

Evaluation of Correlation of HbA1c with Diabetic Complications Among Diabetic Subjects at a Tertiary Care Hospital

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ABSTRACT

Background: To evaluate and correlate diabetic complication with HbA1c levels in diabetic subjects.

Materials & Methods: A total of 20 diabetic subjects with complication of diabetic foot and 20 diabetic subjects without complication were enrolled. Complete clinical examination of all patients was carried out. All the results were analysed using SPSS software.

Results: Mean age of the diabetic foot complication subjects was 44.5 years while mean age of the patients without complication was 37.5 years. The mean HbA1c concentration among patients with and without complication was 7.85% and 10.08% respectively.

Conclusion: HbA1c levels are significantly changed in subjects with diabetic complications.


Keywords: Glycemic profile, Diabetic.

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INTRODUCTION

Diabetes is a condition defined by elevations in glucose. Historically, glucose measured in the fasting state or glucose measured two hours after a carbohydrate challenge (oral glucose tolerance test) have been the standard measures used to diagnose diabetes and identify people at risk for diabetes (frequently termed "prediabetes"). HbA1c has been used widely since the 1980s and is the standard measure used for monitoring glycemic control in clinical practice.¹

In red blood cells, HbA1c is hemoglobin that has glucose attached to the N-terminal valine of the beta chain and is reported as the proportion of total hemoglobin. Because the lifespan of red blood cells is approximately 120 days, HbA1c therefore reflects average glycemia over the past two to three months (since it is weighted towards the more recent months).² Advantages of HbA1c include the lack of participant preparation (fasting is not necessary); high within-person reliability;^{3,4} and excellent standardization of the assay in most countries.⁵⁻⁷

Diabetic foot ulcers are common and estimated to affect 15% of all diabetic individuals during their lifetime. It is now appreciated that 15 – 20% of patients with such foot ulcers go on to need an amputation. Almost 85% of the amputations are preceded by diabetic foot ulcers.⁸⁻¹⁰

Numerous risk factors for the development of foot ulcers have been suggested, the most important being peripheral sensory

neuropathy followed by peripheral vascular disease. The proportion of neuropathic, neuroischemic, and purely ischemic lesions in diabetics is 54, 34, and 10%, respectively.¹⁰

In India, it is estimated that approximately 40,000 legs are being amputated every year, of which 75% are neuropathic with secondary infection, which is potentially preventable. Certain factors, such as, barefoot walking, illiteracy, low socioeconomic status, late presentation by patients, ignorance about diabetic foot care among primary care physicians, and belief in the alternative systems of medicine contribute to this high prevalence.¹¹

Hence, this study was conducted to evaluate and correlate diabetic complication with HbA1c levels in diabetic subjects.

MATERIALS & METHODS

A total of 20 diabetic subjects with complication of diabetic foot and 20 diabetic subjects without complication were enrolled in present study conducted in Department of Biochemistry, Krishna Mohan Medical College & Hospital, Mathura, Uttar Pradesh, India. The age of subjects was between 30 to 50 years. Complete clinical examination of all patients was carried out. Blood samples were obtained from all the patients and mean HbA1c concentration was analysed and compared. All the results were analysed using SPSS software.

RESULTS

A total of 40 subjects were enrolled. Mean age of the diabetic foot complication subjects was 44.5 years while mean age of the patients without complication was 37.5 years. A mean HbA1c concentration among patients with and without complication was

7.85% and 10.08% respectively. Mean RBS concentration among patients with and without complication was 117.2mg/dL and 127.4 mg/dL respectively. Mean FBS concentration among patients with and without diabetic foot complication was 104.5 mg/dL and 116.8mg/dL respectively.

Table 1: Age-wise distribution

Age group (years)	Patients without Diabetic foot complications	Patients with Diabetic foot complications
Less than 35	11	8
More than 35	9	12
Total	20	20
Mean age	37.5	44.5

Table 2: Comparison of HbA1c, FBS and RBS values

Parameter	Patients without Diabetic foot complications	Patients with Diabetic foot complications	p- value
Mean HbA1c (%)	7.85	10.08	0.01
Mean FBS (mg/dL)	104.5	116.8	0.03
Mean RBS (mg/dL)	117.2	127.4	0.01

DISCUSSION

The management of diabetic foot ulcers includes several facets of care. Offloading and debridement are considered vital to the healing process, for diabetic foot wounds.¹²

The goal of offloading is to redistribute force from the ulcers sites and pressure points at risk, to a wider area of contact. There are multiple methods of pressure relief, including total contact casting, half shoes, removable cast walkers, wheelchairs, and crutches.¹³ An open diabetic foot ulcer may require debridement if necrotic or unhealthy tissue is present. The debridement of the wound will include the removal of the surrounding callus, which decreases the pressure points at the callused sites on the foot. Additionally, the removal of unhealthy tissue can aid in removing colonizing bacteria in the wound. It will also facilitate the collection of appropriate specimens for culture and permit examination for the involvement of deep tissues in the ulceration.¹⁴ Hence, this study was conducted to evaluate and correlate diabetic complication with HbA1c levels in diabetic subjects.

In the present study, a total of 40 subjects were enrolled. Mean age of the diabetic foot complication subjects was 44.5 years while mean age of the patients without complication was 37.5 years. A mean HbA1c concentration among patients with and without complication was 7.85% and 10.08% respectively. A study by Xu F et al investigate the relationship between glycemic variability and DPN in type 2 diabetes with well-controlled HbA1c (HbA1c < 7.0%). 45 type 2 diabetes with well-controlled HbA1c (HbA1c < 7.0%) and with DPN (DM/DPN group) were recruited in the study, and 45 type 2 diabetes with well-controlled HbA1c and without DPN (DM/-DPN group) were set as controls. The multiple parameters of glycemic variability included the standard deviation of blood glucose (SDBG), mean of daily differences (MODD) and mean amplitude of glycemic excursions (MAGE). The DM/DPN group had a greater SDBG, MODD and

MAGE, when compared to the DM/-DPN group ($p < 0.05$). BMI, TC, and LDLC of DM/DPN group were lower than those of DM/-DPN group ($p < 0.05$). The patients with hypoglycemia were comparable between the two groups ($p > 0.05$). Univariate analysis showed DPN was closely associated with BMI, TC, LDLC, SDBG, MODD, MAGE. There was a close relationship between glycemic variability evaluated by MAGE and DPN in type 2 diabetes with well-controlled HbA1c.¹⁵

In the present study, mean RBS concentration among patients with and without complication was 117.2mg/dL and 127.4 mg/dL respectively. Mean FBS concentration among patients with and without diabetic foot complication was 104.5 mg/dL and 116.8mg/dL respectively. Elevated level of HbA1c has been identified as a significant risk factor for cardiovascular diseases and stroke in subjects who may have diabetes. A community-based population study on 11,092 nondiabetic patients found that elevated HbA1c level was strongly associated with the risk of cardiovascular disease and mortality. High levels of HbA1c were associated with an increased risk of recurrence of atrial tachyarrhythmia in patients with type 2 DM and paroxysmal atrial fibrillation undergoing catheter ablation. Even an increase of 1% in HbA1c concentration was associated with about 30% increase in all-cause mortality and 40% increase in cardiovascular or ischemic heart disease mortality, among individuals with diabetes. Whereas reducing the HbA1c level by 0.2% could lower the mortality by 10%.⁴¹ Vaag has suggested that improving glycemic control in patients with type 2 diabetes may be more important than treating dyslipidemia for the prevention of both microvascular and macrovascular complications.¹⁶⁻²⁰

CONCLUSION

HbA1c levels are significantly changed in subjects with diabetic complications.

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