Original Research Article

Utility of HbA1c as a screening test for pre diabetes

Dixit J V[1], Ashtekar C V[2], Acharya N A[3*]

[1]Professor and Head, [2]Consultant Diabetologist, [3]Assistant Professor, Department of Community Medicine, Government Medical College, Latur Maharashtra INDIA.
Email: drjvdixit@gmail.com

Abstract

Background: Prediabetes is a condition having higher than normal blood glucose but not high enough for a diagnosis of diabetes.If we can detect it early, we can prevent diabetes to a great extent. The higher than normal level of HbA1c indicates future risk of developing diabetes. Thus we have conducted this study to explore utility of HbA1c as a screening test for prediabetes. **Methodology:** It was a cross sectional study, conducted in a private clinic ran exclusively for diabetic patients in Latur, Maharashtra. All patients visiting OPD from 1st September 2016 to 31st August 2017 were enrolled in study. After doing the clinical examination of all study subjects, the investigations of Fasting blood sugar, Post meal blood sugar and HbA1c were done for all of them. The patients falling under diabetic range were excluded from the study. The data for remaining patients was analyzed to test sensitivity and specificity of HbA1c level as compared with fasting and post meal sugar levels. **Observations:** Total 822 patients were enrolled in the study period. Among them, 710 were diabetic and hence excluded from the study. HbA1c level was 81.25% sensitive and 35.00% specific as compared to fasting blood sugar for diagnosing pre diabetes while it was 80.85.% sensitive and 38.46% specific as compared to postmeal blood sugar. **Conclusion:** HbA1c is a good screening test for prediabetes.
Key Word: HbA1c, prediabetes, screening

[*]**Address for Correspondence:**
Dr. Acharya N A, Assistant Professor, Department of Community Medicine, Government Medical College, Latur Maharashtra INDIA.
Email: drnamratathakur@gmail.com
Received Date: 13/08/2018 Revised Date: 10/09/2018 Accepted Date: 02/10/2018
DOI: https://doi.org/10.26611/1011811

Access this article online	
Quick Response Code:	Website: www.medpulse.in
	Accessed Date: 05 October 2018

INTRODUCTION

Prediabetes is a condition in which people have higher than normal blood glucose levels but not high enough for a diagnosis of diabetes[1] According to the American Diabetes Association, the diagnostic criteria for prediabetes is an elevated fasting plasma glucose level (100 mg/dL-125 mg/ dL), a glycated hemoglobin (HbA1c) value of 5.7% to 6.4%, or an elevated plasma glucose level after an oral glucose tolerance test (140-199 mg/dL)[2] It Is Noted That The 5 Year Incidence Rate Of Developing Diabetes Was 9% To 25% For People Having HbA1c value between 5.5% and 6.0%.[3] According to an American Diabetes Association expert panel, up to 70% of individuals with prediabetes will eventually have diabetes.[4] It is predicted that by 2030 diabetes mellitus may afflict up to 79.4 million individuals in India[5,6] Lifestyle changes such as weight loss (7% of body weight) and moderate physical activity (150 minutes per week) can reduce the risk of diabetes by as much as 58%[7] One of the authors of this article is running a campaign on effortless weight loss and prevention of diabetes. It has been proven that the conversion rate of prediabetic to non diabetic state was 100% after 3 months only with simple lifestyle modification i.e. diet planning and exercise.[8] Thus, if we can detect the prediabetic condition early, we can prevent the disease to a great extent with simple measures. Whenever a patient suspected of having diabetes visits a clinician, the fasting and postmeal sugars are often advised. Based on the results of the tests, the patient is diagnosed to be normal or prediabetic or diabetic. HbA1c is a test usually performed to detect control of diabetes in patient on medication. The higher

How to cite this article: Dixit J V, Ashtekar C V, Acharya N A. Utility of HbA1C as a screening test for pre diabetes. *MedPulse International Journal of Community Medicine.* October 2018; 8(1): 01-03. https://www.medpulse.in/

than normal level of HbA1c also indicated future risk of developing diabetes. We have conducted this study to explore utility of HbA1c as a screening test for pre diabetes.

AIM

To study utility of HbA1c as a screening test for pre diabetes.

METHODOLOGY

It was a cross sectional study, conducted in a private clinic ran exclusively for diabetic patients in Latur city, Maharashtra. All the patients coming to OPD from 1st September 2016 to 31st August 2017 were enrolled in study. After doing the clinical examination of all study subjects, the investigations of Fasting blood sugar, Post meal blood sugar and HbA1c were done for all of them. The patients falling under diabetic range[2] were excluded from the study. The data for remaining patients was analyzed to test sensitivity and specificity of HbA1c level as compared with fasting and post meal sugar levels. Necessary medical treatment and dietary advice was given to all study subjects.

OBSERVATIONS

Total 822 patients were enrolled in the study period. Among them, 710 were diagnosed to be diabetic and hence excluded from the study. The analysis was done on data of remaining 112 patients. Sensitivity, specificity of HbA1c as a screening test were calculated as compared to fasting and post meal sugars. If only HbA1c level was considered to diagnose pre diabetic condition, then 78 patients would be diagnosed. While if only fasting or postmeal sugars were used to diagnose pre diabetics then 32 and 47 patients would be diagnosed respectively.

Table 1: Comparison between HbA1c and fasting blood sugar to diagnose pre diabetes

		Fasting sugar 100-125 (impaired fasting)	<100 normal	Total
HbA1c	5.7-6.4 (pre diabetic)	26	52	78
	<5.7 normal	6	28	34
	Total	32	80	112

Sensitivity = 81.25% Specificity = 35.0%

Table 1 shows the accuracy of HbA1c level as compared to fasting blood sugar. HbA1c level was 81.25% sensitive and 35.00% specific as compared to fasting blood sugar for diagnosing pre diabetic condition.

Table 2: Comparison between HbA1c and post meal blood sugar to diagnose pre diabetes

		PP sugar 140-199 (impaired pp)	<140	Total
HbA1c	5.7-6.4 (prediabetic)	38	40	78
	<5.7 normal	9	25	34
	Total	47	65	112

Sensitivity = 80.85% Specificity = 38.46%

Table 2 shows the accuracy of HbA1c level as compared to postmeal blood sugar. HbA1c level was 80.85.% sensitive and 38.46% specific as compared to postmeal blood sugar for diagnosing pre diabetic condition. Thus HbA1c was more sensitive test to diagnose pre diabetic state as compared to both fasting and post meal sugar.

DISCUSSION

The prevalence of diabetes in India has been estimated to be 12% in urban areas and 4% in rural areas. More concerning is the fact that diabetes prevalence over the past four decades has increased fourfold.[8,9] The prevalence of diabetes related risk factors i.e. overweight, obesity and physical inactivity is 21.4%, 4.7% and 12.1% respectively.[10] Considering the cost of burden of diabetes on health infrastructure, the identification and treatment of prediabetic individuals is therefore crucial to our efforts to make health care more affordable, prevent preventable disease, and save lives. If physicians screen the patients and risk stratify the individuals with diabetes as normal, prediabetic and diabetic, then we may be able to develop interventions that focus on the risk of the patient with prediabetes.[11] We have studied the utility of HbA1c as a screening test for prediabetes. It has shown a higher sensitivity and lower specificity of HbA1c as a screening test for prediabetes. Various studies carried over the world have different opinions. A study by Mann *et al* shows HbA1c cut-off value of 5.7% showed 27% sensitivity and 93% specificity in identifying pre-diabetes.[12] Heinaza *et al* found that HbA1c of 5.5% gave the highest combination of specificity (76%) and sensitivity (46%).[13] In another study by Tankova, the optimal cut-off level of HbA1c for diagnosing prediabetes was 5.5% (sensitivity 71%, specificity 64%)[14] To compare the HbA1c with fasting sugar, though HbA1c

bears a higher cost, it does not require fasting and has less intraindividual variability than fasting glucose.[15,16] Thus, if we screen the patients and identify the prediabetics early, then we can prevent them in landing in diabetes and its complications in future. It has been well proven in various studies that lifestyle modification was exceptionally effective in preventing diabetes in older individuals, and this finding was largely explained by greater weight loss and an increase in physical activity[8,17] Recent data suggest that lifestyle interventions to prevent diabetes may overcome the genetic risk of diabetes.[18] This information may be helpful to parents of children with a strong family history of diabetes. The cost of HbA1c test is often argued upon. But if we use the test to detect prediabetics then, simple lifestyle modifications (diet and exercise) ;which bear absolutely no cost will certainly prevent the future economic and health losses of patients.

CONCLUSION

The sensitivity and specificity of HbA1c as compared to fasting blood sugar was 81.25% and 35.00% respectively. While it was 80.85% and 38.46% as compared to post meal sugar. A screening test should have good sensitivity so that more number of suspected patients are detected early. Lower specificity of a screening test is acceptable as we are always confirming the diagnosis with gold standard methods. Thus, HbA1c is a good screening test for prediabetes.

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Source of Support: None Declared
Conflict of Interest: None Declared