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Pattern of Ordering Glycated Hemoglobin (HbA1c) By Clinicians in Christian Medical College, Vellore

Dr. Gnanapraba P[1*], Dr. Molly Jacob[2]
[1]Assistant Professor, Department of Biochemistry, Chengalpattu Medical College, Chengalpattu India
[2]Professor and Head, Department of Biochemistry, Christian Medical College, Vellore India

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***Corresponding author**
Dr. Gnanapraba P

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Abstract: Patient care guidelines when introduced have more impact on its laboratory usage. Monitoring of test requests and ordering pattern help in optimizing and providing in-service education which is important after new guidelines. Glycated hemoglobin (HbA1c) is formed non-enzymatically by condensation of glucose or other reducing sugars with alpha- and beta-globin chains of hemoglobin A. Blood levels of HbA1c have been used for monitoring the degree of control of glucose levels in diabetic patients since 1976. It was introduced as a routine test in the Department of Clinical Biochemistry, Christian Medical College, Vellore, in 1995 for monitoring extent of control blood glucose levels in diabetic patients. The American Diabetes Association currently recommends that HbA1c can be used as a diagnostic tool as well. In the present retrospective study, we analyzed the ordering pattern of glycated hemoglobin (HbA1c) by clinicians in Christian Medical College, Vellore during first week of October, 2014. Data were collected from Computerized Hospital Information Processing System (CHIPS) department on the basis of HbA1c ordered during first week of October, 2014. It was analyzed based on the pattern of ordering HbA1c by broad speciality and super speciality departments in Christian Medical College, Vellore. It appears from the data studied that clinicians in the broad specialties used estimation of HbA1c as a diagnostic test to a greater extent than as a monitoring test. The reverse appeared to be the case with clinicians in the super specialties.
Keywords: Diabetes mellitus, haemoglobin A glycosylated, (HbA1c), diagnostic test, monitoring test.

INTRODUCTION

Diabetes mellitus is a complex and chronic medical illness. It requires continuous medical care to prevent complications due to the disease. International Diabetic Federation recently estimated that 8% of the total population in the world have diabetes i.e, 382 million people[1]. This number will rise to 592 million within 25 years. Out of 8% from the total population, 80% were living in low income and middle income countries. India stands second in the list with 65.1 million diabetic patients[1]. Glycated hemoglobins (HbA1c) are minor components of human hemoglobin (Hb). They are formed non-enzymatically by condensation of glucose or other reducing sugars with alpha- and beta-chains of hemoglobin A. The sub fraction HbA1c, a non-enzymatic glycation at the amino-terminal valine of the beta-chain, was identified in the 1960s as a minor "abnormal fast-moving hemoglobin band" in diabetic patients during routine screening for hemoglobin variants[2]. HbA1c was introduced in 1995 at the Department of Clinical biochemistry, Christian Medical College, Vellore for monitoring diabetic patients. HbA1c was previously used for monitoring diabetes mellitus. American Diabetes association guidelines recommended HbA1c as a diagnostic tool[3–7].

AIM OF THE STUDY

The aim of this retrospective study is to analyse the pattern of ordering HbA1c by clinicians in broad speciality and super speciality, Christian Medical College, Vellore during first week of October, 2014.

MATERIALS AND METHODS

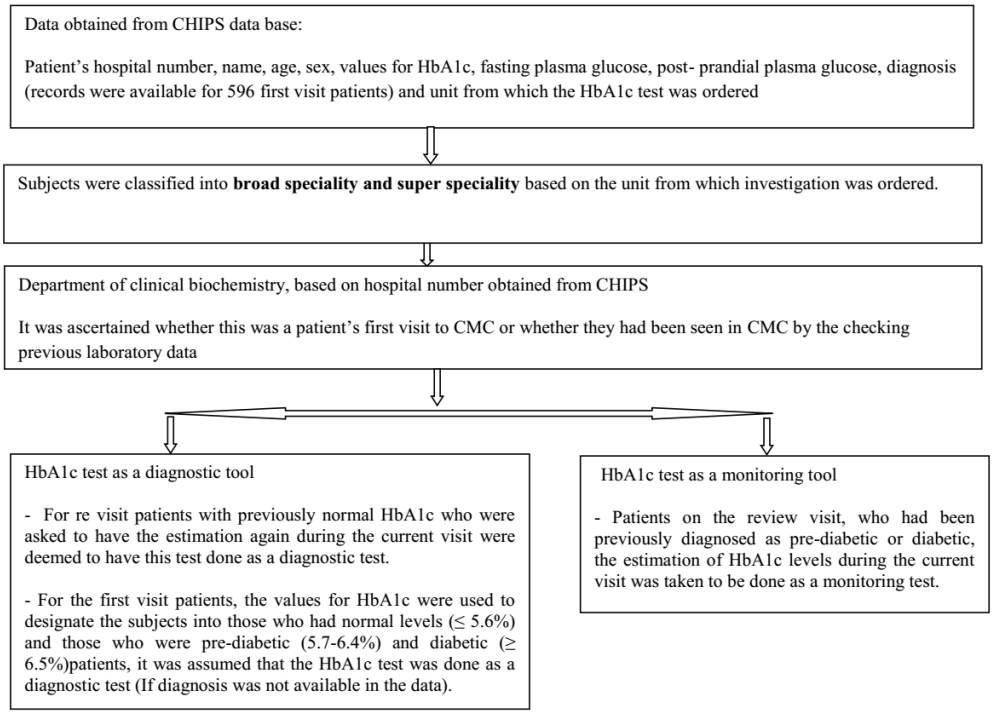
Data were collected from Computerized Hospital Information Processing System (CHIPS) department on the basis of HbA1c tests ordered during the first week of October, 2014.

The specialties that were categorized as broad speciality included Emergency Medicine, Community Medicine, Child Health, Dermatology, Dental, ENT, Family Medicine, General Medicine, Geriatric Medicine, Obstetrics and Gynaecology, Orthopaedics, Reproductive Medicine, Respiratory Medicine and Staff Student Health Service.

The specialties that were categorized as super-specialities included Cardiology, Endocrinology, Paediatric Endocrinology, Endocrine Surgery, Gastroenterology, Hepato-biliary Surgery, Haematology, Medical Genetics, Medical Oncology, Nephrology, Neurology, Paediatric Orthopaedics, Rheumatology, Thoracic Surgery, Urology and Vascular Surgery.

Inclusion criteria

All patients in various departments of CMC, Vellore, who gave blood for estimation of HbA1c between Oct 1st and 7th 2014 (both days included).



Data was analysed using SPSS (Statistical Package for Social Sciences) version 16.0, using appropriate tests. A p value of less than 0.05 was taken to indicate statistical significance

RESULTS

The total number of subjects included in the study was 1914. The number of male subjects in the study were 1089 (43.1%) and female subjects were 825 (56.9%); Number of subjects visited broad speciality were 891(46.6%) and super speciality were 1023 (53.4%); Test was ordered for 209 (10.9%) in-patients and 1705 (89.1%) out-patient. This data was represented below in figure1, 2 and3 respectively

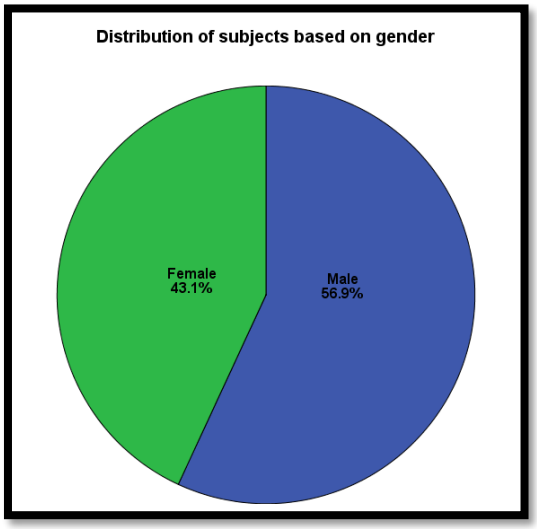


Fig-1

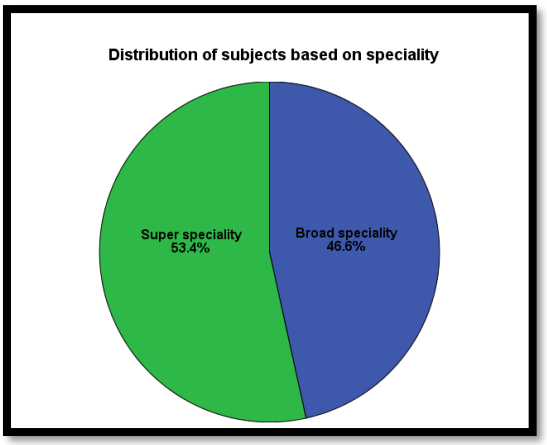


Fig-2

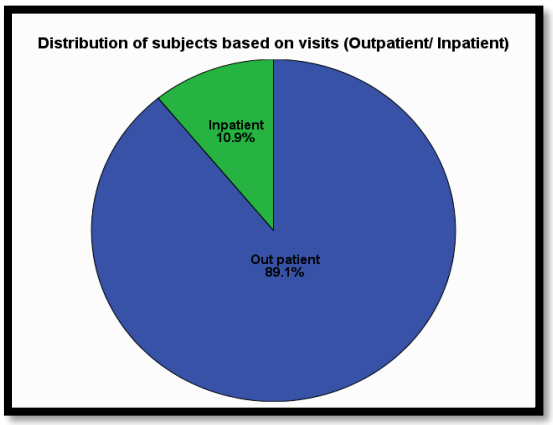


Fig-3

Pattern of ordering of HbA1c in the broad specialities

The total number of subjects for whom HbA1c was ordered under broad speciality was 891. Out of 891 subjects, 574 subjects were with diabetes mellitus, 258 subjects were non-diabetic and 59 subjects were pre-diabetic. Of these 891 subjects, 465 subjects (52.2%) were on their first visit (Table 1). HbA1c was used as a diagnostic tool in 547 subjects and as monitoring tool in 344 subjects.

Table-1: Percentage distribution of patient data in broad speciality

	Number	Percentage (%)
Number of patients who had HbA1c levels estimated	891	100
Patients visiting CMC for the first time	465	52.2
Patients with diabetes mellitus	574	64.4
Patients with pre-diabetes	258	28.9
Patients who were non-diabetic	59	6.6

Tables 2 and 3 show the data on patients from the broad specailties with regard to age, diabetic status (based on levels of HbA1c) and fasting and post-prandial plasma glucose levels.

Table-2: Patient data and Diabetic status based on ADA Guidelines in broad speciality

	Diabetes mellitus		Pre diabetes		Non diabetes	
Parameters	Mean	SD	Mean	SD	Mean	SD
Age (Years)	53.9	12	52.2	11	44.24	15
HbA1c (%)	7.7	1.7	5.81	0.4	5.3	0.4
Fasting plasma glucose (mg/dL)	157.6	63	106	10.3	95.14	8.7
Post-prandial plasma glucose(mg/dL)	233.4	95	139	27.8	102.8	16.8

Table-3: Patient data and Diabetic status based on ADA Guidelines in broad speciality

	Diabetes mellitus		Pre diabetes		Non diabetes	
Parameters	Median	Range	Median	Range	Median	Range
Age (Years)	54.00	2-93	50.00	29-85	44.00	0-92
HbA1c (%)	7.2	4.5-15.1	5.9	4.3-6.5	5.3	4.3-5.8
Fasting plasma glucose (mg/dL)	139.50	67-488	108	78-134	95	73-118
Post-prandial plasma glucose(mg/dL)	217.00	81-732	139	90-198	102	66-153

Estimation of HbA1c was found to be used as a diagnostic tool in 547 (61.4%) subjects and as monitoring tool in 344 (38.6%) the patients seen in the broad specialties (Fig 4).

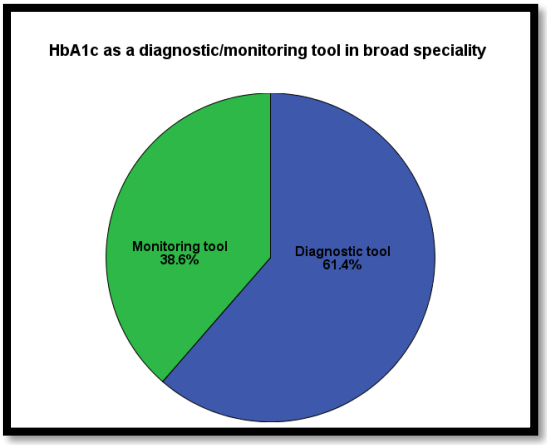


Fig-4

It was found that in the broad specialities, estimation of HbA1c was used as a diagnostic tool to a significantly greater extent than its use as a monitoring tool (p=0.000).

Pattern of ordering of HbA1c in the super specialities

The total number of estimations for HbA1c done for patients seen in the super speciality departments was 1023. Of these, 368 (35.9%) were on their first visit to CMC. Based on the values of HbA1c, 705 (68.9%) subjects were diagnosed to have diabetes mellitus, 251 (24.5%) were non-diabetic and 67 (6.5%) subjects were pre-diabetic (Table 4).

Table-4: Percentage distribution of patient data in super speciality

	Number	Percentage (%)
Number of patients who had HbA1c levels estimated	1023	100
Patients visiting CMC for the first time	368	35.9
Patients with diabetes mellitus	705	68.9
Patients with pre-diabetes	251	24.5
Patients who were non-diabetic	67	6.5

Tables 5 and 6 show the data on patients from the super specailties, with regard to age, diabetic status (based on levels of HbA1c) and fasting and post-prandial plasma glucose levels.

Table-5: Patient data and Diabetic status based on ADA Guidelines in super speciality

	Diabetes mellitus		Pre diabetes		Non diabetes	
Parameters	Mean	SD	Mean	SD	Mean	SD
Age (Years)	53.9	12	52.6	13	44.3	16
HbA1c (%)	7.6	1.8	5.8	0.5	5.3	0.4
Fasting plasma glucose (mg/dL)	144.6	57.6	108	11.2	92.7	7.8
Post-prandialplasma glucose (mg/dL)	217.4	91.3	142	29	104.6	16.2

Table-6: Patient data and Diabetic status based on ADA Guidelines in super speciality

	Diabetes mellitus		Pre diabetes		Non diabetes	
Parameters	Median	Range	Median	Range	Median	Range
Age (Years)	54.33	5-82	53.5	22-76	44	9-91
HbA1c (%)	7.25	4.4-17.8	5.9	4.8-6.7	5.4	4.1-6.2
Fasting plasma glucose (mg/dL)	129.00	64-622	109	83-139	92	64-114
Post-prandial plasma glucose (mg/dL)	200	13-733	145	77-218	102	69-144

HbA1c was found to be used as a diagnostic tool in 496 (48.5%) patients and as a monitoring tool in 527 (51.5%) patients from the super specialties (Fig 5). There was no significant difference between the extents to which it was used as a diagnostic test and for monitoring of glycemic control in this group.

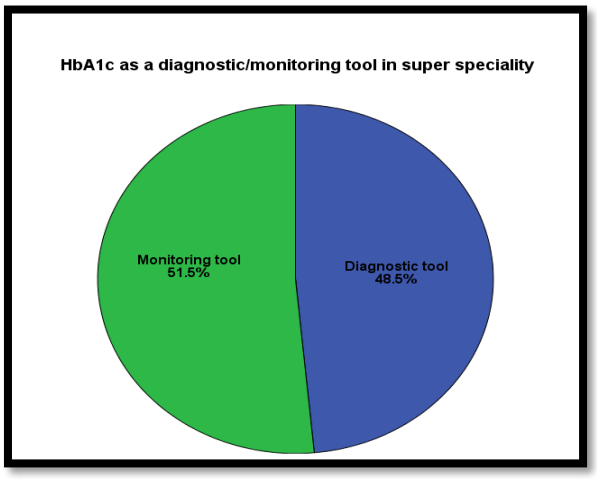
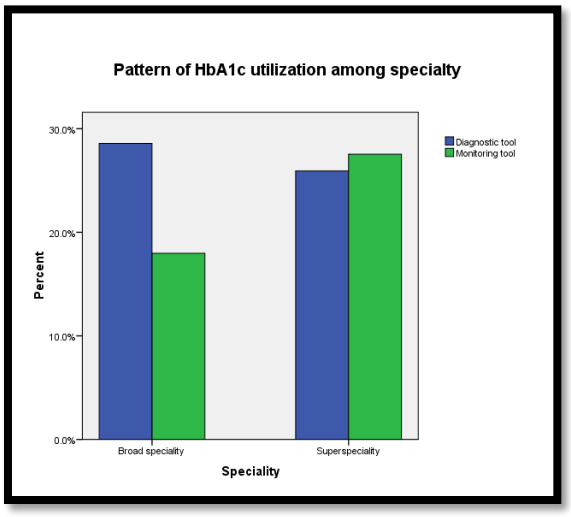


Fig-5

Comparison of pattern of utilization of HbA1c between broad and super specialties



It was found that HbA1c was used as a monitoring tool in the super specialities to significantly greater extent than it was used for this purpose in the broad specialities (p=0.00). There was no significant difference between the broad and super specialities in the extent to which they used HbA1c as a diagnostic tool.

DISCUSSIONS

HbA1c estimation is widely used by clinicians for diagnosis of diabetes mellitus as well as monitoring glycemic control in diabetic patients. In the present study, it was determined whether the pattern of ordering of this test was similar by clinicians in broad and super specialities in medicine. It was found that HbA1c was used as a monitoring tool to a significantly greater extent in the super specialities than it was used for this purpose in the broad specialities. This may be due to

significant differences (p=0.00) in the number of diabetic patients visiting the department, 705 (68.9%) patients were diagnosed to have diabetes mellitus in super specialities; 574 (64.4 %) were diagnosed to have diabetes mellitus in broad specialities). Clinicians in the broad specialties used estimation of HbA1c as a diagnostic test to a significantly greater extent than as a monitoring test. This indicates that these clinicians followed the most recent recommendations of the ADA to utilize estimation of HbA1c as a diagnostic test for diabetes mellitus.

CONCLUSION

It was found that clinicians in the broad specialties used estimation of HbA1c as a diagnostic test to a significantly greater extent than as a monitoring test. Clinicians in the super specialities used it as a monitoring test to a significantly greater extent than clinicians in the broad specialities.

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