



A COMPARITIVE EVALUATION OF BLOOD SUGAR AND GLYCOSYLATED HEMOGLOBIN IN CLINICALLY MANIFESTED DIABETIC NEUROPATHY

General Medicine

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ABSTRACT

Background: Diabetic neuropathy is one of the most common long term complications of diabetes and is clinically present in 30-50%. It is the most common form of neuropathy in the developed countries of world. Also it accounts for 50-70% of non-traumatic amputation. Objective: To compare the efficacy of blood sugar and Glycosylated Hb estimation in predicting the risk of diabetic neuropathy and monitoring the control of diabetes.

Method: 200 diabetic patients attended Department of General Medicine in Meenakshi Medical College Hospital and Research Institute with symptoms suggestive of diabetic neuropathy were subjected to detailed history for the presence of various risk factors, complete clinical examination and lab investigation including, FBS, PPBS, HbA1C, and etc.

Results: Diabetic neuropathy was common in age group of 56-65 years (34%) with average duration of diabetes mellitus for 11.7 years. Based on Glyco-Hb test, poor glycemic control was reported in 31% of cases and based on blood sugar poor glycemic control was reported among 21% of cases (P=0.0011).

Conclusion: Poor glycemic control, a major pathogenic factor for diabetic neuropathy is reflected more often by glycoHb than blood sugar level. Thus glycoHb estimation is superior to conventional method in assessing the risk of and monitoring diabetic neuropathy.

KEYWORDS

Diabetic neuropathy, Glycosylated Hb.

I. INTRODUCTION

The spreading diabetes epidemic is a major health threat for India and threatens to bankrupt our nation. According to recent estimates, presently India has 32 million diabetic subjects, and this is projected to increase to 100 million i.e. rise by 250% by the year 2035. In the CUPS study, 12% of individuals above age of 20 years in Chennai were found to be diabetic in the years 1997.¹ In 2017, 425 million people have diabetes in the world and 82 million people in the SEA Region; by 2045 this will rise to 151 million. There were over 72,946,400 cases of diabetes in India. Also the majority of these will have type-2 diabetes². More than 95-97% of elderly diabetics are of type II diseases. Diabetic Neuropathy is one of the most common troublesome complications of diabetes mellitus. The prevalence of neuropathy is related to age, duration of diabetes and the quality of metabolic control. By the time a diabetic patient has severe Neuropathy, retinopathy and albuminuria are also usually present. It is the most common form of neuropathy in the developed countries of the world, Accounts for more hospitalisation than all the other diabetic complication and accounts for 50-70% of Non-traumatic amputation¹.

Lately KEONTG and GABBAY and their co-workers have suggested measurement of glycosylated hemoglobin (HbA1C) as an Indicator of diabetic control. HbA1C is formed by the post-transcriptional glycosylation of HbA at the amino-terminal valine of Beta chain. This is a slow irreversible chemical reaction which occurs throughout the life span of the RBC, the prevailing plasma-glucose concentration being the most important factor governing the quantity of HbA1C formed. HbA1C can be separated from the major hemoglobin fraction by virtue of its fast movement through a cation exchange resin. When properly assayed HbA1C level in a blood sample gives an estimate of diabetic control for preceding 3-4 month period (i.e. life span of RBC).^{3,4}

II. METHODOLOGY

The study was conducted in the in and outpatients, Department of General Medicine at Meenakshi Medical College Hospital and Research Institute, Kanchipuram from April 2017 to August 2018. Approval for the study protocol and clearance were obtained from the institutional ethical committee. A total number of 200 diabetes mellitus

patients were selected for the study and the patient data was categorized into age, sex, history of drug allergy and systemic illness was analyzed.

After taking the patient's written informed consent, from each participant detailed history was collected using a proforma and following which the patients were examined for complications of diabetes. Venous blood sample was collected from all the participants and analyzed for fasting blood sugars, post prandial blood sugars and HbA1C, and the reports of each test were entered in the same proforma.

Biochemical Analysis:

Laboratory investigations done in all patients include

- FBS and PPBS (Folin-wu method).
- Glycosylated hemoglobin (HbA1C) by Ion Exchanges Chromatographic method. HbA1C

was estimated in blood sample taken for FBS estimation (Kynock and Lehmann, 1977)

III. RESULTS

This study was done as a cross sectional study among diabetes mellitus patients in the Department of General Medicine, Meenakshi Medical College and Research Institute, Kanchipuram. Among 200 study participants 3 were below the age group of 25 years, 11 (5.5%) patients were between the age group of 26-35 years of age. Maximum of patients (34%) was diagnosed with DM in the age group of 56-65 years of age. In the age group of 36-45 years there were 17.5% patients with DM, and above 65 years of age there were 13.5% patients. (55.7±12.8 years). In this present study among DM patients 113 (56.5%) participants were males and 87 (43.5%) participants were females.

Duration of DM among Participants

Table. 1 Showed that 41% of the patients the duration of diabetes was 6 to 10 years, the duration of diabetes mellitus was less than 5 years for 20.5% patients and 11 to 15 years for 27.5% of the study patients. For 11% of the participants the duration of diabetes was found to be more than 15 years. (Mean 11.7 years)

Duration of DM	Frequency	Percentage
<5 years	41	20.5
6 to 10 Years	82	41
11 to 15 Years	55	27.5
>15 Years	22	11
Total	200	100

Different Types of Neuropathy among participants

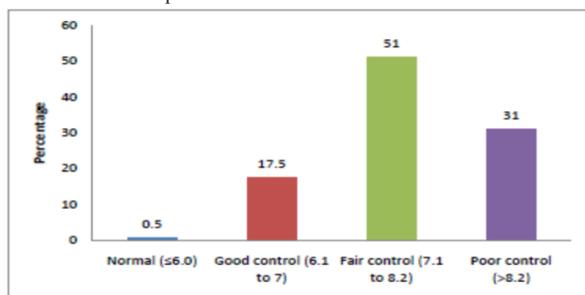
Table.2. indicates that the 200 patients 107 (53.5%) cases had Distal symmetrical sensory neuropathy, 74 (37%) patients presented with Distal symmetrical sensory-motor neuropathy and 51 (25.5%) had autonomic neuropathy. Cranial neuropathy was seen in 6 (3%) patients from this study and 4 (2%) had Proximal motor neuropathy/poly radiculopathy.

Types of neuropathy*	No of cases	Percentage
Distal symmetrical sensory neuropathy	107	53.5
Distal symmetrical sensori-motor neuropathy	74	37
Autonomic neuropathy	51	25.5
Cranial neuropathy	6	3
Proximal motor neuropathy/poly radiculopathy	4	2

*Multiple responses

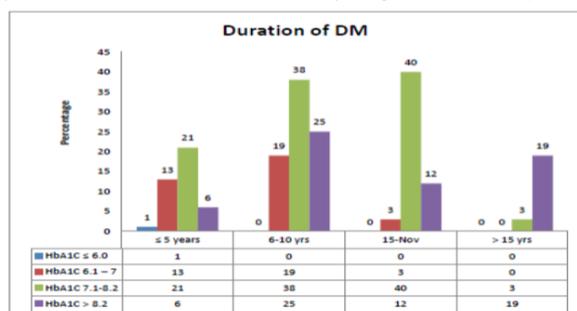
Degree of Control based on HbA1c

Figure.1. showed that the Poor control of HbA1c was noted in 31% patients, whereas 51% patients had fair control of HbA1c. Good control of HbA1c was observed in 17.5% patients. 0.5% had HbA1c value less than or equal to 6.



HbA1c and Duration of DM

Figure.2. showed that the based on the duration of diabetes mellitus and estimated glycosylated hemoglobin 13 patients with less than 5 year duration, 19 patients with diabetes 6-10 years and 3 patients with diabetes 11-15 years had good control of HbA1c . whereas 21,38,40 and 3 patients with diabetes duration of ≤ 5 years,6-10 yrs,11-15 yrs and > 15 yrs have fair control of HbA1c respectively. More cases (25 cases) with poor control was found with diabetes duration of 6-10 years. Also it was found to be statistically insignificant ($P > 0.05$)



DISCUSSION

The exact mechanism in the development of neuropathy in diabetes is uncertain. Whether a poor control of the diabetic state hastens the progression of neuropathy is a question that yet to be answered, one of the earlier studies to establish relation between glycemic control and neuropathy performed by Pirart et al⁵ which showed that poor control was associated with a higher incidence of neuropathy. Intensive glycemic control in the DCCT study showed decreased incidence of diabetic neuropathy to 3% in intensively treated patients compared to 10% in group that received conventional treatment.⁶ Holman et al, concluded that tight control of diabetes retarded or reversed the

progression of the neuropathy.⁷ On the other hand Service et al, found no such correlations.⁸ However majority of the authorities Dyck et al, favour the view that poor control of diabetes is associated with an increased risk of neuropathy.

Though considerable controversy exists regarding the etiopathogenesis of neuropathy in diabetes. It has been conclusively shown by Pirart et al⁹ that the incidence of neuropathy increases with the duration of the diabetes. He also reported that there was a positive correlation between the occurrences of neuropathy and retinopathy. Tesfaye. S.et al¹⁰ showed a significant correlation between diabetic neuropathy, age; duration of diabetes, diabetic retinopathy, cigarette smoking and prevalence of cardiovascular disease in IDDM patient.

In this study, among the 9 patients who had normal blood sugar values, 1 patient had HbA1c was under 6, likewise among 57 patients who had good control of blood sugars 35 patients had HbA1c was within 6.1 – 7. Fair blood sugar values were maintained by 92 patients and 102 patients had fair control of HbA1c (7.1-8.2). HbA1c poor control was seen in 62 patients. Also it was found to be statistically significant ($P < 0.05$)

Kurezyn. A.D et al¹¹ suggested that bell’s palsy occurs greater than expected frequency in diabetics, however only one case was observe in our study. In the present study 30% of neuropathy patients had coexisting autonomic dysfunction. The duration of diabetes was long and level of glycemic control was poor (mean value GlycoHb – 11.05%). Ewing and Clarke.¹² have reviewed various series and suggested that the incidence of such abnormalities may vary from 17 to 40% in diabetes. Pfeifer M.A. et al and Youne et al (1986)¹³ have also documented the occurrence of autonomic abnormalities in patients with somatic neuropathy.

CONCLUSION

In this present study we conclude that the longstanding diabetes and poor glycemic control are particularly associated with an increased risk of neuropathy in diabetes mellitus and estimation of glycosylated hemoglobin is a simple, rapid and objective procedure to assess diabetic control and It serves both as a screening test for uncontrolled diabetes and as an indicator of the efficacy of various therapeutic regimens.

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