International Journal of Medical and Health Research
ISSN: 2454-9142
Received: 29-08-2018; Accepted: 30-09-2018
www.medicalsciencejournal.com
Volume 4; Issue 10; October 2018; Page No. 218-220

Evaluation of the blood glucose levels of the diabetic patients administered with general anaesthesia

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Abstract
Surgery provides a stress response resulting in various biochemical and hormonal changes. Hormonal interplay is the key role, in the evolution of stress response, which has been estimated as hyperglycemic response. Bases on the above literature findings the present study was planned to evaluate the blood glucose levels in the diabetic patients.
The total 25 patients diagnosed with the diabetes and undergoing the surgery in IMS BHU, Varanasi from Aug 2015 to Dec 2015 were enrolled in the present study. The enrolled patients were receiving the general anaesthesia. These patients were enrolled in the group A and there are 25 patients without any symptoms of diabetes were also enrolled in the present study in group B. First fasting blood sugar levels were assessed pre operatively by glucometer with glucose oxidase strip by standard capillary method. After securing intravenous access pre operatively normal saline was used as maintenance fluid diabetic patients were on no insulin, no glucose protocol for assessing variation in blood sugar.
Hence based on the data generated in the above two study group of the patients it can be concluded that the degree of rise of blood sugar due to surgical stress in controlled diabetics is not very significant when compared to non-diabetics. As in the diabetic patients the blood glucose level is well controlled with the medicines.

Keywords: blood glucose, diabetes, hypoglycemia, stress response

Introduction
Globally, as of 2010, an estimated 285 million people had diabetes, with type 2 making up about 90% of the cases. In 2013, according to International Diabetes Federation, an estimated 381 million people had diabetes. The increase incidence in developing countries follows the trend of urbanization and lifestyle changes, perhaps most importantly a "Western-style" diet. In April 2014, the National Institutes of Health (NIH) reported that the percentage of people with diabetes in the United States doubled since 1998.Thanks to Frederick Banting who, along with Charles Best, discovered insulin in 1922, which enabled us to manage diabetes perioperative.
Patients with diabetes are more likely to undergo surgery than are people without diabetes. Maintaining glycemic control in subjects with diabetes presents a challenging problem during the perioperative period. The higher morbidity and mortality relates in part to the heightened incidence of coronary heart disease, hypertension, renal insufficiency, and increased rates of postoperative complications. But advances in perioperative management have enabled diabetic patients to undergo complex surgery with increasing safety.
Pathophysiology of hyperglycemia during trauma and surgical stress [1-3].

1. The stress of surgery and anesthesia results in increased secretion of counter regulatory hormones (catecholamines, cortisol, glucagon, and growth hormone) and excessive release of inflammatory cytokines, such as tumor necrosis factor-alpha, interleukin-6 and interleukin-1.
2. The counter regulatory response results in a number of alterations in carbohydrate metabolism, including insulin resistance, increased hepatic glucose production, impaired peripheral glucose utilization, and relative insulin deficiency.
3. Increased counter regulatory hormones during stress also lead to enhanced lipolysis and increased free fatty acid (FFA) concentration.

Hypertension and cardiovascular disease is inordinately common so assumes high priority. History of myocardial infarction, unstable angina, poor physical inability, cerebral vascular episodes should be taken. Even asymptomatic diabetic patients have an incidence of acute ischemic events. A low threshold for cardiac testing has been recommended in diabetics, especially those over 50 years of age, with obesity, physical inactivity, hypertension, albuminuria, dyslipidemia, and chronically elevated glucose (>200 mg/dL) and HbA1C levels (> 7%).The preoperative detection of CAD in diabetic patients is difficult. The standard baseline electrocardiogram has a value of only 25% for predicting cardiac events. Asymptomatic diabetic patients with multiple risk factors should be investigated by stress testing if they have a low-

functional capacity or if they are to undergo major or vascular surgery. The positive predictive value of all stress tests is modest (20–30%); however, their negative predictive value is excellent (95–100%). Stress tests with dipyridamole-thallium scintigraphy and dobutamine echocardiography are dynamic investigations with better diagnostic accuracy.

The type of anesthesia may influence the hyperglycemic response during surgery. General anesthesia has been shown to result in higher blood glucose concentration than local and epidural analgesia. Circulating catecholamines, cortisol, and glucagon concentration are higher in patients undergoing general anesthesia. Volatile anesthetic agents inhibit insulin secretion and increase hepatic glucose production.

Epidural analgesia has a minimal effect on carbohydrate metabolism and levels of counter regulatory hormones are not significantly elevated. The combination of regional and general anaesthesia techniques is best over general anaesthesia alone. It should be noted that the reduced hyperglycemia associated with epidural analgesia is strictly limited to the operative period; afterwards, there is no difference in glycemic control [4-6].

Establishing good glycemic control and correcting any other metabolic abnormalities are usually accomplished on an outpatient basis before surgery because most patients are hospitalized just before surgery. To stabilize glycemic control in patients taking insulin, frequent glucose monitoring should be performed, with insulin dosages adjusted appropriately. Ideally, patients should monitor blood glucose levels before meals, after meals, and at bedtime. Long-acting insulin can be discontinued one to two days before surgery, and glucose levels can be stabilized with a regimen of intermediate insulin mixed with short acting insulin twice daily or short-acting insulin before every meal.

During postoperative period, insulin-glucose infusion should be continued till at least 2 hours after the first meal. Blood sugar should be monitored every 2 hourly and normal insulin regime or oral hypoglycemic agents can be started with the first meal. It is also important to monitor the sodium and potassium levels. Postoperative hyponatremia is a common electrolyte abnormality and hypokalemia if not answered at the right time may lead to cardiac arrhythmias. Nausea and vomiting should be prevented, and if present, should be treated vigorously. Good analgesia decreases catabolic hormone secretion. Nonsteroidal anti-inflammatory drugs should be used with caution in patients with renal dysfunction. Judicious use of antibiotics and better wound care and postoperative glycemic control can prevent postoperative infection [7].

Surgery provides a stress response resulting in various biochemical and hormonal changes. Hormonal interplay is the key role, in the evolution of stress response, which has been estimated as hyperglycaemic response. Bases on the above literature findings the present study was planned to evaluate the blood glucose levels in the diabetic patients.

Methodology

The total 25 patients diagnosed with the diabetes and undergoing the surgery in IMS BHU, Varanasi from Aug 2015 to Dec 2015 were enrolled in the present study. The enrolled patients were receiving the general anaesthesia. These patients were enrolled in the group A and there are 25 patients without any symptoms of diabetes were also enrolled in the present study in group B.

The approval of the institutional ethics committee was taken before starting the study. All the patients and their parents were informed consents. The aim and the objective of the present study were conveyed to them.

Following was the inclusion and Exclusion criteria of the study:

Inclusion Criteria

1. Age 30- 60 years
2. American Society of Anaesthesiologists I and II physical conditions patients
3. Diabetic patients scheduled for surgery involving General anesthesia

Exclusion Criteria

1. Patients at particular risk of heart conditions, such as congenital disease
2. Patients with ketoacidosis or hyperosmolar coma,
3. Pregnant/lactating females.

First fasting blood sugar levels were assessed pre operatively by glucometer with glucose oxidase strip by standard capillary method. After securing intravenous access pre operatively normal saline was used as maintenance fluid diabetic patients were on no insulin, no glucose protocol for assessing variation in blood sugar.

Patient receiving general anaesthesia in either groups were given a standard regimen with glycopyrrolate 0.2 mg and ondansetron 4mg and fentanyl 2mcg/kg as pre medication and induction with propofol 2mg/kg, intubating dose of suxamethonium and maintenance with vecuronium, oxygen and nitrous oxide ratio of 2:4 lit/min reversal was done with neostigmine 0.05mg/kg and glycopyrrolate. Patient is extubated after throat suction.

Results & Discussion

The data from the 25 diabetic and 25 non diabetic patients undergoing the surgery and administered with the General Anaesthesia were collected and presented as below.

The data from the both the study group was evaluated and presented as below.

Table 1: Demographic Details

Group	Group A	Group B
Age	Diabetic patients (no. of Cases)	Non-diabetic Patients (no. of Cases)
30-40 years	7	3
40-50 years	10	12
50-60 years	8	10
Total	25	25
Body Mass Index	27.5 – 32.4	23.6 – 27.3
Waist Hip Ratio	0.81- 0.86	0.75 – 0.82

Table 2: Glucose level at Different Condition

	Group A	Group B
Condition of Sampling	Diabetic patients (no. of Cases)	Non-diabetic Patients (no. of Cases)
Preoperative	83.5 – 96.7 mg/dL	86.9 – 94.5 mg/dL
5 mins after intubation	82.6 – 96.8 mg/dL	85.8– 95.8 mg/dL
30 mins after intubation	101.2 – 118.6 mg/dL	95.6 – 112.7 mg/dL
5 mins after Extubation	113.7 - 134.1.6 mg/dL	102.6 – 125.33 mg/dL

The blood glucose levels at the preoperative stage showed the normal levels. The blood glucose level after the intubation in the both the study groups. The sympathoadrenal stimulation as a consequence of surgery and anaesthesia is associated with severe metabolic changes simultaneous with these changes there is marked inhibition of insulin secretion. The results of the above study show that there is less stress response and mild increases in blood glucose levels in both the comparative groups, which is slightly higher in diabetic group but within normal physiological range. There is not much variation in both the groups.

The type of anesthesia may influence the hyperglycemic response during surgery. General anesthesia has been shown to result in higher blood glucose concentration than local and epidural analgesia. Circulating catecholamines, cortisol, and glucagon concentration are higher in patients undergoing general anesthesia. Volatile anesthetic agents inhibit insulin secretion and increase hepatic glucose production.

Our study was well supported by Yuhong [8] who had observed that combined general and epidural anaesthesia during upper abdominal surgery suppress stress response and thus glucose intolerance quite effectively, whereas only general anaesthesia was quite ineffective in attenuating the rise of plasma glucose.

Attention has been drawn to the abnormal blood sugar response to large doses of sedatives and hypnotics by Hunter and Greenberg 1954 [9]. Some of the drugs used for anaesthetic pre medication act on the neural mechanism controlling ACTH secretion to increase the output of this hormone while others inhibit the secretion.

The results of the study are in accordance with the work of Tetsuhiro Sakai, David'O Flaherty in 1995 [10], which showed that circulating cortisol was significantly suppressed by Propofol, and propofol completely abolished the response of circulating cortisol to surgery intraoperatively and decreases the rise of glucose levels intra operatively. Thomas Schrickar 2000 showed that propofol/ sufentanil anaesthesia prevents the rise of intra operative glucose levels significantly.

Conclusion

Hence based on the data generated in the above two study group of the patients it can be concluded that the degree of rise of blood sugar due to surgical stress in controlled diabetics is not very significant when compared to non-diabetics. As in the diabetic patients the blood glucose level is well controlled with the medicines.

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