Predictors of Poor Glycemic Control Among Type Two Diabetic Patients

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Abstract Diabetes is the sixth leading cause of death and results in high morbidity[1]. The purpose of the following study is to determine which factors, including obesity, level of physical activity, dietary intake, Medical profile and socio-demographic characteristics are associated with poor glycemic control among diabetic patients in the Almadinah Diabetic Centre. A systematic random sampling technique was used to select the respondents with type two diabetes using self-administered, pre-tested questionnaire. HbA1c level was abstracted from patients' records. Hight and weight was measured and BMI was calculated, self-reports of socio-demographic profile, Medical profile, International Physical Activity Questionnaire and 24 hours diet recall. Poor glycemic control was defined as HbA1c > 7%. The percentage of poor glycemic control was highest among male, aged 60 years and above, no formal education, not working, low income, those with positive family history of diabetes, and those with oral and combination treatment (oral and diet), and those with one and more complications, those were diagnosed at age 40 years and above, and those were with diabetes for 7 years and above, low physical activities, obese respondents and those with abnormal calories intake. Respondents with poor glycemic control were significantly associated with family history, duration of diabetes mellitus, diabetic management and diabetic complications (p<0.05). Results of logistic regression showed that the respondents with positive family history of diabetes were 3.448 times more likely to have poor glycemic control compared with to those with no family history. Those with oral and combination treatment (oral and diet) were 78.14 times more likely to have poor glycemic control compared with those on diet. This rather high of poor glycemic control implies the importance of the need that Diabetic Centre authority should put their efforts into action, for example, by Continues educational programs that emphasize lifestyle modification with importance of adherence to treatment regimen would be of great benefit in glycemic control for glycemic control among diabetic patients.

Keywords Diabetes, Poor Glycemic Control, Good Glycemic Control

1. Introduction

There are several theories explaining the existence of diabetes among the people of Saudi Arabia. Along with those theories, come the rival discussions about the methods, ways and measures that should be taken to control diabetes and reduce its extreme adverse effects on the population.

Approximately 85% to 90% of people infected diabetes have type two diabetes which results from decreased sensitivity to insulin (called insulin resistance) and impaired beta cell functioning resulting in decreased insulin production[2]. Type two or adult onset diabetes is a common and rapidly increasing disease.

Due to its complications such as degeneration of the retina leading to blindness, kidney disease, coronary heart disease, stroke, amputations of the limbs, problems during pregnancy, and congenital malformations; diabetes causes an enormous burden to health care services and costs[3]. Most populations infect diabetes increasingly and rapidly, and by 2030 the number of infected type two diabetes is predicted to be more than double as compared with the current figure[4]. Type two diabetes develops as a combination of genetic susceptibility and environmental factors, and its rate increases steeply with age.

Type two diabetes is one of the many diseases affecting peoples' health in many countries especially Saudi Arabia. Taking a special consideration of the cases in Saudi Arabia, various factors have been depicted to predict the poor glycemic control among the citizens in Almadinah diabetic patients.

Saudi society is undergoing tremendous progress such a rapid socioeconomic transition that it is unfair to apply the results of glycemic control studies from western countries to Saudi community, particularly Almadinah society. Few researchers in Saudi Arabia have studied the problem of glycemic control in some areas such as Riyadh and Abha[5]. Nevertheless, none of them has addressed the problem with

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glycemic control among diabetic patients in Almadinah, Saudi Arabia.

Predictors of poor glycemic control can be deduced from the relationships between the following: glycemic control and socio-demographic characteristics (gender, age, income, occupational status and educational level), glycemic control and the level of physical activity, glycemic control and obesity, glycemic control and dietary intake, and glycemic control and diabetic profile (age at diagnosis, duration of diabetes, type of treatment, complication and family history)[6].

Glycemic control is a medical term that refers to the typical levels of blood sugar in a person with type two diabetes[7]. Good glycemic control is defined as an HbA1c value of 7 % or less for the past three months. Poor glycemic control is defined as an HbA1c value of more than 7 % for the past three months[8]. Obesity is defined by body mass index (BMI $\geq$ 30 kg/m^2) and can be classified as underweight, normal and obese. The level of physical activity is monitored using the International Physical Activity Questionnaire (IPAQ) to obtain reliable conclusions and can be classified into low, moderate and high physical activity. Dietary intake is calculated depend on patient's activity, Gender and BMI, and patients will be classified to normal and abnormal calories intake.

2. Purpose of the Study

To identify the predictors of poor glycemic control among type two diabetic patients in the Al-Medina Diabetic Centre.

3. Methodology

A cross sectional study was conducted to determine the predictors of poor glycemic control among type two diabetes in Al-madinah Diabetic. The study population was made up of type two diabetes where diagnosed and registered in Al-Madinah Diabetic Centre for more than three month and not less than 20 years old and able to walk. Also, the respondents for this study were recruited using systematic random sample technique. In the meantime, data were collected using self administered questionnaire, HbA1c level was collected from patient's files as all diabetic patients must have it during regular visit. Height was measured without shoes to the nearest of 0.1 centimetre (cm) using a stand-meter. Weight was measured to the nearest of 0.1 kg on a bathroom scale, the subject wearing light clothes and with no shoes. BMI was calculated as weight (kg) divided by the square of the height (m2). Meanwhile, the data was analyzed with SPSS tool version (19), where chi measures of central tendencies and distribution were determined as the initial focus on the data. Descriptive statistics were conducted on the data in order to draw the information required to prove or disprove the study hypothesis. However, descriptive statistics was based on Pearson Chi-square. In

addition, the logistic regression model conducted with enter, forward LR, backward LR model to give the overall prediction, which provided with important conclusion from the data.

4. Results

The proportion of poor glycemic control in this study was significantly higher 76.4%, the percentage of poor glycemic control was highest among male (80.9%), aged 60 years and above, (82.8%), no formal education (87.5%), not working (77.9%), and those with monthly income between SR 1000 to 3000 (79.5%). However there was no significant association (p > 0.05) between gender, age group, level of education, working status, monthly income and glycemic control. Meanwhile, the results showed that there was a significant association between family history of diabetes mellitus and glycemic control. The percentage of poor glycemic control was significantly higher among those with positive family history of diabetes mellitus than those without family history. Meanwhile, the diabetic management results showed that there was a significant association between diabetic management and glycemic control. However, 64.2% of respondents were with oral and combination treatment (oral and diet), and 85.6% of those respondents have poor glycemic control. Also, the results indicated that there was a significant association between diabetic complications and glycemic control. Furthermore, the analyses showed that the percentage of poor glycemic control was significantly higher among those with one complication and more than one complication than no complication (p < 0.05). On other hand, the results indicated that 54.2% of respondents were diagnosed at age 40 years and above, and 81.6% of those respondents were with poor glycemic control. However, there was no significant association between age at diagnosis with poor glycemic control. In the meantime, for duration of diagnosis, the results showed that 52.8% of respondents were with diabetes for 7 years and above, and 83.8% of those respondents were with poor glycemic control. However, poor glycemic control was significantly higher with those long diagnoses of diabetes mellitus (p < 0.05). Also, the results indicated that, the proportion of patients with low physical activities was significantly higher among respondents (96.4%) than other who engaged moderate or/and high activities. However, there was no significant association (p > 0.05) between physical activity and glycemic control. Moreover, this study present that, there were 45% of respondents obese and 76.2% of those respondents were with poor glycemic control. However, there was no significant association between different obesity levels and glycemic control. Also, the results showed that there were 52.8% of respondents with abnormal calories intake, and 73% of those respondents were with poor glycemic control. However, there was no significant association between calories intake and glycemic control. The final results showed the predictors of poor

glycemic control. The respondents with positive family history of diabetes were 3.448 times more likely to have poor glycemic control compared with to those with no family history. In addition, those with oral and combination (oral and diet) management were 78.14 times more likely to have poor glycemic control compared with those on diet. These results have been supported by many previous studies in most or some associated factors[9] and[10] respectively. In conclusion, for clinical classification of poor glycemic control this study used HbA1c result to measure average of blood glucose level over the past 2-3 months (normal value less than 7%). However, the American Diabetes Association (ADA) has designated HbA1c level of < 7 % as a goal of optimal blood glucose control[11]. The proportion of poor glycemic control among diabetes patients was very high, which was closing comparable to exact of that reported from many countries. Besides that, positive family history of diabetes and not adherent to diabetes self-care management behaviours were associated with poor glycemic control. Continues educational programs that emphasize lifestyle modification with importance of adherence to treatment regimen would be of great benefit in glycemic control.

5. Discussion

This study has shown the existing theories on diabetes and glycemic control methods to some extent. In addition, it has shown that the lifestyle, socio-demographic characteristics, medical profile, obesity, dietary intake and physical activity factors affect the probability of poor glycemic control and the extent to which the disease progresses and getting complications. These factors were described using various variables, and have been analyzed and the results explained to show public health policy makers a starting point to direct efforts to make the patients aware of their condition and have good glycemic control. Glycemic control plays a key role in preventive long-term complications such as; impaired vision (blindness), renal failure, neuropathy,..etc. there are modifiable and non modifiable factors contribute in poor glycemic control etiology which influence and increasing the proportion of poor glycemic control among type two diabetes.

5.1. Response Rate

There were a total of 152 respondents involved in this study and the overall response rate was 92%. All these respondents were with type two diabetes and have been registered in the Diabetic Centre at least three months before the studying date.

5.2. Proportion of Poor Glycemic Control

Poor glycemic control proportion among respondents was statistically documented in this study 76% comparable study that conducted in Jordon and shows the proportion of poor glycemic control among patients with type two diabetes was 65.1% (HbA1c >7%)[12]. In Pakistan study shows, the proportion of poor glycemic control was 46.7% HbA1c >7.5%[13] and in Kuwait, the proportion of poor glycemic control was 66.7% of diabetes mellitus patients had HbA1c ≥ 8%[14]. However, the above studies shows that in the Eastern Mediterranean Region have same problem with high proportion of poor glycemic control. However, previous study in Saudi Arabia reported, the proportion of poor glycemic control among type two diabetes was 73%[15]. Although clinical studies have showed that glycemic control correlates with a reduction in complications of diabetes[16].

5.3. Characteristic of Respondents

Most of respondents that were participated in this study consist of female 93 (66.4%). On other hand, the percentage of poor glycemic control was highest among male. However, the finding is consist with that reported by other studies, the prevalence of diabetes mellitus was found to be 15.8% (24.2% in males and 11.3% in females) and a total of 451 subjects, and there were 76.7% of those patients were with poor glycemic control. The same also, in the percentage of poor glycemic control was highest among aged 60 years and above, (82.8%)[17]. As well as, older individuals (aged ≥ 65 and above) 1.58 times more likely had better diabetes controlled than younger age group[10].

In this study, most of respondents in this study with no formal education 34.3%. however, there were 87.5% of those patients with poor glycemic control, in somehow the study has been supported other study that mentioned, patients with higher education levels are more likely to have better glycemic control (due to stronger problem-solving and coping capacities arising from educational experience)[18]. In meanwhile the majority of diabetic patients (90%) had poor knowledge about their diabetes that influenced to poor glycemic control[19]. Same study mentioned that, the older patients more likely to have poor overall of knowledge about their diabetes. So, there was a liner association between education level and glycemic control.

In addition, this study reported that, 67.8% of respondents without work; in contrast, 32.1% were having jobs. However, there were 77.9% of those patients were with poor glycemic control. Furthermore, most of respondents were with low monthly income 52.1% and by other hand, 7.1% were with high monthly income. However, there were 79.5% of patients with low monthly income were with poor glycemic control. However, according to several studies, monthly income, self-related health and perceived barriers were consistently associated with poor glycemic control.

The result shows that, most respondents were obese 45% and BMI was normally distributed with the average of 29.9 kg/m². This showed the average of respondents BMI was in the upper limit of the normal range of 18.5 – 30 kg/m²[20]. Furthermore, there were 76.2% of those patients were with poor glycemic control. In addition, most of respondents who were participated in this study were abnormal dietary intake 52.8%. However, there were 73% of those patients were with poor glycemic control. In somehow the study has been

supported other study that mentioned, the increasing in calories intake contributed the rising prevalence of obesity in female in Saudi population and affecting glycemic control for diabetic patients as well[21]. Changes in HbA1c are mainly proportional to the random blood glucose level and the levels were higher in obese both types of diabetes than in non-obese[22]. Moreover, other study results mentioned that overweight and obesity are risk factors glycemic control and there were a convincing association between excessive weight gain and the glycemic control[23].

This study had shown that most respondents engaged low physical activity 96.4% and few respondents perform moderate or vigorous type of activity. However there was no significant association (p > 0.05) between physical activity and glycemic control. Study results has not been in agreement with a number of studies results such that; six personal barriers, such as having little time, being too tired, not being in good health, lacking energy, lacking motivation, and low physical activity[24]. In meanwhile, physical activity improve glycemic control result, reduce blood pressure, and positively affect other coronary heart disease risk factors for individuals who already living with type two diabetes[25]. It is reported that, physical exercise protected from type two diabetes[26]. However, Life style in Saudi Arabia play a vital role in keeping diabetic patients engages low physical activity. Weather can also be a contributing factor which makes patients unable to perform physical activity such as too hot or too cold. Poor weather has been identified as an environmental barrier to being physical active[26]. A part from that, diabetes can influence the participation of respondents in physical activity.

This study shows that, there were diabetic complications among respondents, 41.4% of respondents were having one diabetic complication and 34.2% were having more than one diabetic complication. However, 74.1% of patients were having one diabetic complication with poor glycemic control. In contrast, 87.5% of patients were having more than one diabetic complications were with poor glycemic control. Further study reported that, worse quality of life compared with non-diabetic population because of the diabetic complications[27].

Furthermore, this study shows that, there were 90.7% of respondents with oral and combination (oral and diet) treatment. However, 83.5% of those patients were with poor glycemic control. However, the finding is consist with that reported by other studies, those taking medications less likely controlled their diabetic as compared with those on diet[10].

Also, this study shows that, 57.1% of respondents were with positive family history and 68% of those patients were with poor glycemic control. Moreover, there were 52.8% of respondents were having diabetes for 7 years and above and there were 83.8% of those patients with poor glycemic control. This results has been supported by other study that mentioned, increased I year duration of diabetes was 1.01 time more likely had better diabetes control[10].

This study has also shows that there were 54.2% of respondents have been diagnosed with diabetes at 40 years old and above. However, there were 81.6 of those patients with poor glycemic control

6. Conclusions

This study indicates the important factors that determine the extent of poor glycemic control among type two diabetes in Al-Madinah Diabetic Centre. Measures to reduce the number of cases with poor glycemic control include but are not limited to educating patients and vulnerable populations on how to manage and prevent diabetic complications. Monitoring the diet and engage physical activities were concluded to be vital for the promotion of good glycemic control. Public Health Care Practitioners need to educate and constantly check patients' HbA1c levels for urgent management to provide health and prevent complications.

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