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Role of Glycosylated Haemoglobin (HbA1c) as Predictor of Post-Operative Hyperglycemia and Complication after Major Gastro-Intestinal Surgery

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Abstract
Aim: *Prediction of post operative complications from pre operative HbA1c levels & its relation on post op. morbidity & overall recovery of patient after major gastro-intestinal surgery.*
Materials and Methods: *A total no. of 60 patients who were planned for major GI surgery were taken into study and were divided into two groups as per pre- op HbA1c level (<6% or >6%).The clinical data & final results were analysed in relation to pre op. and post op. hyperglycemia.*
Observation: *It is observed that post-op. day1 FBS is raised in all patients, however post-op day 1 hyperglycemia is present in 60% of patients in HbA1c> 6% and 22.5% in patients in HbA1c < 6%. The post-op. complications occur more i.e. 65% in HbA1c >6% and 20% in HbA1c <6%. The infectious complication is more i.e. 50% in HbA1c >6% and 5% in HbA1c <6%. The post-op. recovery i.e. early bowel movement, early oral feeding are also delayed in HbA1c >6% group. The post-op. hospital staying is also more in this group. The post-op. CPR response is also significantly raised in HbA1c > 6% group.*
Conclusion: *That pre operative HbA1c may be used to identify patients at higher risk of poor post-op. glycemic control and prediction of post- op. complications, recovery & morbidity after major gastro-intestinal surgery.*
Keywords: *Hyperglycemia, HbA1c, Gastro intestinal surgery.*

Introduction

Surgery like any trauma induces a complex series of hormonal and metabolic changes that increases secretion of cortisol, epinephrine, glucagon & growth hormone during surgery and is associated with insulin resistance and hyperglycemia in diabetic patient. Metabolic stress & insulin resistance are consequence of major surgery &the resulting post-operative hyper-glycemia is associated with increased morbidity & mortality.[1] Individuals with Type-1 diabetes are at greater risk of metabolic complications if not managed adequately preoperatively. A diabetic patient spends 30-50% more time in hospital than a non

diabetic following major surgery .Carefully managed diabetes does not add significantly to surgical risk. Most often it is poor glycemic control; inefficient monitoring facilities, pre existing unrecognised sepsis and diabetic complications which contributes to adverse outcome.[2] This study based on hypothesis that pre-operative plasma concentration of glycosylated Hb (HbA1c) a long term marker of glucose control, its correlation with post-operative glucose control, the magnitude of inflammatory response, post operative recovery and 30 days overall morbidity after major gastro-intestinal surgery.

Aims & Objectives

1. Role of pre-operative HbA1c on post-operative hyperglycemia.
2. Prediction of postoperative complications from preoperative HbA1c level.
3. Relation of HbA1c (pre operative) on post-operative recovery and 30days overall morbidity after GI surgery.

Materials & Methods

This study was conducted in SCB Medical college hospital Cuttack from October 2015 to December 2017. This is a prospective, hospital based, non –randomized interventional study. Approval from the ethical committee of the medical college was obtained for this study. All indoor patients admitted to the surgery deptt. Were enrolled for this study as per inclusion & exclusion criteria. The exclusion criteras are haemoglobinopathies, haemolytic anaemia, uraemia & complications of diabetes mellitus at the time of admission. A total no. of 60 patients out of 110 patients who were planned for major GI surgery were taken in this study. Detailed history of individual patient, all routine blood investigations, necessary imagings, pre- operative cardiology & pulmonary assessments were done. Condition of the individual patient one day prior to surgery, one day after surgery, 7th post-operative day, and 30th post-operative day were assessed and studied. Patients were divided into two groups as per the glycosylated haemoglobin level within normal range (4.5-6%.) HbA1c < 6% and above normal (over 6%) HbA1c > 6%.

Observations

Out of 60 patients 20(33%) patients were having pre-operative level of HbA1c >6.0% and 40(67%) patients were below an equal to 6.0%. (Table: 1)

Table: 1 Categorisation of patients as Pre op. HbA1c

Preop. HbA1c (%)	Number of patients(n)	Percentage (%)
>6	20	33
< 6	40	67

The age of patients in this study ranged between 29-76 years. The mean age of these patients were 59.5 years & 52.3yaers in category HbA1c > 6% & HbA1c < 6%. (Table: 2) No patient in the age group of 20—29 years in category HbAc < 6%.

In Hb A1c >6% out of 20 patients 12(60%) were male & 8((40%) were female & in HbA1c < 6% out of 40 patients 20(50%) were male & 20(50%) were female. (Table-3)

Table: 2 Pre po. HbA1c in different age group

	HbA1c > 6%(n=20)		HbA1c< 6%(n=40)	
Age Group(yrs)	No. of patients	Percentage	No. of patients	Percentage
20-29	01	05	0	0
30-39	01	05	02	05
40-49	03	15	16	40
50-59	05	25	07	17.5
60-69	06	30	12	30
70-79	04	20	03	7.5

Table-3 Sex wise Pre op. HbA1c

	HbA1C >6% (N=20)		HbA1c <6% (N=40)	
SEX	NO. Of patients	Percentage	No. Of patients	Percentage
MALE	12	60	20	50
FEMALE	08	40	20	50

In this study six (6) major gastro intestinal surgical procedures were included. In HbA1c > 6% maximum no. of patients 6(30%) were undergone partial gastrectomy and minimum no. of patients 1(5%) undergone APR whereas in HbA1c < 6% category maximum no. of patients 15(37.5%) were undergone truncal vagotomy with GJ+JJ and minimum no. of patients 1(2.5%) were undergone total colectomy. (Table: 4)

Table: 4 Type of surgical procedure

	Hb A1c>6%		HbA1c<6%		
Ma jor GI surgical procedure	No. of patients	Percentage	No. of patients	Percentage	No. of patient in each procedure
Partial gastrectomy	06	30	09	22.5	15
Truncal vagotomy with GJ&JJ	04	20	15	37.5	19
Anterior resection	05	25	05	12.5	10
Abdominoprineal resection	01	05	05	12.5	06
Total colectomy	02	10	01	2.5	03
Hemi-colecyomy(rt/lf)	02	10	05	12.5	07

In this study post-operative complications were observed in two categories of patients with regards to nine different types of complications after undergoing the above mentioned major GI surgical procedure. No. of complications were 13(65%) in HbA1c > 6% category and in HbA1c <6% category it is 8(20%). In HbA1c > 6% patients out of 13, 10(50%) patients were with infection complications compare to 2(5%) out of 8 patients with complications in HbA1c < 6% category .(Table 5,6)

Table: 5 Type of surgical complications

	HbA1c> 6%		HbA1c <6%	
Complications	No. of complications	Percentage	No. of complications	Percentage
Wound infection	04	20	01	2.5
UTI	03	15	01	2.5
Atelectasis	0	0	02	05
Anastomotic leak	01	05	0	0
Respiratory failure	0	0	01	2.5
Cardiac failure	0	0	01	2.5
Post-op. Ileus	01	05	01	2.5
Stoma necrosis	01	05	0	0
Pneumonia	03	15	01	2.5

Table: 6 No of patients with complications

	HbA1c>6%		HbA1c <6%	
	No.	Percentage (%)	No.	Percentage (%)
No. of patients with complications	13	65	08	20
No. of patients with infectious complications	10	50	02	05

Out of 20 patients of HbA1c > 6% first bowel movement is delayed in 17 (85%) but in patients of HbA1c < 6% 35(87.5%) patients out of40 having early first bowel movement. (table-7) Patients taking orally without any IVF is late in 17(85%) in category HbA1c > 6% out of 20 is more as compared to 5(12.5%) out of 40 in category HbA1c < 6%. Out of20 patients 15(75%) of patients stayed in hospital more than 9 days in category HbA1c> 6% whereas 10(25%) patients out of 40 stayed more than 9 days in category HbA1c < 6%. (Table:8)

Table: 7 First bowel movement

	HbA1c>6%(N=20)		HbA1c<6%(n=20)	
Time(post op.)	No.of patients	Percentage	No. of patients	Percentage
EARLY(<3Days)	03	15	35	87.5
Late(>3days)	17	85	05	12.5

Table: 8 Duration of hospital stay

	HbA1c>6%		HbA1c<6%	
Duration of hospital stay	No. of patients	Percentage	No. of patients	Percentages
Early(<9 days)	05	25	30	75
Late (> 9days)	15	75	10	25

Post operative day 1 FBS level was increased from that of pre-operative in all the 60 cases but post-operative day1 hyperglycemia (FBS) was present in12(60%) patients in category HbA1c > 6% to 09 (22.5%) patients in HbA1c < 6%.This post-op day1 hyperglycemia is associated with complications (post-op) in 20 patients out of 21 and out of 39 patients only 1 patient present with complication(P= < 0.0001). Post-operative day 7 &day 30 hyperglycemia present in 10(50%) & 8(40%) respectively in HbA1c > 6% to that of 7(17.5%) & 4(10%) in HbA1c < 6%. Post – operatively all 60patients of study group showed increase CRP response, but 13(65%) patients showed significant increase (more than 100mg/l) of CRP value in HbA1c > 6% category to 8 (20%) patients of HbA1c <0 6% category (P=0.0006) considered to be statistically significant. (Table: 9)

Table: 9 CRP Response

	Significant increase(>100mg/l)	Percentage	Increase(<100mg/l)	Percentage
HbA1c<6% (n=40)	08	20	32	80
HbA1c>6%(n=20)	13	65	07	35
	21		39	

Discussion

In this study a total no. of 60 patients out of 110 patients were taken for study protocol and were divided into two groups as per preoperative level of glycosylated haemoglobin (HbA1c), i.e.4.5-6% and over6%. Out of 60 patients 40(67%) were below and equal to 6 percent and 20(33%) were above 6% preoperatively. Only one third of the non –diabetic patients has raised pre-operative level ofHbA1c in this study in contrast to only a quarter of the of the non-diabetic patients or more in other studies.[1,2,3,4]. The age group in this study ranged between 29-76 years and the men age of the patient was 52.3 years (HbA1c < 6%) & 59.5 years (HbA1c > 6%) which is in contrast to study of other group is on lower side probably the other study groups has taken patients of higher age group. The sex ratio in this study is 12:08 and 20:20 respectively in HbA1 < 6% and HbA1c > 6% which also differs from study of other group.[5,6,7]. In the present study six major GI surgical procedures were included which is similar

to two other study groups. The total no. of complications were 65% and 20% respectively in HbA1c > 6% and HbA1c < 6% with P=0.0006 which is extremely significant from statistical view point . The no. of patients with infection complications were 50% and 5% respectively in HbA1c > 6% and HbA1c < 6%. Out of 60 patients 21(35%) patients had one or more post-operative complications of whom 15(25%) had at least one post operative complication during 30days follow up. Out of 20 patients, 17(85%) patients recorded delayed bowel movement in HbA1c > 6% and only 5(12.5%) patients showed delayed bowel movement in HbA1c < 6% group, with P= <`0.0001 which is statistically extremely significant.[8,9] Post operative day 1 FBS levels were increased from pre –operative blood sugar level in all 60 patients because of surgical stress, but post-op. Day1 hyperglycemia was present in 12(60%) &9(22.5%) respectively in patients with HbA1c >6% & HbA1c <6% with P=0.0041 which is statistically significant. Postoperatively all 60 patients of this study group showed increase in CRP response. The mean CRP level in HbA1c>6% patients was 120.5mg/l whereas in HbA1c < 6% patients was 95.65mg/l (P=0.0006). Present study showed four weeks after surgery the HbA1c level was no significant different from that before surgery in either group.

Conclusion

This study showed that preoperative HbA1c level may be related to post operative hyperglycemia level. Also post operative hyperglycaemia appears prevalent among patients with no history of diabetes. Post-operative complications can be related to pre operative HbA1c levels. Pre operative HbA1c levels may be related to post operative recovery and 30 days overall morbidity after major gastro –intestinal surgery. This present study suggest that pre-operative HbA1c may be used to identify patients at higher risk of poor postoperative glycemic control and prediction of post operative complications, post-op. Recovery and 30 days overall morbidity after major gatro-intestinal surgery.

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Bibliography

1. RSSDI Textbook of Diabetes Mellitus 2nd edition: Vol.-1 &Vol-2.
2. Fischer master of surgery
3. British journal of surgery, vol-96 Nov. 2009.
4. MC. Graw Hill, Lange Current Medical Dignosis and Treatment 2010 56-57 1084.
5. O Sullivan, CJ Hynes X, Mahendran B Andrews EJ, Avalos G TAWLIK, s et al ,HbA1c in non diabetic and diabetic vascular patients
6. Krinsley JS. Effect of an intensive glucose management protocol on the mortality of critically ill adult patients. Mayo Clin P w2004 992-1000.
7. Soop MJ, Myrenfors P,Thorell A, Ljuv gqvist O; Pre operative oral carbohy-draye treatment attenuates immediate post operative resistance; Am J Physio-Endocrine Metab; 2001;280 E576-83.
8. Cai B, Chen F, Ji Y et al Alpha 7 cholinergic agonist prevents systemic inflammation and improves survival during resiuscitation: Cell Mol Med 2009; 13(9B): 3774-3785.
9. Ruickshank AM , Fraser WD, Burns HI et al. Response of serum interleukin -6 in patients undergoing elective surgery of varying severity ; Clin Sci 1990; 79: 161-5.