ORIGINAL RESEARCH PAPER

General Medicine

A STUDY OF THE COMPLICATIONS OF TYPE 2 DIABETES MELLITUS IN A TERTIARY CARE HOSPITAL AND THEIR CORRELATION WITH HbA1c LEVELS

KEY WORDS: diabetes mellitus, complications, HbA1c

Dr. Prasanta Dihingia Associate Professor, Department of Medicine, Assam Medical College and Hospital, Dibrugarh, Assam, India.

Dr. Debarun Choudhury Post-graduate trainee, Department of Medicine, Assam Medical College and Hospital, Dibrugarh, Assam, India.

Dr. Sreemanta Madhab Baruah* Assistant Professor, Department of Medicine, Assam Medical College and Hospital, Dibrugarh, Assam, India. *Corresponding Author

Dr. Tridip Kr. Das Assistant Professor, Department of Medicine, Assam Medical College and Hospital, Dibrugarh, Assam, India.

Dr. Chayanika Dutta Registrar, Department of Medicine, Assam Medical College and Hospital, Dibrugarh, Assam, India.

ABSTRACT

Introduction: Diabetes mellitus is a chronic progressive metabolic condition. HbA1c has assumed a pivotal position not only to diagnose but also to predict the complications of diabetes mellitus.
Objectives: To study the complications of type 2 diabetes mellitus and to correlate with HbA1c levels.
Methods: This is single centre, observational study carried out in all diabetic patients above 30 years age in Medicine Department of Assam Medical College and Hospital, Dibrugarh from March 2016 to February 2018. Prevalence of six complications were studied- nephropathy, neuropathy, retinopathy, CVA, CAD and sepsis.
Results: 289 patients were taken up for study. 69.5% had evidence of retinopathy, 64.3% had nephropathy and 35.6% had neuropathy. Sepsis was present in 22.1% cases. 34.9% had CVA and 31.5% had CAD. Those with higher HbA1c had more prevalence of complications.
Conclusion: HbA1c correlated well with the complications inspite of its inherent limitations.

INTRODUCTION:

Diabetes mellitus is the most common endocrine disease of this century. Changing lifestyle and urbanization has caused an increase in the incidence in developing countries, including India. As per the International Diabetes Federation, India has around 73 million diabetics in 2017, only second to China[1]. Diabetes can lead to both micro and macro-vascular complications. Measurement of glycated hemoglobin(HbA1c) provides an objective, retrospective index of glycemic control and can to some extent also predict development of complications[2,3,4]. For every 1% rise in glycated hemoglobin, there is an 18% rise in risk of cardiovascular disease[5]. In the studies done so far, micro-vascular complications have been seen to rise proportionately with rising HbA1c. However, the relationship with macro-vascular complications is less predictable[6,7].

AIMS AND OBJECTIVES:

1. To find the prevalence of complications of type 2 diabetes mellitus.
2. To correlate the complications with the HbA_{1c} levels.

MATERIALS AND METHODS:

This is single centre, observational study carried out in all diabetic patients admitted in Medicine Unit-5 of Assam Medical College and Hospital, Dibrugarh in the period from March 2016 to February 2018. Data were collected in a proforma which included particulars of the patient, duration of diabetes and the clinical features at presentation. Ethical clearance was taken from the institutional committee.

Inclusion criteria:

1. Type 2 diabetes mellitus patients aged 30 years and above admitted in Medicine Unit-5 of Assam Medical College and Hospital, Dibrugarh
2. Informed and written consent

Exclusion criteria:

1. Type 1 diabetics
2. Pregnant women
3. Known malignancy
4. Refusal to give consent

A total of 289 patients were studied after fulfilling the above criteria. Diabetes was defined as per ADA guidelines. Detailed history was taken from each patient including presence of visual disturbances, foamy urine, paraesthesia, chest pain, dyspnea on exertion, focal neurologic deficit and fever.

Microvascular outcomes were defined as follows:

(1) Retinopathy defined by the presence of any of the following lesions: micro-aneurysms, hemorrhages, cotton wool spots, intra-retinal microvascular abnormalities, hard exudates, venous beading and new vessels.
(2) Nephropathy was defined as presence of micro- or macro-albuminuria, with micro-albuminuria defined as urinary ACR ≥1.9 mg/mmol for men and ≥2.8 mg/mmol for women, and macro-albuminuria as ACR ≥28 mg/mmol for men and ≥40 mg/mmol for women
(3) Peripheral neuropathy, defined as either monofilament sensory test result below four out of five points on either side of the feet or NCS showing axonal neuropathy.

Macrovascular outcomes were defined as follows:

1. Coronary artery disease as defined by ST-T changes and/or loss of R wave progression on ECG or documented evidence of acute coronary syndrome.
2. Cerebrovascular disease as defined by abrupt onset of neurologic deficit lasting>24 hrs and/or evidence of stroke on radio-imaging studies.

Sepsis was defined using the SIRS criteria. Plasma glucose was analysed by glucose oxidase-peroxidase method and HbA1c by the HPLC method.

RESULTS:

Out of 289 patients studied, 181(62.6%) were males and 108(37.4%) were females (Fig 1)

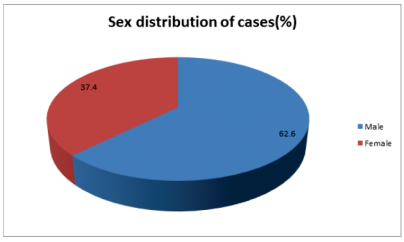

Fig. 1 The sex distribution of the study group

Of these, 201(69.5%) had evidence of retinopathy, 186(64.3%) had nephropathy and 103 had neuropathy (35.6%). Sepsis was present in 64(22.1%) cases. 101(34.9%) had symptoms and/or signs of CVA and 91(31.5%) had co-existing CAD (Fig. 2)

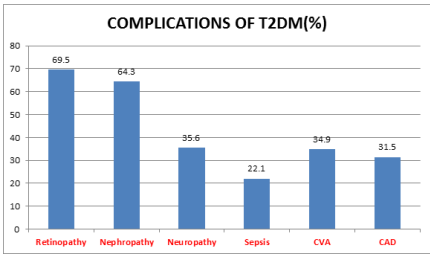

Fig. 2 The prevalence of complications in the study group

The mean HbA1C in the study group was 8.3%. Those with good control of glycemia (HbA_{1c}<7%) had less prevalence of complications than those with poor control (Fig. 3)

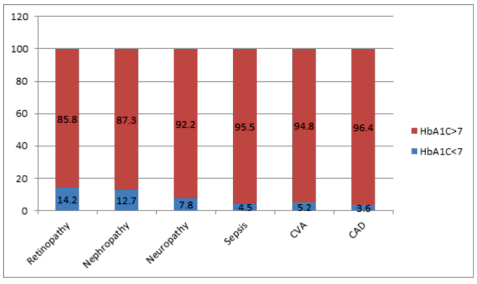

Fig. 3 The prevalence of complications in respect of the glycemic status

DISCUSSION:

This study showed that the prevalence of retinopathy was highest among the six complications studied. Those having uncontrolled glycemic status were more prone to develop complications including CVA, CAD and sepsis. Similar results have been shown in other studies of this nature[9,10,11]. Some studies have also shown that HbA1c may correlate with dyslipidemia[12] which can be indirectly related to CAD. Thus, our study supports the fact that HbA1c correlates well with the complications of diabetes mellitus, both micro-vascular and macro-vascular. However, our study may have been confounded by several factors. First, 43% patients had co-existent hypertension which may have influenced the development of complications. Second, hemoglobinopathies are common in this part of the country which may have affected HbA1c values. Third, HbA1c may also have been affected by the presence of CKD in 27% of the study population. Lastly, health awareness and access to healthcare is not up to the mark in this remote corner of the country and the values represented here may reflect only the tip of the iceberg of the larger problem existing in the community.

CONCLUSION:

HbA1c is a useful tool for diagnosis of diabetes as well as a weak biomarker for predicting complications. However, it has its inherent limitations in respect of the co-existing diseases and the assay used. There is a need to discover a better marker for prognostication of diabetic patients in relation to the complications they might develop. Till that time, we can use this valuable tool as a rough guide to predict the natural course of diabetes mellitus.

REFERENCES:

1. http://www.diabetesatlas.org/across-the-globe.html [accessed on 25/01/19]
2. Sherwani et al. Significance of HbA1c Test in Diagnosis and Prognosis of Diabetic Patients. Biomarker Insights 2016:11 95–104
3. Kumar S, Aneja GK, Trivedi A, Atam V, Shankhwar SN, Panwar A, Kumar P. Correlation of diabetic nephropathy and HbA1c in newly diagnosed type 2 diabetic patients of Western UP. Int J Sci Res Publ. 2014;4(12):1-4.
4. Özmen et al. The Relationship Between Glycosylated Haemoglobin and Diabetic Retinopathy in Patients with Type 2 Diabetes. Turk Jem 2007; 11: 10-5
5. Selvin E, Marinopoulos S, Berkenblit G, Rami T, Brancati FL, Powe NR, et al. Meta-Analysis: Glycosylated Hemoglobin and Cardiovascular Disease in Diabetes Mellitus. Ann Intern Med. 2004;141:421–431.
6. Bejan-Angoulvant T, Cornu C, Archambault P, Tudrej B, Audier P, Brabant Y, Gueyffier F, Boussageon R. Is HbA1c a valid surrogate for macrovascular and microvascular complications in type 2 diabetes?. Diabetes & metabolism. 2015 Jun 1;41(3):195-201.
7. Gore MO, McGuire DK. A test in context: Hemoglobin A1c and cardiovascular disease. Journal of the American College of Cardiology. 2016 Dec 6;68(22):2479-86.
8. Sabanayagam C, Liew G, Tai ES, Shankar A, Lim SC, Subramaniam T, Wong TY. Relationship between glycated haemoglobin and microvascular complications: is there a natural cut-off point for the diagnosis of diabetes?. Diabetologia. 2009 Jul 1;52(7):1279.
9. Ohkubo, Y, Kishikawa, H, Araki, E. Intensive insulin therapy prevents the progression of diabetic microvascular complications in Japanese patients with non-insulin-dependent diabetes mellitus: A randomized prospective 6-year study. Diabetes Res Clin Pract 1995; 28: 103–117.
10. Patel, A, MacMahon, S, Chalmers, J. Intensive blood glucose control and vascular outcomes in patients with type 2 diabetes. N Engl J Med 2008; 358: 2560–2572.
11. Martin-TimonI., Sevillano-CollantesC., Segura-GalindoA., del Cañizo-GómezF.J. Type 2 diabetes and cardiovascular disease: have all risk factors the same strength? World J Diabetes. 2014; 5: 444–70
12. KhanH.A., SobkiS.H., KhanS.A. Association between glycaemic control and serum lipids profile in type 2 diabetic patients: HbA1c predicts dyslipidaemia. Clin Exp Med. 2007; 7: 24–9.