Research Article

Identifying and addressing the determinants that affect successful control of diabetes mellitus type II

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ABSTRACT

Background: Various life variables are known not essential to the advancement of type 2 diabetes including weight, absence of adequate physical action, terrible eating routine, anxiety, and urbanization. A number of dietary factors such as consumption of sugar-sweetened drinks in excess and the type of fats in the diet also appear to play a role. **Objectives:** Estimating the prevalence of successful control of type 2 diabetes mellitus (DM) and its determinants at Diabetic Centre, Prince Mansur Military Hospital for Community Medicine, Taif, Kingdom of Saudi Arabia. **Materials and Methods:** A cross-sectional study was adopted. It included adult DM type 2 patients (18-60 years), at (PMFCH), Armed Forces Hospital, Taif region. Successful control of type 2 DM has been defined strictly by achievement of targeted glycemic control glycated hemoglobin (HBA1C) <7. An Arabic self-administered questionnaire was utilized to collect data from patients. It includes demographic data, disease history, and lifestyle (social factors). HBA1C was recorded from the file of the patient. Trained nurse measured the weight (in kg) and height of each patient to calculate body mass index (BMI). **Results:** Among 370 diabetic patients, 331 returned completed questionnaire giving a response rate of 89.5%. More than one-quarter of them (27.2%) aged over 60 and 48.4% aged between 40 and 60 years. DM was controlled among only 27.5% of the diabetic patients (HBA1C <7%) while it was uncontrolled among most of them (72.5%). In logistic regression analysis, the duration of DM, diabetes treatment, BMI, family support, and compliance with diabetic diet regimen were all significantly related to glycemic control based on HBA1C value. **Conclusion:** The patients with poor glycemic control were high, which is nearly comparable to that reported from many countries. Longer duration of diabetes, and not adherent to diabetes self-care management behaviors, obesity, combination therapy, and lack of family support were associated with poor glycemic control.

KEY WORDS: Diabetes; Mellitus Type II; Prince Mansur Military Hospital; Taif

INTRODUCTION

Diabetes mellitus (DM) is a metabolic issue that is portrayed by high blood glucose with regard to insulin resistance and relative insulin inadequacy. Sort 2 diabetes makes up around 90% of instances of diabetes with the other 10% because of DM sort 1 and gestational diabetes. Obesity is thought to be the primary cause of type 2 diabetes in people who are genetically predisposed to the disease. Type 2 diabetes is initially control by increasing exercise and dietary modification.

Type 2 diabetes is typically a chronic disease, associated with a 10 years shorter life expectancy. This is partly due to a number of complications with which it is associated including cardiovascular disease and stroke, lower limb amputations,

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increased rates of hospitalizations, nontraumatic blindness and kidney failure, cognitive dysfunction, and dementia through disease processes such as Alzheimer's disease and vascular dementia.[27,28]

Various way of life variables are known not essential to the advancement of sort 2 diabetes including weight, absence of adequate physical action, terrible eating routine, anxiety, and urbanization.[15] A number of dietary factors such as consumption of sugar-sweetened drinks in excess[16] and the type of fats in the diet appear to play a role.[17,7]

Onset of sort 2 diabetes can be deferred or anticipated through appropriate sustenance and general activity.[19] According to American Diabetes Association (ADA) successful control of type 2 DM has been defined strictly by achievement of targeted glycemic control glycated hemoglobin (HBA1C) <7.[3] Intensive lifestyle measures may reduce the risk by over half. The benefit of exercise occurs regardless of the person's initial weight or subsequent weight loss (World Health Organization [WHO], 2009). Proof for the advantage of dietary changes alone, however, is restricted, with some confirmation for an eating regimen high in green verdant vegetables and some to limit the admission of sugary beverages.[25] In those with impaired glucose tolerance, diet and exercise and/or metformin or acarbose may decrease the risk of developing diabetes. Lifestyle interventions are more effective than metformin.[21]

Administration of sort 2 diabetes concentrates on the way of life mediations, bringing down other cardiovascular danger calculates, and keeping up blood glucose levels in the typical reach. Managing other cardiovascular risk factors including hypertension, high cholesterol, and microalbuminuria improves a person's life expectancy. Intensive blood sugar lowering as opposed to standard blood sugar-lowering does not appear to change mortality. The objective of treatment is ordinarily a HBA1C of under 7% notwithstanding; these objectives might be changed after expert clinical interview, considering specific dangers of hypoglycemia and future.[22]

A proper diet and exercise are the foundations of diabetic care with a greater amount of exercise yielding better results. Aerobic exercise leads to a decrease in HBA1C and improved insulin sensitivity.[27]

Customarily, an effective treatment of the patients with sort 2 DM has been characterized entirely by accomplishment of focused glycemic control, basically utilizing a ventured care approach that starts with changes in the way of life consolidated with oral treatment that is gradually escalated as ailment movement progresses and β-cell capacity decreases. A new paradigm for managing patients with type 2 DM should address the concomitant risk factors and morbidities of obesity, hypertension, and dyslipidemia with equal or occasionally even greater aggressiveness than for hyperglycemia. The use of antidiabetic agents that may favorably address cardiovascular risk factors should be considered more strongly in treatment algorithms although no pharmacological therapy is likely to be ultimately successful without concomitant synergistic lifestyle changes.[24]

All around starting 2010, it was assessed that there were 285 million individuals with sort 2 diabetes making up around 90% of diabetes cases (Goodman, 2010). This is equivalent to about 6% of the world's adult population. Diabetes is common both in the developed and the developing world. Diabetes commonness is comparative in men and ladies despite the fact that it is marginally higher in men underneath 60 years old and somewhat higher in ladies at more established ages. While diabetes is a global problem its effects are most marked in Asia-4 of the 5 countries with the greatest number of people with diabetes are Asian people with diabetes in the year 2000 (millions) 1. India (31.7), 2. China (20.8), 3. U.S. (17.7), 4. Indonesia (8.4), and 5. Japan (6.8). Other ethnic gatherings, for example, Pacific Islanders, Latinos, and Native Americans likewise give off an impression of being especially defenseless to diabetes. This might be because of certain ethnic gathering's affectability to a Western way of life. Customarily considered an illness of grown-ups, sort 2 diabetes is progressively determined in kids in parallel to have rising stoutness rates.[27]

Rates of diabetes in 1985 were estimated at 30 million, increasing to 135 million in 1995 and 217 million in 2005. This increase is believed to be primarily due to the global population aging, a decrease in exercise, and increasing rates of obesity. It is recognized as a global epidemic by the WHO.[27] The prevalence of diabetes varies throughout the world but increasing because of changes in lifestyle. According to the estimates of WHO, 346 million people worldwide have diabetes. More than 80% of people with diabetes live in low- and middle-income countries.

The Kingdom of Saudi Arabia (KSA), a nation of more than 27 million individuals, is a quickly creating nation.[4] During the last three decades, the potential surge in socioeconomic growth has considerably influenced the lifestyle of the people. A recent community-based national epidemiological health survey in KSA has found the overall prevalence of DM as 23% (Al-Nozha et al., 2004) which is alarming for health-care providers. People with diabetes should receive medical care from a physician-coordinated team. These groups may incorporate doctors, medical attendant professionals, doctor's collaborators, medical attendants, dietitians, drug specialists, and emotional wellness experts with the ability and a unique enthusiasm for diabetes. It is essential in this collaborative and integrated team approach to involve family and assessment of social factors in individuals with diabetes assumes play an active role in their glycemic control. There is strong evidence to suggest that a close correlation exists between good glucose

control and improved clinical outcomes in hospitalized diabetic patients and in the outpatient setting.[2]

MATERIALS AND METHODS

This study was conducted at the adult DM type 2 outpatient clinics in the Diabetic Centre at Prince Mansur Military Hospital for Community Medicine (PMMCH), Armed Forces Hospitals, Taif, KSA. This is considered the first point of contact between the general public and the health-care system. It is in this way a perfect area to get a more representative specimen from individuals with various sociodemographic and social qualities. Diabetic an endocrine focus is situated at diabetic focus, PMMCH, with 20 centers including: 5 grown-up diabetic facilities, 2 grown-up endocrine, 2 pediatrics endocrine facilities, 1 bone mass thickness clinic,1 foot care clinic,1 training clinics,1social facility, 1 brain research facility, 1 endocrine unit,1 pediatric appraisal clinic, 1 ophthalmology center, and 1 dietitian center.

A cross-sectional approach was carried out to estimate the prevalence and to identify the determinants of successful control of DM type 2 at Diabetic Centre, Prince Mansur Family and Community Hospital, Armed Forces Hospital in Taif region. The study population was the Saudi Patients who diagnosed as DM type 2. So for this study, the adult DM type 2 patients (18-60 years), both sexes, who attend outpatient clinics during the month of December 2012 at diabetic center at (PMFCH), Armed Forces Hospital in Taif region. In this way, test size is 337, keeping in mind the end goal to represent non-reaction and accomplish dependable and exact result the specialist expanded the example size by 10% to be 370. A self-manage surveys were given to the gathering (attendant) in a diabetic focus, to give them to the diabetic patients with the facility card section. The information was gathered in 4-week time interim from 4 grown-up diabetic facilities every day, 12 persistent every center, 240 patients every week, 960 patients in 4-week.

Statistical Package for Social Sciences software version 20.0 was used for data entry and analysis. Descriptive statistics (number, percentage for categorical variables and mean, standard deviation and range for continuous variables) and analytic statistics using Chi-square tests (χ^2) to test for the association and/or the difference between two categorical variables were applied. $P \leq 0.05$ was considered statistically significant.

Poor glycemic control based on HBA1C was treated as dependent variable in multivariate logistic regression analysis model. Significant variables associated with poor glycemic control in bivaraite analysis were treated as independent categorical variables. Multiple associations were evaluated in multiple logistic regression models based on the backward stepwise selection. This procedure allowed the estimation of the strength of the association between each independent variable while taking into account the potential confounding effects of the other independent variables. The insignificant covariates were removed from the model. Each category of the predictor variables was contrasted with the initial category (reference category). The adjusted measure of association between determinant factors and poor glycemic control was expressed as the odds ratio (OR) with 95% confidence interval (95% CI). Adjusted or crude ORs with 95% CI that did not include 1.0 were considered significant.

RESULTS

An aggregate of 370 diabetic patients welcomed to take an interest in the study, the returned complete survey was 331 with reaction rate of 89.5%. Table 1 exhibits the sociodemographic qualities of the diabetic patients. More than one-fourth of them (27.2%) matured more than 60 and half of them (48.4%) matured somewhere around 40 and 60 years. Male patients speak to 75.8% of them. The majority of them (83.7%) were married. More than half of them (58.3%) had more than 3 children, had private houses (53.8%) and not working (53.2%). Almost two-thirds of diabetic patients (63.1%) breadwinner one family and reside urban area (67.7%). More than one-quarter of them (29.3%) had at least university degree. The income was <5000 SR/month among 55.6% and more than 20,000 SR/month among 3.3% of the participated diabetic patients.

Similarly, Table 2 demonstrates that the duration of diabetes was more than 10 years in 41.4%. Diabetic complications were reported by 43.8% of diabetic patients. Regarding diabetes therapy, a combination of oral hypoglycemics and insulin was reported by 47.4% of them while insulin alone and oral hypoglycemics alone were reported by 14.8% and 34.1% of the participants, respectively. Most of the diabetic patients (78.8%) were satisfied with diabetic therapy and almost two-thirds of them (69.5%) have mentioned that they sometimes compliant with diabetic diet regimen while only 25.7% were always compliant with it.

Similarly, the following table shows the multivariate logistic regression analysis results. The results show that after controlling for potential confounders that were significant in bivariate analysis (gender, educational level, income, marital status, and smoking) in logistic regression analysis, the duration of DM, diabetes treatment, body mass index (BMI), family support and compliance with diabetic diet regimen were all significantly related to glycemic control based on HBA1C value.

DISCUSSION

In spite of the fact that DM is connected with a high occurrence of confusions, its control results in decrease of bleakness and mortality, as well as financial weight of the

Table 1: Demographic characteristics of the diabetic patients (*n*=331)

Demographic data	Frequency (%)
Age in years	
20-30	42 (12.7)
31-40	39 (11.8)
41-50	74 (22.4)
51-60	86 (26.0)
>60	90 (27.2)
Sex	
Male	251 (75.8)
Female	80 (24.2)
Marital status	
Single	19 (5.7)
Married	277 (83.7)
Divorced	14 (4.2)
Widowed	21 (6.3)
Number of children	
≤3	130 (41.7)
>3	182 (58.3)
Family breadwinner	
None	24 (7.3)
One family	209 (63.1)
More than one family	98 (29.6)
Housing	
Rural	107 (32.3)
Urban	224 (67.7)
Type of accommodation	
Private	178 (53.8)
Governmental	39 (11.8)
Rent	114 (34.4)
Job	
Yes	15 (46.8)
No	176 (53.2)
Education	
Illiterate	53 (16.0)
Primary school	63 (19.0)
Intermediate	46 (13.9)
Secondary school	72 (21.8)
University	64 (19.3)
Above university	33 (10.0)
Income (SR/month)	
≤5000	184 (55.6)
5001-10,000	60 (18.1)
10,001-15,000	52 (15.7)
15,001-20,000	24 (7.3)
>20,000	11 (3.3)

Table 2: Medical history of the diabetic patients (*n*=331)

Medical history	Frequency (%)
Duration of diabetes (years)	
<1	56 (16.9)
1-5	52 (15.7)
6-10	86 (26.0)
>10	137 (41.4)
Diabetic complications	
Yes	145 (43.8)
No	186 (56.2)
Diabetic therapy	
Diet regimen	12 (3.6)
Oral hypoglycemics	113 (34.1)
Insulin	49 (14.8)
Oral hypoglycemics and insulin	157 (47.4)
Satisfaction with diabetes therapy	
Full satisfied	155 (46.8)
Somewhat satisfied	106 (32.0)
Neutral	25 (7.6)
Somewhat unsatisfied	30 (9.1)
Full unsatisfied	15 (4.5)
Compliance with diabetic diet regimen	
Always	85 (25.7)
Sometimes	230 (69.5)
Never	16 (4.8)

infection. This control is considered as one of the guidelines of the result of diabetes smaller than usual facilities in Saudi Arabia PHCCs.[6] HBA1C, fasting, and postprandial blood glucose levels are used to assess the level of glycemic control (Bakkau et al., 1998). HBA1C is used to assess level of glycemic control in this study.

In our study, 72.5% of diabetic patients (type 2) showed poor glycemic control (HBA1C over 7%). This figure is higher that reported in Riyadh, KSA by Azab (2001) where poor glycemic control was reported among 44-49% of type 2 diabetic patients. In their study, glycemic control was evaluated based on two readings of fasting blood glucose. Poor glycemic control was characterized by having fasting blood glucose >10 mml/L. These figures ought to be under 10% in the national objectives of diabetic control. Likewise, the poor glycemic control accomplished in this study was additionally found in other neighborhood and global studies, e.g., a neighborhood study was directed on diabetic patients at King Khalid University Hospital, Riyadh. It found that 77% of the patients had HbA1 values above normal range, and 16.5% had severe hyperglycemia (blood sugar >27.7 mmol/L) (Famuyiwa et al., 1992). Glycemic control was also found to be generally poor in diabetic patients in a typical English community.[10] In Netherlands, nearly half of the general practice population of type 2 diabetes patients had levels of HBA1C over 7.0%.[14] For these and other reasons, some authors believe that practical measures of achieving glycemic targets in diabetic patients is quite difficult.[13]

As per ADA (1996), the standardization of glucose qualities was not accomplished as a gathering in the seriously treated patients required in the diabetes control and complication trial because of mean glucose qualities being 40% above ordinary cutoff points. More nearby studies are expected to survey glycemic control among diabetic patients in the Kingdom. The relatively high prevalence of poor glycemic control achieved in this study reflects the greater needs for

Table 3: Factors associated with glycemic control

Factors	χ^2	*P*-value
Demographic factors		
Age (years)	8.43	0.077
Marital status	8.25	0.041
Number of children	1.07	0.300
Family breadwinner	3.53	0.171
Family member working in health field	0.24	0.624
Housing	2.03	0.154
Accommodation	1.58	0.454
Income	10.03	0.040
Educational level	14.48	0.019
Working status	3.21	0.068
Medical factors		
Duration of diabetes	9.33	0.025
Diabetic complications	0.001	0.973
diabetes treatment	9.72	0.021
Satisfaction with diabetes treatment	5.64	0.228
Compliance with diabetic diet regimen	6.12	0.047
Social factor		
Family support in therapy	7.17	0.007
Smoking history	8.07	0.018
History of social stress	0.38	0.539
History of regular physical activity	2.18	0.536
BMI	91.67	0.001

BMI: Body mass index

Table 4: Factors associated with poor glycemic control: Results of multivariate logistic regression analysis

Parameters	Adjusted OR	95% CI
Duration of diabetes (in years)		
<1	1.0	
1-5	1.3	0.23-2.39
6-10	1.6	0.68-4.33
>10	2.1	1.05-6.3*
Diabetes treatment		
Oral hypoglycemics	1.0	
Diet regimen	1.02	0.13-27.3
Insulin	2.7	1.2-8.2*
Oral hypoglycemics and Insulin	2.5	1.09-11.3*
BMI**		
Normal®	1.0	
Overweight	2.03	0.8-6.3
Obesity grade 1	4.2	1.6-8.3*
Obesity grade 2	4.7	1.4-9.6*
Obesity grade 3	6.3	2.0-11.6*
Family support in therapy		
Yes	1.0	
No	1.88	1.1-3.8*
Compliance with diabetic diet regimen		
Always	1.0	
Sometimes	1.66	1.01-4.3*
Never	1.88	0.02-9.3

CI: Confidence interval, BMI: Body mass index, OR: Odds ratio

more efforts to improve it. There is a pressing need for public education programs and for promoting public awareness.

The KSA has confronted a quick improvement program and financial change in the course of recent decades that brought about changes in dietary propensities and expanded pervasiveness of corpulence, connected with less physical movement. Mindfulness programs about the significance of proper way of life changes (e.g., eating routine and activity) are of central in controlling the infection. Patient and family instruction for self-administration ought to be empowered. The self-monitoring of blood glucose by patients has been designed to improve glycemic control.

The study demonstrates that the rate of good glycemic control among diabetic patients under the study is 27.5%. It is a great deal not exactly the national objectives of diabetic control which consider more than 40% of diabetic patients to be in the brilliant classification. In a Jordanian study,[16] poor glycemic control (HBA1C ≥7%) was present in 65.1% of patients. In Kuwait, 66.7% of the studied population had HBA1C ≥8%.[5] In Saudi Arabia, only 27% of the patients reached target level of glycemic control (Akbar, 2001). In Pakistan (Habib and Aslam, 2003), 46.7% of patients had HBA1C ≥7.5%. In Trinidad, 85% had HBA1C ≥7%.[12] Furthermore, HBA1C reported from National Health and Nutrition Examination Survey III was >9% in 24.5% of patients (51) In UK, 69% had HBA1C >7.5%.[23]

Strengths and Limitation

This study demonstrated that more drawn out length of diabetes was related fundamentally with poor glycemic control. This finding is steady with that reported by different studies.[8] Longer duration of diabetes is known to be associated with poor control, the worsening of glycemic control over time could be explained by a reduction in pancreatic beta cell function and an increased fat mass, particularly visceral adiposity, leading to greater insulin resistance associated with the ageing process.[26] According to UK Prospective Diabetes Study Group (1998), it is known that achieving and maintaining HBA1C levels <7% is difficult in patients with a longer duration of DM even with the addition of the third oral hypoglycemic drug. Hypoglycemia remains a major limiting factor in achieving tight glycemic control with insulin.

In this study, the patients with poor glycemic control will probably be recommended mix of oral antidiabetic specialists and insulin or insulin alone, which may show that doctors are endeavoring multitherapy or moved to insulin to give better illness control. The relationship between treatment with mix of oral antidiabetic specialists and insulin or insulin alone and poor glycemic control is reliable with different studies.[29] This finding reflects the fact of deteriorations of diabetes over time, and the need for higher doses or additional mediations increases over time. Therefore, the patients who were treated

by combination therapy of oral antidiabetic agents and insulin had more progressive disease which required more aggressive treatment to provide glycemic control, but this phenomenon could be attributed to delay in applying insulin in the treatment of patients with poor glycemic control.

In our study, 60.6% of patients were overweight or hefty. Typical BMI patients would be advised to control on diabetes. The same has been accounted for in different studies[1,9] and in a meta-investigation study the absence of a relationship among age and poor glycemic control in our study is not reliable with the discoveries of various studies[11,20] which reported that more youthful age was connected with poor glycemic control. We found that poor glycemic control was more common among patients who were not adherent for diabetic diet regimen. Therefore, patients should be motivated to follow the dietetic instruction as prescribed. In spite of the importance of diet and exercise in control of diabetes, only a small percentage of patients with Type 2 diabetes were adherent to diet regimen and physical activity. Continuous education is recommended to encourage physical activity and diet regimen adherence.

In this way, from the above dialog, we presume that the extent of patients with poor glycemic control was high, which is about tantamount to that reported from numerous nations. Longer span of diabetes, and not follower to diabetes self-consideration administration practices, weight, mix treatment and absence of family backing were connected with poor glycemic control.

CONCLUSION

The patients with poor glycemic control were high, which is nearly comparable to that reported from many countries. Longer duration of diabetes, and not adherent to diabetes self-care management behaviors, obesity, combination therapy, and lack of family support were associated with poor glycemic control.

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