Review Article

The Management of Glycemic Control In Associated Disorders

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Abstract

Glycemic control is a very useful parameter for the prevention of the chronic metabolic diseases complications such as diabetes, metabolic syndrome, cardiovascular and kidney disease. Glycemic control management among chronic metabolic diseases has been an area of active research from the past decades. The glycemic index specifies that how fasting blood glucose level is elevated after consuming a high carbohydrate-containing diet. The metabolic studies among the human populations showed that glycemic index is directly related with different chronic metabolic diseases. The sturdiest associations are suggested that the low caloric diet consumption can prevents metabolic complications. Primary and tight glycemic control is compulsory to prevent and reduce the development of vascular complications in individuals with chronic disorders. The aim of this review was to provide a practical guideline on the bases of the survey of the related key studies which had reflected the clinical guidelines and current perspectives related to glycemic management. The objective of this review is also to investigate the interventions, related to glycemic control in patients with diabetes, metabolic syndrome and cardiovascular diseases. In conclusion, we can say that multidisciplinary management of glycemic control are powerful measure for the prevention of metabolic diseases complications, providing necessary support for reducing in economic burden of chronic metabolic diseases.

Keywords

Glycemic control, Stroke, Central Obesity, Arterial Hypertension, Insulin Resistance, Glycemic Index

Introduction

Diabetes mellitus is becoming a major health hazard across the world. In 2014 according to world Health Organization (WHO) the prevalence of diabetes was to be 9% globally among adult population1. Devastating burden of the diseases is in low and middle- income countries, where four out of five people are living with diabetes. The diabetes requires constant medical care and self-management in order to avoid short-term as well as long-term complications. The disease management can result in significant increase in the total economic burden. The cost of

diabetes in 2013 was approximately \$548 billion word wide2. Diabetic people are at the higher risk with number of life-threatening problems. Constantly high blood glucose levels can cause the acute and chronic diabetic complications the chronic microvascular complication includes retinopathy, nephropathy, and neuropathy. However, the acute macro vascular complications of diabetes are coronary heart disease (CHD), stroke and peripheral arterial diseases. Macro vascular diseases are more prevalent and cause disability and death in diabetic patients3. The hyperglycemia also promotes conditions including central obesity, dyslipidemia, arterial hypertension and insulin resistance. Improved glycemic control can reduce the risk factors of related diseases4.

Glycemic Control in Diabetes
Diabetic individual is at higher risk for vascular disease including micro vascular complications and lower extremity amputations4. The macro vascular complications include cardiovascular, cerebrovascular and peripheral vascular chronic changes. These are mainly concern about significant proportion of premature deaths in patients with diabetes5. The research is indicating that the increase production of free radicals in poor glycemic control may be an important contributing factor in these complications. These reactive oxygen species amplified especially in uncontrolled diabetes, it can lead the auto oxidation of glycosylated proteins, activation of sorbitol pathway, induction of membrane damage, and oxidation of cellular lipids ad proteins. The increased oxidation stress caused by poor glycemic control consequences in an increase catalase and a decrease in super oxide dismutase (SOD) and paraoxonase (PON) activities therefore catalase /SOD and catalase /PON ratios

might be altered and promote development of glycemic complications6. Furthermore, it was shown that depression in diabetic individual is positively associated with glucose deregulation, central obesity and poor adherence to medication regimens. The cortisol abnormalities associated with depression would have hyperglycemic effects. Likewise, the remission of depression is associated with a reduction in glycosylated HbA1c levels in diabetic patients7. There is a communal interaction between depression and glycemic control in which depression may produce hyperglycemic which provoke depression in diabetic patients8.

Glycemic Control in Metabolic Syndrome
The metabolic syndrome (MS) is a significant risk factor for cardio pulmonary diseases immature death in patients with diabetes. MS is characterized by the clustering of independent cardiovascular risk factors including impaired glucose regulation, central obesity, dyslipidemia, and hypertension8. It increases the frequency of cardiovascular disease (CVD) in patients with T2DM, appropriate treatment of dyslipidemia, hyperglycemia and hypertension is essential to reduce the risk factors. Good glycemic control is also significant because of the evidence suggesting that a reduction in HbA1c level to 7.0% or less will reduce CVD events in patient with diabetes9. It has been shown that cute hyperglycemia in MS increase inflammatory markers including IL-6 and TNFαin in individuals with and without T2DM. Clinical trials and epidemiological studies suggest that postprandial hyperglycemia is may be stronger risk factor for the development of CVD and atherosclerosis than fasting glucose or HbA1c levels10. Effective Glycemic control plays a vital role in inhibition of CVD event

and related metabolic risk factors in individuals with MS and T2DM11.

Glycemic Control Guidelines

Blood glucose levels essential to estimate the glycemic status and also to make decisions on the treatment plans. Several indices are used to estimate the blood glucose levels which include 12 hours fasting or pre-prandial glucose, 2-hour postprandial glucose, bedtime glucose, and hemoglobin A1c (HbA1c) levels. Overall glycemic exposure by both fasting and post prandial plasma glucose is reflected by HbA1c level over the past 2-3 months. Glycated HbA1cis a reliable estimate of mean glucose postprandial glucose levels over the previous 3 to 4 months for most individuals. Various organizations have guidelines for glycemic control, that is attainment of recommended HbA1c goals of <7.0 or 6.5% to get effective management of type 2 diabetes mellitus (T2DM) 12. Glycemic control is a vital element of care of DM people. For glycemic control the American Diabetes Association (ADA) presently recommend HbA1C level less than 7.0%. The international diabetes federation (IDF) and American Association of Clinical Endocrinologist (AACE) recommend a target of glycemic control less than 6.5%10.

Glycemic Control by Self-Management and Drug Therapy

The control of hyperglycemia is a top priority to achieve specific glycemic goals because it can substantially reduce morbidity rate of diabetes. While optimizing diabetic care reduces immature death and complication rates. Maintenance of glycemic levels nearby to the normal range have a powerful beneficial effect on diabetes specific microvascular and macro vascular complications13. Healthy lifestyle and medication plays a pivotal role in the management of glycemic control. It was proved that regular exercise and weight loss is more effective for improving HbA1c levels in diabetic individuals. It potentially decreases three-fold HbA1c level in T2DM patients. Usually, aerobic activities have been suggested for people with T2DM because of its known benefits on insulin sensitivity and glycemic control14. Self-monitoring of glycemic control includes daily monitoring of glucose level at home as well as intermittent monitoring of overall glycaemia is very important to reduce the acute and chronic diabetic complications15.

It is admitted that diabetes requires diabetes self-management (DSM) care abilities, and patients also need to be trained about diabetes self-management skills to become capable and sufficiently responsible to take care of themselves. Self-management is a big challenge which requires skillful integration of healthy diet, regular exercise, optimum weight control, self-monitoring of blood glucose, and medication adjustment in the daily routine over long periods, which in turn will help diminish or prevent following acute and long-term complication of the disease16. Pharmacological therapy is a gold standard method to achieve the glucose control as close to the non-diabetic range. Initially anti-hyperglycemic monotherapy is often unsuccessful to achieve glycemic goals, as the glycemic targets recommended by standard guidelines. Presently most of the patients require additional agents to maintain the glycemic control due to progressive nature of the disease17. The controlled clinical trials like Diabetes Control and Complications Trail (DCCT), Stockholm Diabetes Study in type1 diabetes, UK Prospective Diabetes Study (UKPDS) and Kumamoto Study in T2DM have helped to establish the different glycemic goals of therapies. The existing effective therapies,

metformin are the most commonly used oral anti hyperglycemic therapy both as mono and also in combination with other agents such as thiazolidinedione's or as sulfonylurea's. Metformin have ability to decreases the hyperglycemic levels by reducing hepatic glucose output and also improve insulin resistance18. Several randomized, controlled clinical trials(RCTs) have demonstrated many others anti- glycemic interventional drug therapies such as Insulin, Metformin, Acarbose, Xenical, Troglitazone, Ramipril, Losartan, pravastatin, Rosiglitazone, Nateglinid, Pioglitazone and Insulin etc19.

Glycemic Control with diet
Regulation of blood glucose levels to achieve glycemic control is a major goal in the management of diabetes, thus, dietary techniques by which normal glycemic control can achieve is likely important in limiting the complications of diabetes. The amount and type of carbohydrate in a food influences the blood glucose level. The National Academy of Sciences-Food and Nutrition Board recommended range of carbohydrate intake per day contribute to control the hyperglycemia20. It was proved that the use of a low glycemic index carbohydrate diet improves the glucose and lipid profiles in T2DM subjects21. Dietary fiber rich diet is also helpful for the treatment of hyperglycemia in patient with diabetes. The dietary fiber improves postprandial hyperglycemia by delaying the digestion and absorption rate of carbohydrates and lipids, which leads to improve glycemic control and reduce the body weight. Dietary fiber may boost peripheral insulin sensitivity possibly via short-chain fatty acids produced by fermentation of fiber in the intestines22.

Conclusion
Many research studies argue that the tight glycemic control can slowdown the diabetes complications such as micro and macro vascular complications. These targets of normoglycemia can achieve with the help of nutrition's and drug therapies. Furthermore, the tight glycemic control to condense the progression of the disease by which quality of life can improved, and also should be balance the comorbidities. It is recommended that avoid hyperglycemia, which is associated with increased cardiovascular risks factors diabetic complication and chronic kidney diseases etc.

Further studies are required to establish whether simpler treatment regimens and effective nutritional approaches could be equally effective on tight glycemic control, and it is also need to introduce the new diets which have ability to control the hyperglycemia.

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