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A Comparative Study of Blood Glucose Levels under General Anaesthesia in Non Diabetic and Controlled Diabetic Patients

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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 The aim of the study is to prove that well balanced anesthesia in controlled diabetic mellitus patients; the rise of blood sugar is not significant when compared to non diabetic patients The study was conducted on controlled diabetics and non diabetic patients during surgery under general anaesthesia with muscle relaxant technique to evaluate the degree of rise of blood glucose intraoperatively and compared. Study includes Fifty ASA grade 1 and grade 2 patients of either sex between 35-55 years age group scheduled for various elective surgical procedures of 1-2 hours of duration like laporatomy, thyroidectomy, upper limb orthopedic procedures elective ENT procedures. The study was undertaken in two groups 25 patients in each conducted in Osmania General Hospital and in ENT hospital, Hyderabad after approval by institutional ethical committee with written informed consent. It was found from the study that in well balanced general anaesthesia the degree of rise of blood sugar due to surgical stress in controlled diabetics is not very significant when compared to non diabetics*

Key Words: *blood glucose, diabetes, hypoglycemia, muscle relaxant ,stress response*

I. Introduction

The metabolic and hormonal response to anaesthetics and surgery has been a subject to extensive evaluation and discussion for the past many decades.

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 or variation in catecholamine concentration to different types of surgery and anesthesia

The most widely known clinical metabolic disturbance is certainly the elevated blood sugar which occurs during anaesthesia. Surgical stress inflicted on a diabetic patient has a wide range of complications which include ketosis, acidemia, electrolyte imbalance, ultimately culminating in cardiac arrest.

There are many variations in hyperglycemic response with various anaesthetic agents and techniques.

This study involves an effort into insight of the hyperglycemic fluctuations taking place in an anaesthetic and surgical stress environment on the diabetics in comparison with non diabetic patients.

1.1. Diabetes mellitus

Diabetes is chronic systemic disease caused by absolute or relative deficiency of insulin, Due to a total or relative lack of insulin, body breaks down its own fat, proteins and glycogen to produce sugar resulting in high sugar levels in the blood with excess byproducts called ketones being produced in the liver.

1.1.1Classification

TYPE 1	OTHER SPECIFIC TYPES
A-Immune mediated	1.Genetic defects –MODY
B-Idiopathic	2.Disease of exocrine pancreas
	3.Endocrine diseases
	4.Drug induced
TYPE 2	5.Genetic syndromes
Gestational diabetes mellitus	6.Infections

1.1.2Diagnostic Criteria

Symptoms of diabetes, random blood glucose >11.1mmol/L (200mg %)

Or

Fasting plasma glucose>7mmol/L (126mg %)

Or

Two hours post prandial plasma glucose 11.1mmol/L (200mg %)

II. Materials and methods

The study was conducted on controlled diabetics and non diabetic patients during surgery under general anaesthesia with muscle relaxant technique to evaluate the degree of rise of blood glucose intraoperatively. The rise of blood glucose is compared among the controlled diabetic patients and non diabetic patients.

Fifty ASA grade 1 and grade 2 patients of either sex between 35-55 years age group scheduled for various elective surgical procedures of 1-2 hours of duration like laporatomy, thyroidectomy, upper limb orthopedic procedures elective ENT procedures were taken, The study was conducted in Osmania General Hospital and in ENT hospital, Hyderabad after approval from Institutional ethical committee with written informed consent of all patients selected for study. The study was undertaken in two groups of 25 patients in each group.

Group **A**-non diabetics
Group **B** –controlled diabetics

All patients were assessed pre operatively and investigated to exclude other systemic diseases. Patients with ASA grade3 &4 were excluded from the study patients who were having blood glucose less than 60 mg% were also excluded from study .uncontrolled diabetics and surgeries more than 2 hours duration were excluded from the study The range of glycosylated hemoglobin in this study group was between 5-7%. Patients with Hb A1c levels above 7% were excluded from study.

In diabetics insulin and anti diabetic drugs were precluded from midnight before operation..
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 ondensetron 4mg and fentanyl 2mcg/kg as pre medication .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 .

2.1. Monitoring

Patients were monitored preoperatively and throughout the procedure using
1. Non invasive blood pressure monitor
2. Pulse oximeter
Pulse rate, blood pressure and oxygen saturation were monitored for all patients throughout the procedure

2.2 Blood sugar estimations:

For estimating blood sugar level, glucometer is used with glucose oxidase strip by standard capillary method samples were collected from each patient at the following intervals

- Pre operatively fasting blood sugar
- 5 mins after intubation
- Followed by samples at 30 mins interval after intubation
- Post operatively 5 min after extubation

The results were studied statistically.

3.Observations and results:

Table i:

Pre-OPERATIVE BLOOD SUGAR VALUES IN NON-DIABETIC AND DIABETIC PATIENTS

Group	Mean +/- SD
Group A	88.16[9.55]
Group B	89.44[16.83]

The above data were comparable without any statistical significance [p-values greater than 0.05], p value – 0.077.

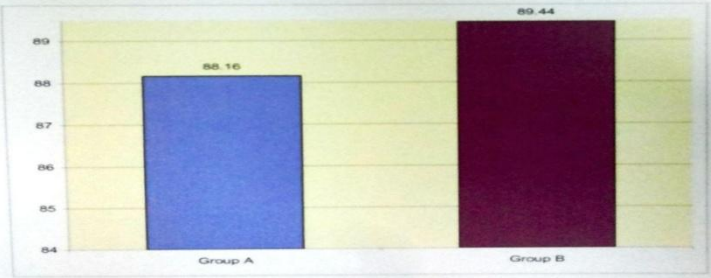


Table-ii

TRENDS OF BLOOD SUGAR LEVELS AT VARIOUS TIME INTERVALS

Group	Pre Operative	5 Min. after Intubation	30 Min. after Intubation	5 Min. after Extubation
Group A	88.16[9.55]	86.92[10.77]	103.44[14.09]	117.6[16.61]
Group B	89.44[16.83]	89.96[6.4]	108.44[9.01]	124.76[11.65]

The values are mean with S.D.in brackets

The above data were comparable with any statistical significance [p –values greater than0.05],

p value for 5min after intubation : 0.23

p value for30min after intubation : 0.14

p value for 5min after extubation : 0.08

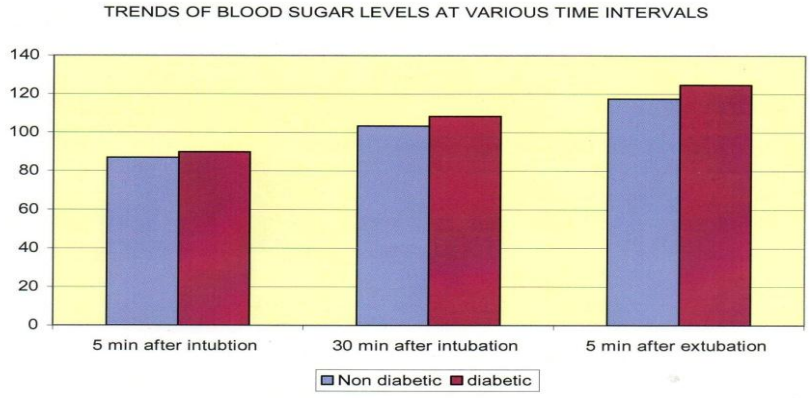


Table iii

TABLE SHOWING A COMPARISION OF BLOOD SUGAR RISE (%) BETWEEN NON DIABETIC AND DIABETIC AFTER EXTUBATION

Group	Mean +/- SD
Group A	24.15%[9.5]
Group B	27.72%[6.66]

Values are mean with SD in brackets

The above results show 3.67%rise of blood sugar in diabetics when compared to nondiabetic group.

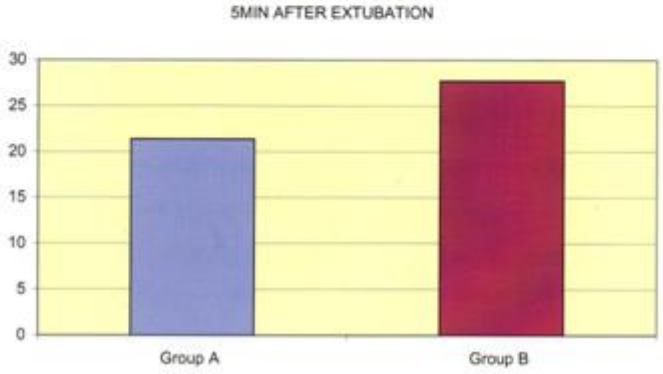
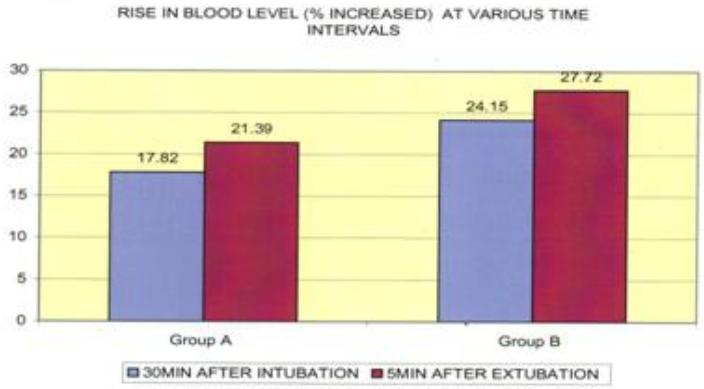


Table iv

RISE IN BLOOD LEVEL (% INCREASED) AT VARIOUS TIME INTERVALS

Group	5 Min. after Intubation	30 Min. after Intubation	5 Min. after Extubation
Group A	-1.06%[10.16]	17.82%[14.16]	24.15%[9.5]
Group B	0.63%[7.3]	21.39%[11.01]	27.72%[6.66]

Values are expressed as percentage increased mean and SD in brackets



III. Discussion

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. This is present during operation and is associated with marked Glucose intolerance (Allison,Tomlin,Chamberlain 1968, Clareal,1970). The hyperglycemic response to surgery and anaesthesia was reviewed by Clark RJ 10968, 1970 conforming the response as a relation to duration and extent of stress .

Attention has been drawn to the abnormal blood sugar response to large doses of sedatives and hypnotics by hunter and Greenberg 1954.

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

Opioids capable of reducing the stress response by modulating nociception at different levels of neuraxis , as well as by influencing centrally mediated neuro endocrine responses. For eg-Fentanyl can abolish the hyperglycemic response to surgery and may reduce cortisol and GH responses better than halothane.In the present study fentanyl (2mcg/kg) was given before induction .

In this study mean values of blood glucose in all groups studied were within normal physiological range. The minimum and maximum mean basal values in the groups studied were in the range of 70-103mgm%

In the general anaesthesia group of non diabetic and diabetic patients premedication was done with glycopyrrolate and fentanyl 2mcg/kg , induction with propofol 2 mg/kg. Tetsuchiro sakai,David O' Flaaharty et al (1995) showed that circulating cortisol was significantly suppressed by Propofol and completely abolished the response of circulating cortisol to surgery. In this study post intubation blood sugar levels showed a decrease of 1.064% in non diabetic that is attributed to suppression of stress response of intubation by fentanyl and Propofol.Fentanyl can prevent ACTH release and attenuate pituitary–adrenal response to stress.

The response to intubation in the diabetic group was an increase by only 0.63% which is slightly higher than non diabetic population but within the normal physiological range and statistically non significant.The rise of blood sugar at the end of 30 min was 17.82% in non diabetic while in diabetic was 21.39%.There was only 3.57% of difference in the two groups . After extubation the rise of blood glucose in non diabetic was 24.15% while in diabetics was 27.72%.Post extubation mean glucose levels in non diabetics was 117.6 with SD of 16.61, in diabetics mean 124.76 with SD of 11.65 .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 with in normal physiological range. There is not much variation in both the groups

The results of the study are in accordance with the work of Tetsuhiro Sakai, David'O Flaherty in 1995, 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.

In our study also there was not much rise of blood glucose levels in both non diabetics and controlled diabetics by using propofol and fentanyl.

This study gives an insight into suppression of stress response of surgery by using various anaesthetic drugs in general anaesthesia. This knowledge allows us to decide on the use of various anesthetic drugs, which will better control the surgical stress and decreases the morbidity in patients subjected to various degrees of surgeries.

IV. Conclusion:

Blood sugar levels during surgery under general anaesthesia technique was studied in fifty patients in 2 groups, group A – non diabetic and group B – well controlled diabetics, 25 patients in each group.

It was found that response to surgical stress in surgeries of less than 2 hrs duration in non diabetics and controlled diabetics can be minimized by using opioids like fentanyl and induction agents like Propofol

The requirement of intra-operative insulin regimen can be minimized by maintaining intra-operative blood glucose levels within the normal physiological ranges.

It is concluded from the study that with well conducted and well balanced general anaesthesia the degree of rise of blood sugar due to surgical stress in controlled diabetics is not very significant when compared to non diabetics.

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