JMSCR Vol||05||Issue||09||Page 27389-27392||September 2017

www.jmscr.igmpublication.org
Impact Factor 5.84
Index Copernicus Value: 71.58
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v5i9.06

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Adjusted Blood Cell Glucose (ABC-G) In Diabetics and Non Diabetics

Authors
Vandana.S.Pulate[1], Dr D.H.Nandal[2], Dr R.R.Kunkulol[2], Mrs.Tambe.S.N[2]
Corresponding Author
Vandana.S.Pulate
MSc. (Medical) Pharmacology**,** Rural Medical College, PIMS (DU) Loni
Email: *vandanapulate1@gmail.com*

Abstract
Aims and objectives: *The aim of our study was estimation and comparison of ABC-G in Diabetic & Non Diabetic patients*
Design: *Comparative study.*
Material and Methods: *Total numbers of 250 coded blood samples were processed for estimation of ABC-G out of which 125 were from Diabetic patients and equal number from Non diabetic subjects, both visiting diabetic clinic of Pravara Rural Hospital, Loni.*
Observation: *There was higher difference between mean value of ABC-G in Diabetics and Non Diabetics.*
Conclusion: *There was extremely significant difference between mean value of ABC-G in diabetics and non diabetics.*

Introduction

Prevalence of diabetes is increasing globally. Diabetes mellitus, a major metabolic disorder, is the major health problem of the 21st century. World Health Organization (WHO) has recently (2016) projected that the number of diabetic people would double by 2030.[1,2] According to the International Diabetes Foundation, India would be number one all over the world in having highest number of diabetic patients.[3] Diabetes mellitus is a chronic metabolic disorder characterized by rise in blood glucose level.[4] In human blood, glucose, like water, is distributed between erythrocytes and plasma. The molality of glucose (amount of glucose per unit of water mass) is same throughout.[5] The concentration is higher in plasma because the concentration of water and, therefore, glucose is higher in plasma than in erythrocytes.[5] Human erythrocytes are continuously exposed to glucose in plasma during their circulatory life span of 120 days.[6] Human red blood cells take on average 20 seconds to complete one cycle of circulation.[7,8,9]

Maximum scientific studies used plasma glucose as a main marker for diabetic research. However the measurement of glucose in human cells has been studied and considered by significantly less number of research workers. The present study is therefore designed to estimate the glucose concentration in Whole blood, plasma and blood cells. The measurement of glucose in blood cells, is adjusted to total number of erythrocytes and is referred as "Adjusted Blood Cell Glucose" (ABC - G). Thus ABC-G is an average amount of glucose per erythrocyte. The glucose concentr-ation in diabetics and non diabetics is estimated

by GOD POD, Folin-Wu in whole blood, Plasma and Blood cells.

Duration of study: Two years (Dec. 2014 and Dec2016).

Aim and Objectives

Primary Aim of the study was the estimation and comparison of ABC-G in Diabetic & Non Diabetic patients visiting Pravara rural hospital, Loni.

Methodology

Total numbers of 250 coded blood samples were processed of which 125 were from Diabetic patients and equal number from Non diabetic subjects, both visiting diabetic clinic of Pravara Rural Hospital, Loni. The coded blood samples were used to estimate plasma glucose by Glucose oxidase Peroxidase (GOD POD) method, Glycocylated Haemoglobin (HbA1c) and Complete blood count (CBC) using Autoanalysers. Estimation of glucose in whole blood, plasma and Blood cells was done by using Folin-Wu method in the departmental laboratory after standardization of Folin-Wu and error analysis . RBC Count and Blood cell glucose obtained by Folin-Wu was used to estimate ABC-G in diabetics and Non Diabetics.

ABC-G was calculated using following formula:

$$\text{ABC-G (Femtogram/RBC)} = \frac{\text{Blood cell glucose in mg \%}}{\text{RBC in Millions/mm3}} X\ 10$$

Statistical Analysis: The glucose values so obtained were statistically analysed using the soft ware " INSTAT". Unpaired student "t" test was applied to test ABC-G difference in blood samples of diabetics and non diabetics

Observations and Results

Blood samples from 125 diabetics and 125 from non diabetics were processed to obtained the ABC-G values. The results after decoding of samples at the end of study are shown in Table no: I

Table No: I Comparison of ABC-G in Diabetics and Non Diabetics

Sr.No.	Number of samples	ABC-G(Femtogram /RBC) Mean ± SD		Students unpaired "t" test	P value and significance
		ABC-G in DM	ABC-G in Non DM		
1.	125	354.37 ± 168.10	182.86 ± 28.99	11.241	< 0.0001 Extremly significant

Student's Unpaired 't' test found extremly significant difference between mean value of ABC-G in Diabetics and Non Diabetics. In Diabetics minimal observation was 129 and maximum was 1090. In Non Diabetics minimal observation was 108 maximum was 292.

Fig no: 01 Comparison of ABC-G in Diabetics and Non Diabetics

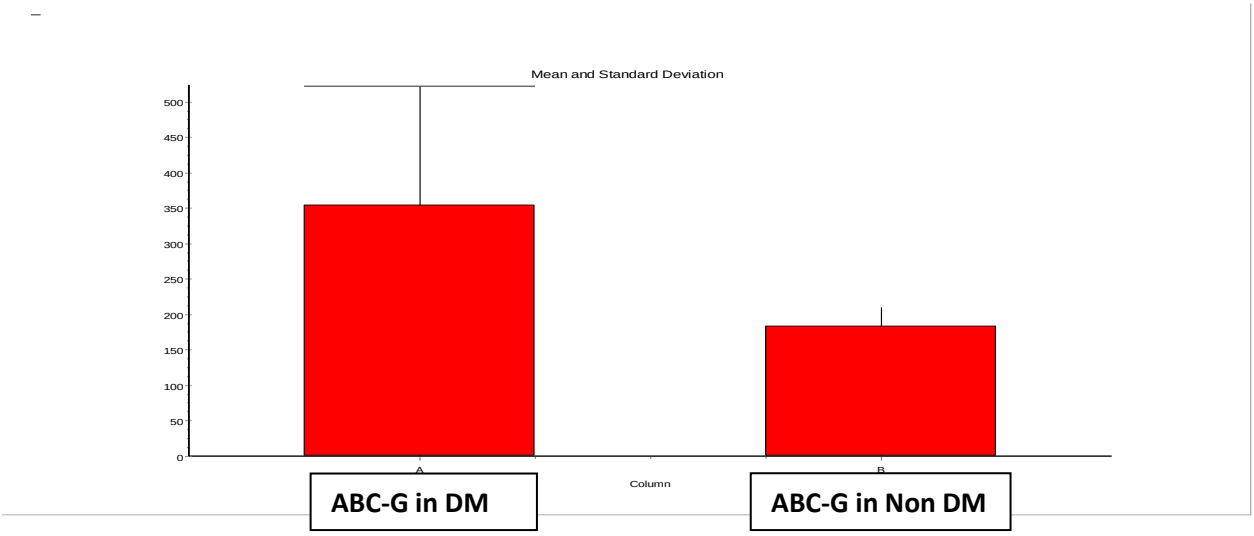
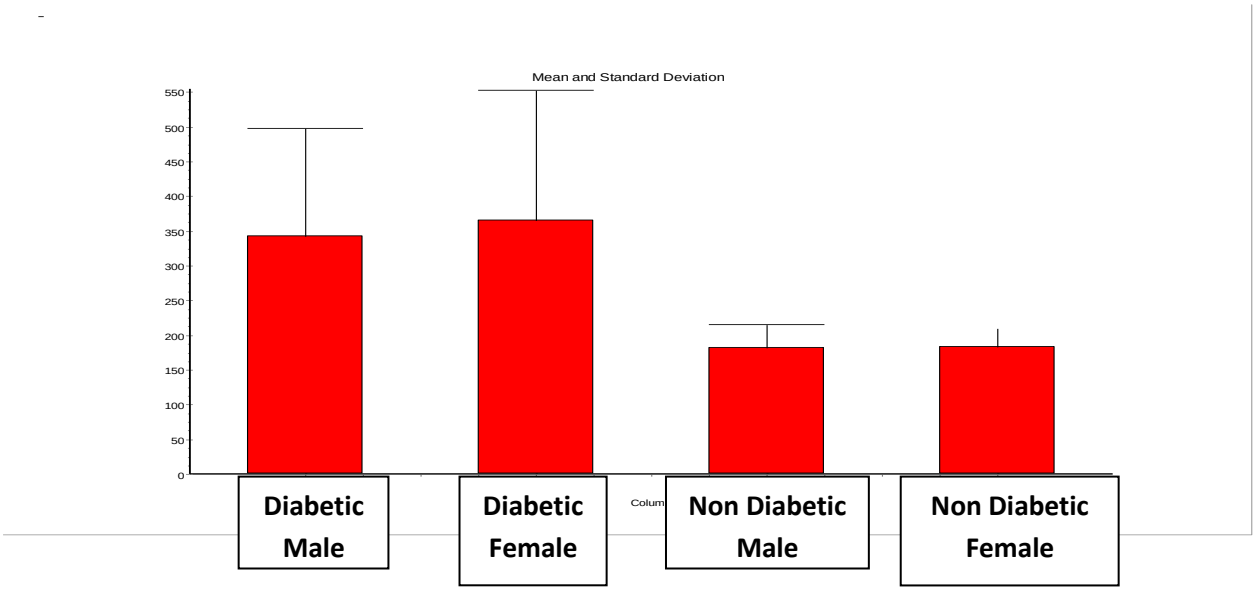


Table No: II Comparison of ABC-G in Male and Female of Diabetic and Non Diabetic

Sr.No.	Group	ABC-G in Femtogram Mean ± SD		"t" test : "t" value	P value
		Male	Female		
1.	DM	343.45 ± 154.39	366.11 ± 186.94	0.7334	0.4647
2.	Non DM	182.58 ± 33.04	183.01 ± 26.66	0.08014	0.9363
't' value		6.888	8.635		
P value		<0.0001	<0.0001		

It was observed that the mean ABC-G in Male diabetics was 343.45fg and Female diabetics was 366.11fg.The mean ABC-G in Male Non diabetics was 182.58fg and in female Non diabetic was 183.01fg. Student's Unpaired 't' test found no significant difference between mean value of ABC-G in Male and Female Diabetics and Non Diabetics. Considering analysis of ABC-G in diabetics and Non diabetics irrespective of sex we found higher values of ABC-G in samples of diabeties.(Fig no:01)

Fig no:02 Comparison of ABC-G in Male and Female of Diabetic and Non Diabetic.



Discussion

ABC-G represents the average glucose contain per erythrocyte. Since all mammalian cells utilize glucose, content of the glucose per cell has attracted our interest in it. We found that this kind of study in diabetics and non diabetics, to our knowledge has not been reported so far. As a result we could not compare our results with that of any one else.

The content of glucose per cell is affected by large number of physiological factors. The amount of glucose present in a cell depends upon permeability properties of cell membrane of erythrocyte and functioning glucose transporters GLUT proteins transport glucose and related hexoses according to a model of alternate conformation.[10, 11,12]

Student's Unpaired 't' test found extremly significant difference between mean value of ABC-G in Diabetics and Non Diabetict with ' t' value 11.241, p value <0.0001 (Table NO:I,Fig no 01). However there was no significant difference between mean value of ABC-G in Male and Female Diabetics and Non Diabetics.(table No:II,Fig no:02). This study found a significant difference in ABC-G in diabetics and non diabetics.It is likely that free passive diffusion of glucose through membrane of erythrocyte made glucose concentration in erythrocyte significantly higher, than the erythrocytes of non diabetics

Conclusion

In the present study we found extremely significant difference (p <0.0001) between mean

value of ABC-G in diabetics and non diabetics. There was no significant difference in mean values of ABC-G in male and female diabetic and non diabetics.

References

1. World Health Organization, Global Report on Diabetes. Geneva,2016. Accessed 30 August 2016.
2. Wild S, Roglic G, Green A, Si Maton, Anthea; Jean Hopkins; Charles William McLaughlin; Susan Johnson; Maryanna Quon Warner; David LaHart; Jill D. Wright (1993). Human Biology and Health. Englewood Cliffs, New Jersey, USA: Prentice Hall. ISBN 0-13-981176-1.
3. South Asians Facts Web. 30 April 2015 http://indianheartassociation.org/why-indians-why-south-asians/overview/
4. "About diabetes". World Health Organization. Archived from the original on 31 March 2014. Retrieved 4 April 2014.
5. Approved IFCC Recommendation on Reporting Results for Blood Glucose (Abbreviated) Paul D'Orazio,1 Robert W. Burnett, 2 Niels Fogh-Andersen,3* Ellis Jacobs, 4Clinical Chemistry 51:9 1573–1576 (2005)
6. W.F. Ganong (2003) Medical Physiology, 21stedn. Los Altos,CA: Lange Medical.
7. Laura Dean. Blood Groups and Red Cell Antigens
8. Pierigè F, Serafini S, Rossi L, Magnani M (January 2008). "Cell-based drug delivery". Advanced Drug Delivery Reviews. 60 (2): 286–95.
9. Hillman, Robert S.; Ault, Kenneth A.; Rinder, Henry M. (2005). Hematology in Clinical Practice: A Guide to Diagnosis and Management (4 ed.). McGraw-Hill Professional. p. 1.
10. Oka Y, Asano T, Shibasaki Y, Lin J, Tsukuda K, Katagiri H, Akanuma Y, Takaku F (1990). "C-terminal truncated glucose transporter is locked into an inward-facing form without transport activity". Nature. 345 (6275): 550–3.
11. Hebert D, Carruthers A (1992). "Glucose transporter oligomeric structure determines transporter function. Reversible redox-dependent inter conversions of tetrameric and dimeric GLUT1". J. Biol. Chem. 267 (33): 23829–38.
12. Cloherty E, Sultzman L, Zottola R, Carruthers A (1995). "Net sugar transport is a multistep process. Evidence for cytosolic sugar binding sites in erythrocytes". Biochemistry. 34 (47): 15395–406.