HBA1C AS A MARKER FOR HIGH RISK DIABETIC SURGICAL PATIENT

Nawfal Ali Mubark

MB,ChB, DA, FICMS, Lecturer in Anesthesiology, Department of Surgery, College of Medicine, University of Basrah, Basrah, IRAQ.

Abstract

The objective of this study is to determine high levels of HbA1c in diagnosed diabetics who are considered to be euglycemics. This prospective study was conducted in 2 hospitals, Al-Taalemee Teaching Hospital and Al-Basrah General Hospital. Data collection began in September 2008 to March 2009. Sixty two diabetic patients were included in this study, all were adults aging between 18 to 80 years. They were type I or II diabetics and their last measured blood glucose was 120-150mg\dl. Patients physical status was ASA classification I or II and will be subjected to elective major and super major operations. Twenty six (42%) patients appeared to have high level of HbA1c (more than 6.5%), so HbA1c level is more accurate than the blood glucose in determining the good glycemic controlled patients and in isolation of high risk diabetic surgical patients. The baseline glucose levels and HbA1c are useful in checking the efficacy of the therapeutic control of diabetes.

Introduction

Glycosylated (or glycated) hemoglobin (hemoglobin A1c, HbA1c or Hb A 1c) is a form of hemoglobin used primarily to identify the average plasma glucose concentration over prolonged periods of time. Its name is sometimes abbreviated to A1c. It is formed in a non-enzymatic pathway by hemoglobin's normal exposure to high plasma levels of glucose. Glycosylation of hemoglobin has been implicated in nephropathy and retinopathy in diabetes mellitus. Monitoring the Hb A1c in diabetic patients may improve the treatment[1]. Diabetes mellitus is associated with poorer outcomes in perioperative period. In the undiagnosed diabetic population, asymptomatic hyperglycemia (Fasting plasma glucose; 126mg/dl) has been reported as a predictor for higher rate of cardiovascular death and greater morbidity/mortality after cardiac surgery[2]. It remains unclear whether glycosylated hemoglobin (HbA1C) could be considered a surrogate marker for morbidity/mortality in diabetic surgical patients. Glycated haemoglobin (HbA1c) is a reliable indicator of diabetic control in most but not all situations. Glycation of haemoglobin is non-linear over time and occurs over the whole life span of the red blood cell (normally 120 days). Situations in which red cell life span is reduced may give rise to low HbA1c results. HbA 1 c is not a diagnostic test for diabetes and should not be used as a screening test[3].

The baseline glucose levels and HbA1c are useful in checking the efficacy of the therapeutic control of diabetes. A retrospective cohort study suggested that perioperative HbA 1 c >7% was associated with a significant increase in postoperative infections compared to those with HbA1C<7%[2].

Diabetic complications and other diabetic related vascular disease results in more frequent surgery to organ systems including: kidney, retina, cerebrovascular,

cardiovascular, and peripheral vascular, as well as foot ulcers. Silent ischemia frequently occurs in diabetic patients. Therefore, careful assessment of diabetic patients prior to surgery is required. This includes a complete physical examination and ECG, searching for abnormalities suggestive of previous myocardial infarction. Coronary heart disease is much more common in individuals with diabetes than in the general population[4].

The aim of this study is to determine and isolate high risk diabetic surgical patients prior to general anesthesia.

Patients and Methods

This prospective study was conducted in 2 hospitals, Al-Taalemee Teaching Hospital and Al-Basrah General Hospital. Data collection began in the 2 hospitals in September 2008 to March 2009. All the patients were considered to be euglycemic on the base that they are known to be diabetics on regular treatment and their last readings of blood glucose level are normal.

All patients were adults aging between 18-80 years, with type l or II diabetes, whose last measured blood glucose was 120-150mg\dl, with ASA classification l or II and they were scheduled to major and super major operations.

An additional inclusion criterion for study participation was the willingness of the patients which may affect the study through volunteer bias or exclusion bias. Subjects were excluded if they had alcohol or drug abuse problems. This is for matching, so that we can avoid confounder.

Patients had aspiration of 2-3 ml of blood from a peripheral vein with complete aseptic technique and sent to a well-known private laboratory in an EDTA tube. The results were gathered and analyzed by Statistical Package of Social sciences (SPSS 11.0) and Microsoft office-Excel 2007.

Results

Number of patients included in this study was 62 patients (21 patients were males and 41 patients were females) as shown in table I. The mean age of the patients was 45.5 years, ranging from 18 years to 80 years, with standard deviation of 15.5 as demonstrated in table II. The mean duration of the disease (diabetes mellitus) was 4.6 years ranging from 6 months to 26 years, with standard deviation of 6.1 as in table III. Regarding the type of treatment, 23 (37.1 %) patients were on insulin therapy, 33 (53.2%) patients were on oral hypoglycemic drugs and 6 (9.7%) patients were on dietary control as shown in table IV. Thirty six patients (58%) had a normal level HbA1c (less than 6.5%) while 26 patients (42%) had a high level of HbA1c (more than 6.5%).The value of HbA1c was ranging from 4.2% to 10.9% , the mean value was 6.6%, with standard deviation of 1.4 as in table V.

Factors that may affect diabetic control:

1.Age: age is considered to be a statistically important factor in controlling of diabetes mellitus according to HbA1c value where Fisher test has been applied with resultant P-value of 0.019 (<0.05). Hereby we are confident at a level of 95% that the result is significant.

2.Gender: The sex of the patients is seemed to be not a significant factor in controlling of diabetes mellitus, where Fisher test has been applied with resultant P-value of 0.666 (>0.05).

4. Duration of the disease: There is no significant relation between the duration of the disease and control of diabetes. Fisher test was applied and the resultant P-value was 0.636 (>0.05).

Discussion

This study showed that the age of the patients play an important role in controlling of diabetes mellitus where patients aging >55 years are at increased risk of being uncontrolled concerning that they had high HbA1c value i.e. patients aging >55 years tend to have high HbA1c[2].

2

Concerning other variables, (gender, duration of the disease and the type of treatment) none of them tend to be a significant factor to affect controlling of diabetes (concerning high HbA1c value). These results may be affected by selection (some patients were excluded from the study) or by small sample size which was due to several factors for example unavailability of the test in the general hospitals and even in the private laboratories, the patients' unwillingness and the extra cost on the patients.

Conclusion

HbA1c level is more accurate than the blood glucose in determining the good glycemic controlled patients and in isolation of high risk diabetic patients. The baseline glucose levels and HbA1c are useful in checking the efficacy of the therapeutic control of diabetes.

Table I: The role of gender in controlling of diabetes.

Gender	Normal level of HbA1c	High level of HbA1c	Total
Males	13	8	21
Females	23	18	41
Total	36	26	62

Table II: The role of age in controlling diabetes.

Age	Normal level of HbA1c	High level of HbA1c	Total
15-35	12(33.3%)	6(23.1%)	18(29%)
35-54	19(52%)	8(30.8%)	27(43.5%)
55-	5(13.9%)	12(46.2%)	17(27.4%)
Total	36	26	62

3

Table III: The role of duration of the present illness on controlling of diabetes.

Duration of the illness	Normal level of HbA1c	High level of HbA1c	Total
Less than 1 year	5(71%)	2(29%)	7
1-5 years	26(56%)	20(44%)	46
More than 5 years	5(56%)	4(44.2%)	9
Total	36	26	62

Table IV: The role of the type of treatment on controlling diabetes.

Type of treatment	Normal level of HbA1c	High level of HbA1c	Total
Oral hypoglyc. drugs	21(64%)	12(36%)	33
Insulin	12(52%)	11(48%)	23
Dietary control	3(50%)	3(50%)	6
Total	36	26	62

Table V: HbA1c Value.

HbA1c Value	Number of patients	Percentage
High	26	42%
Normal	36	58%
Low	62	100%

References

1. I. Larsen ML, Herder M, Mogensen EF (1990). "Effect of long-term monitoring of glycosylated hemoglobin levels in insulin-dependent diabetes mellitus". N. Engl. J. Med. 323 (15): 1021-5. PMID 2215560.

2. American Diabetes Association. Diagnosis and classification of diabetes mellitus.Diabetes Care. 2007;30(1) (suppl1):S42-47.

3. Bartol T (December 1, 2000). Comparison of Blood Glucose, HbA1c, and Fructosamine.Retrieved on 2007-06-04. - gives a comparison chart and cites following source: Nathan DM, Singer DE, Hurxthal K, Goodson JD (1984). "The clinical information value of the glycosylated hemoglobin assay". N. Eng!. J Med. 310 (6): 341-6. PMID 6690962.

4. Sacks DB, McDonald JM. The pathogenesis of type II diabetes mellitus: a polygenic disease. Am J ClinPathol. 1996;105:149-156.

5