years, only 43% had good glycemic control. This meant the majority of the patients in these two categories had uncontrolled diabetic status. In the group with>12 years education as much as 61.3% had good diabetic control with HbA1c %. Educational level was significantly associated with glycemic control in our study. This finding is in accordance to the finding of koelina sil et.al [13] from200 type 2 Diabetes Mellitus patent of India. Their study concluded that glycemic control is better in more educated persons and level of education has an inverse relationship to the complication score. This may be possibly explained by the fact that patients with low education status have low diabetes knowledge, low self-management behaviors, lower self-efficacy and lower continuity of care leading to poor glycemic control. As diabetes is a chronic metabolic disorder it is imperative that full knowledge about the disorder imparted to the patient and care takers of the patient. The team taking part in the treatment of the patient should go through with the patients at length to educate them about the disease and the complications that might arise in them during the course of treatment or the disease progression.

In our study, the participants with diabetes mellitus for more than five years had less percentage of good glycaemic control as compared to those with diabetes mellitus of less than five years duration (53.8% vs 37.1%). Juarez et al. also reported that patients who had had diabetes for 10 years were about nine times more likely to have poor glycemic control than those who had had diabetes for three years.[14] A longer duration of diabetes negatively affects glycemic control, possibly because of progressive impairment of insulin secretion over time as a result of βcell failure. Therefore, as the disease progresses, most patients require an increase in their pharmacotherapy to maintain glycemic control.

That only 44.5% of the studied population had good glycaemic control is of serious concern and all efforts should go out to ameliorate this predicament. As it takes a concerted effort to deal with all the issues and the various people involved with the diabetic patient: the dietician, physician, endocrinologist, family members, social worker, chiropractor, psychologist etc. should liaise with each other and work in unison for the betterment of the patient. More important is that the patient himself or herself get motivated to learn enough about the disease, the goal of therapy, the side effects of the different therapeutic modalities, hypoglycemia, diabetic comas and the complications of the diabetes mellitus. So patient education and motivation is pivotal. Educational programs that emphasize lifestyle modification with emphasis on

family support are encouraged. The responsibility of the physician does not end with the diagnosis of diabetes. Conversely, it is an advent of a life-long responsibility along with patient education and a long-term goal to have euglycemic status to avert and minimize the complication of diabetes mellitus.

CONCLUSION

The majority of type 2 diabetes mellitus attending KIST MCTH had poor glycemic control. The poor glycemic control is more in patients with poor education levels as compared to those with higher education and also those with diabetes mellitus of more than five years duration have poor glycemic control as compared to those with diabetes mellitus of less than five years duration. Increasing the literacy rate and implementing programs that emphasize lifestyle modification to delay the onset of development of diabetes mellitus should be encouraged to achieve good glycemic control in diabetic patients.

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