IJMRP

International Journal of Medical Research Professionals

Original Article

Study of Glycated Hemoglobin (Hba1c) in Obese Diabetics Patients and Non Obese Diabetics Patients

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Article History
Received: 10 Jan 2016
Revised: 12 Jan 2016
Accepted: 25 Jan 2016

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ABSTRACT

Background: Is to study the HbA1c level on diabetics obese patients and diabetics non obese patients. **Aims of study:** Cross-sectional study of two groups of diabetics patients with obesity and another group non obese diabetics patients. **Patients and Method:** This cross-sectional study included 92 inpatients and outpatients with diabetes from (February 2015 to December 2015) in Al- karama Teaching Hospital Department of medicine. The samples were divided into two groups, group 1 (obese diabetics patients), and group 2(non obese diabetics patients). The level of hba1c and fasting blood sugar was measured in each group. **Results:** Patients with non-obese diabetics have higher level of HbA1c than obese diabetics patients, frequency of HbA1c in non-obese diabetics patients was 8.9±2.9 **%** while in obese diabetics patients is 8.2±2.5 %, P-value <0.005 were considered significant. Also the fasting blood sugar (FBS) in non-obese 218.2±106.9 while in obese 207.3±94.6 which mean higher.
Conclusions: Level of HbA1c is higher in non-obese diabetics patients than obese diabetics patients and also fasting blood sugar.

KEYWORDS: Diabetes, Glycated hemoglobin, HbA1c, Obese.

INTRODUCTION

Glycated hemoglobin (hemoglobin A1c, HbA1c, A1C, or Hb1c; sometimes also HbA1c or HGBA1C) is a form of hemoglobin that is measured primarily to identify the average plasma glucose concentration over prolonged periods. It is formed in a non-enzymatic glycation pathway by hemoglobin's exposure to plasma glucose. HbA1c is a measure of the beta-N-1-deoxy fructosyl component of hemoglobin, Normal levels of glucose produce a normal amount of glycated hemoglobin. As the average amount of plasma glucose increases, the fraction of glycated hemoglobin increases in a predictable way. This serves as a marker for average blood glucose levels over the previous 3 months prior to the measurement as this is the lifespan of red blood cells.[1,2]

In diabetes mellitus, higher amounts of glycated hemoglobin, indicating poorer control of blood glucose levels, have been associated with cardiovascular disease, nephropathy, and retinopathy. Monitoring HbA1c in type 1 diabetic patients may improve outcomes.[3] The hemoglobin A1C (HbA1C) assay has become the gold-standard measurement of chronic glycaemia for over two decades. Anchored in the knowledge that elevated HbA1C values increase the likelihood of the microvascular complications of diabetes (and perhaps macrovascular complications as well), clinicians have used Hb A1C test results to guide treatment decisions, and the assay has become the cornerstone for the assessment of diabetes care, it has assumed that the HbA1C assay reflects average glycaemia over the preceding few months.[4-9]

Because HbA1C is thought to reflect average glycaemia over several months[10], and has strong predictive value for diabetes complications[11,12], HbA1C testing should be performed routinely in all patients with diabetes, at initial assessment and then as part of continuing care. Measurement approximately every 3 months determines whether a patient's glycemic targets have been reached and maintained, based on the work of the National Glycohemoglobin Standardization Program (NGSP) in the U.S. and other similar programs in other parts of the world.[13-15]

Overweight and obesity

Are defined as abnormal or excessive fat accumulation that presents a risk to health. A crude population measure of obesity is the body mass index (BMI), a person's weight (in kilograms) divided by the square of his or her height (in metres). A person with a BMI of 30 or more is generally considered obese. A person with a BMI equal to or more than 25 is considered overweight.[17] Overweight and obesity are major risk factors for a number of chronic diseases, including diabetes, cardiovascular diseases and cancer, it considered a problem not only in high income countries, overweight and obesity are now dramatically on the rise in low- and middle-income countries, particularly in urban settings.[18-20]

Table 1: Contains the correlation between HbA1C levels and mean plasma glucose levels.[16]

	Mean plasma glucose	
A1C (%)	mg/dl	mmol/l
6	126	7.0
7	154	8.6
8	183	10.2
9	212	11.8
10	240	13.4
11	269	14.9
12	298	16.5

PMC full text: Diabetes Care .2008Aug:31(8):1473-78[16]

Type 2 diabetes mellitus is strongly associated with obesity in all ethnic groups. More than 80 percent of cases of type 2 diabetes can be attributed to obesity, which may also account for many diabetes-related deaths.[21,22] The lowest risk was associated with a BMI below 22 kg/m2 (slightly lower than in men from the Health Professionals Study); at a BMI greater than 35 kg/m2, the relative risk for diabetes adjusted for age increased to 61. The risk may be increased further by a sedentary lifestyle or decreased by exercise.[23,24]

PATIENTS AND METHODS

This study is cross-sectional, 92 patients was enrolled in this study collected from diabetic clinic in Al karama teaching hospital these diabetic patients divided into two groups first 46 patients are diabetes obese and another 46 patients are diabetes non-obese according to the body mass index Body weight, height, fasting blood sugar, hemoglobin A1C was measured.

Statistical analysis

The SPSS 20 was used to analysis the data, T-paired score was used , P-value <0.005 were considered significant.

RESULTS

The body mass index (BMI) in non-obese 23.2±1.9 as displayed in Fig.1 and Table 2 while in obese 27.8±7.7 as displayed in Fig.4. The fasting blood sugar (FBS) in non-obese 218.2±106.9 as in Fig.2 and Table 2, while in obese207.3±94.6 as in Fig.5 and Table 2. The hemoglobin A1c (HbA1c) in non-obese 8.9±2.9 as in Fig. 3 and Table 2 while in obese 8.2±2.5 as in Fig.6 and Table 2.

Paired t test for comparison between non-obese and obese was 0.00 which is statistically significant (<0.005).

Table 2: Display mean, median, and standard deviations between obese and non-obese diabetics patients

Statistics							
		BMI Non obese	FBS Non obese	HbA1c non obese	BMI obese	FBS obese	HbA1c obese
N	Valid	46	46	46	46	46	46
	Missing	8	8	8	8	8	8
Mean		23.2087	218.2609	8.9565	27.8739	207.3478	8.2639
Std. Error of Mean		.40860	22.30973	.61890	1.60816	19.73426	.54008
Median		23.1000	168.0±000	8.7000	28.1000	182.0000	8.1000
Std. Deviation		1.95957	106.99372	2.96814	7.71246	94.64220	2.59011

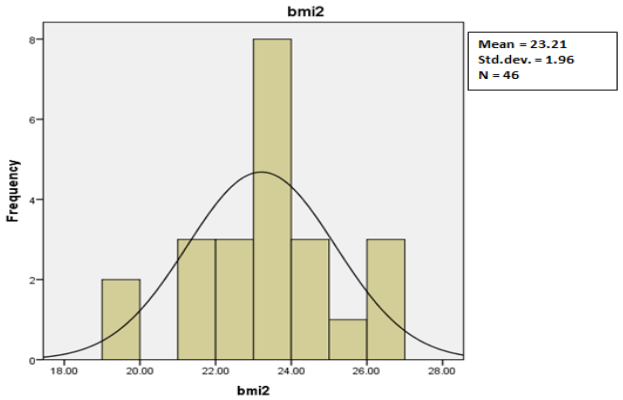

Fig 1: Frequency of BMI non- obese diabetics patients

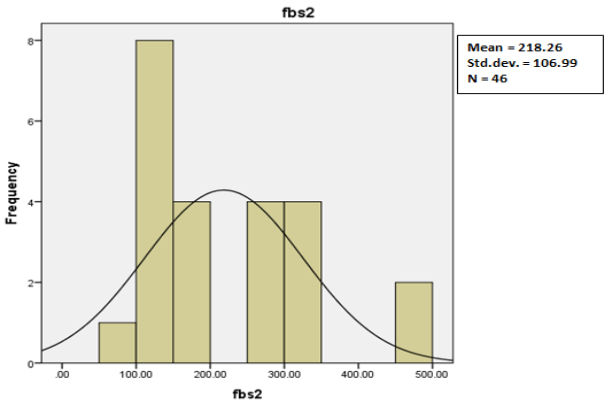

Fig 2:Frequency FBS in non-obese diabetics patients

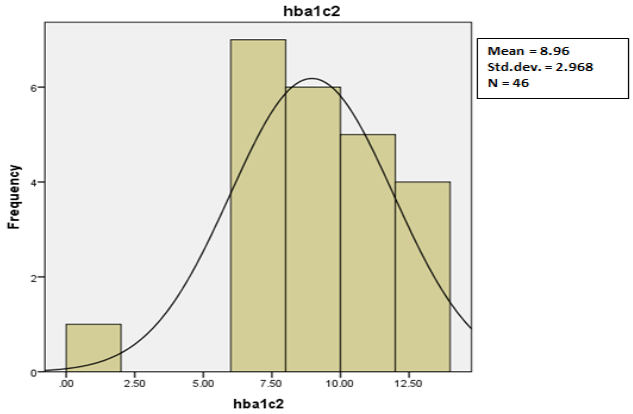

Fig 3: Frequency Hba1c in non-obese diabetics patients

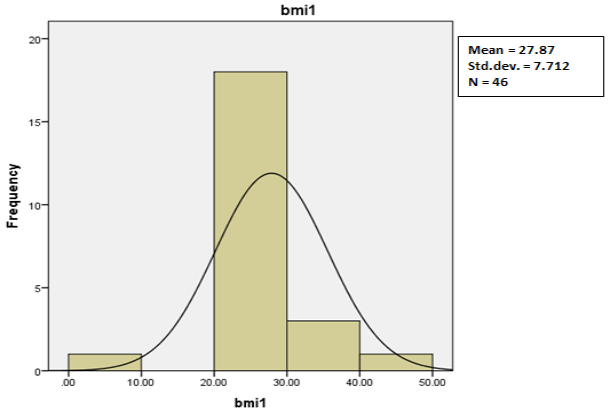

Fig 4: Frequency BMI in obese diabetics patients

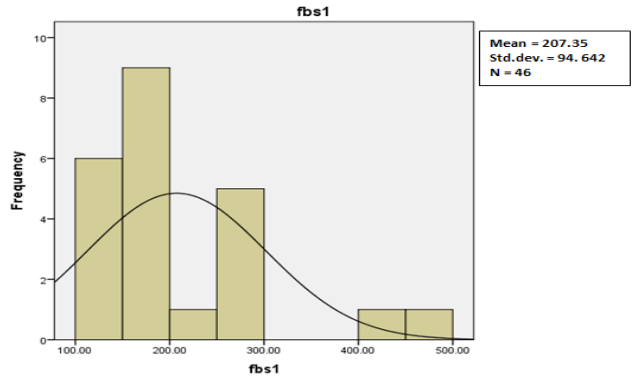

Fig 5: Frequency of the FBS in obese diabetics patients

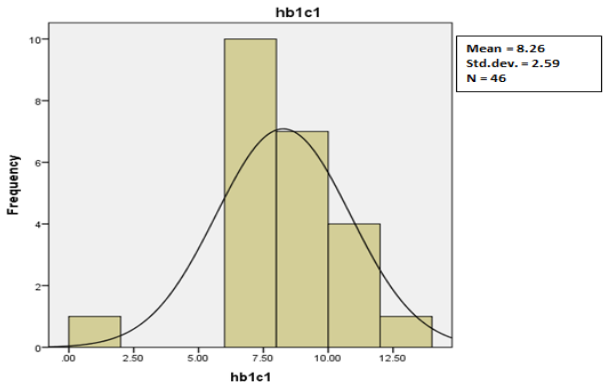

Fig 6:Frequency of Hba1c in obese diabetics patients

DISCUSSION

Many previous studies mentioned that there is important relationship between the HbA1c and the obesity and lipid disturbances especially in diabetes patients like Liliana Zago, et al.[25] where they found that HbA1c showed a positive association with glucose and the TG/HDL ratio, These events were more frequent in patients with obesity. Zehra Esra Önal, et al.[26] also showed a positive relationship between insulin resistance and serum HbA1c levels of obese children. While, Unluer AN, et al.[27] study revealed that There no difference between obese and non-obese groups in terms of HbA1c values.

In this cross sectional study, we studied the level of Glycated hemoglobin (HbA1c) in obese diabetics patients and non obese diabetics patients and the results were different from the above studies where we found that Patients with non obese diabetics have higher level of HbA1c than obese diabetics patients, frequency of HbA1c in non obese diabetics patients was 8.9±2.9 % while in obese diabetics patients is 8.2±2.5 %, P-value <0.005 and this differ from other outside Iraq studies, Liliana Zago et al. study and Zehra Esra Önal et al. and this may be explained by bad uncontrolled blood sugar of non obese diabetics patients and this asserted by high level of fasting blood sugar to these non obese diabetics patients more than those with obese diabetics patients The mean fasting blood sugar (FBS) in non-obese 218.2±106.9 while in obese 207.3±94.6. P-value <0.005.

CONCLUSION

The level of Glycated hemoglobin (HbA1c) and fasting blood sugar rises in non-obese diabetics patients more than obese diabetics patients, We believe that, larger comprehensive studies can highlight the impact of glycemic control and obesity (BMI) on hba1c level in blood.

CONFLICT OF INTEREST: None declared.

REFERENCES

1. Miedema K (2005). "Standardization of HbA1c and Optimal Range of Monitoring". Scandinavian journal of clinical and laboratory investigation 240: 61–72. PMID 16112961.

2. Peterson KP, Pavlovich JG, Goldstein D, Little R, England J, Peterson CM (1998)."What is hemoglobin A1c? An analysis of glycated hemoglobins by electrospray ionization mass spectrometry". Clinical Chemistry (journal) 44 (9): 1951–1958.PMID 9732983.

3. Larsen ML, Hørder M, Mogensen EF (1990). "Effect of long-term monitoring of glycosylated haemoglobin levels in insulin-dependent diabetes mellitus". N. Engl. J. Med. 323 (15): 1021–5. PMID 2215560. doi:10.1056/NEJM1990/10/11.3231503.

4. Koenig BS, Peterson CM, Kilo C, Cerami A, Williamson JR: Hemoglobin A1C as an indicator of the degree of glucose intolerance in diabetes.Diabetes 1976; 25:230–232.

5. Svendsen PA, Lauritzen T, Soegaard U, Nerup J: Glycosylated hemoglobin and steady-state mean blood glucose concentration in type I (insulin-dependent) diabetes. Diabetologia 1982; 23:403–405.
6. Nathan DM, Singer DE, Hurxthal K, Goodson JD: The clinical information value of the glycosylated hemoglobin assay. N Engl J Med 1984; 310:341–346.
7. Rohlfing CL, Wiedmeyer HM, Little RR, England JD, Tennill A, Goldstein DE: Defining the relationship between plasma glucose and HbA1c: analysis of glucose profiles and HbA1c in the Diabetes Control and Complications Trial.Diabetes Care 2002; 25:275–278.
8. Murata GH, Hoffman RM, Duckworth WC, Wendel CS, Shah JH: Contributions of weekly mean blood glucose values to hemoglobin in A1C in insulin-treated type 2 diabetes: the diabetes outcomes in veterans study (DOVES). Am J Med Sci 2004; 327:319–323.
9. American Diabetes Association: Standards of medical care– 2007.Diabetes Care30(Suppl. 1): S10, 2007
10. Sacks DB, Bruns DE, Goldstein DE, Maclaren NK, McDonald JM, Parrott M. Guidelines and recommendations for laboratory analysis in the diagnosis and management of diabetes mellitus. Clin Chem 2002;48:436–472
11. DCCT: The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. The Diabetes Control and Complications Trial Research Group. N Engl J Med 1993;329:977–986
12. Stratton IM, Adler AI, Neil HA, Matthews DR, Manley SE, Cull CA, Hadden D, Turner RC, Holman RR. Association of glycaemia with macrovascular and microvascular complications of type 2 diabetes (UKPDS 35): prospective observationalstudy. BMJ 2000;321:405–412
13. Goldstein DE, Little R, Lorenz RA, Malone JI, Nathan DM, Peterson CM, Sacks DB: Tests of glycemia in diabetes. Diabetes Care 2004; 27:1761–1773.
14. Little RR, Rohlfing CL, Wiedmeyer HM, Myers GL, Sacks DB, Goldstein DE: The National Glycohemoglobin Standardization Program (NGSP): a five-year progress report. Clin Chem 2001; 47:1985–1992.
15. Mosca A, Paleari R: Standardization schemes for hemoglobin A1c determination. In Monitoring Glycaemic Control in the Diabetic Patient.John WG, Ed. London, Harcourt Health Communications, Mosby International, 2001, p. 137–150
16. Nathan DM, Kuenen J, Borg R, Zheng H, Schoenfeld D, Heine RJ, A1c-Derived Average Glucose Study Group. Translating the A1C assay into estimated average glucose values. Diabetes Care 2008;31: 1473–1478
17. P. Hanlon, M. Byers , B.R. Walker, H.M. Macdonald. (2010). obesity. Davidson's principles and practice of medicine. 20th ed. p. 116-118.
18. Krauss, RM, Winston, M. Obesity: Impact on cardiovascular disease. Circulation 1998; 98:1472.
19. Willett, WC, Manson, JE, Stampfer, MJ, et al. Weight, weight change, and coronary heart disease in women. Risk within the 'normal' weight range. JAMA 1995; 273:461.
20. McGill, HC Jr, McMahan, CA, Herderick, EE, et al. Obesity accelerates the progression of coronary atherosclerosis in young men. Circulation 2002; 105:2712.
21. Willett, WC, Dietz, WH, Colditz, GA. Guidelines for healthy weight. N Engl J Med 1999; 341:427. 22-Colditz, GA, Willett, WC, Rotnitzky, A, Manson, JE. Weight gain as a risk factor for clinical diabetes mellitus in women. Ann Intern Med 1995; 122:481.
22. Helmrich, SP, Ragland, DR, Leung, RW, Paffenbarger, RS Jr. Physical activity and reduced occurrence of non-insulin-dependent diabetes mellitus. N Engl J Med 1991; 325:147.
23. Chan, JM, Rimm, EB, Colditz, GA, et al. Obesity, fat distribution, and weight-gain as risk-factors for clinical diabetes in men. Diabetes Care 1994; 17:961.
24. Liliana Zago1, Adriana Weisstaub1, Maria del Carmen Masselli2, Victoria Ortiz2, Ana Lía Felipoff1, Hernán Dupraz1, Clara Perdomo3, Maria Esther Rio3, Natalia Presner2, Santiago Rivera2 and Carlos González Infantino2. The FASEB Journal. 2013;27:1067.11)
25. Zehra Esra Önal, et al. Association of glycosylated hemoglobin (HbA1c) levels with Iinsulin resistance in obese children. 2014 African Health Sciences Vol 14 Issue 3.
26. Unluer AN1, Findik RB, Sevinc N, Karakaya J. Comparison of HbA1c levels in obese and non-obese polycystic ovarian patients. Clin Exp Obstet Gynecol. 2013;40(1):148-50.

Cite this article as: Fawzi H. Zayr, Hussein A. Mohammed, Ahmed H. Jasim, Mitham Z. Salih. Study of Glycated Hemoglobin (Hba1c) in Obese Diabetics Patients and Non Obese Diabetics Patients. Int J Med Res Prof. 2016, 2(1); 61-64.