Post-operative Stress Hyperglycemia is an Important Risk Factor for Worse Surgical Outcome – An Experience in a Tertiary Health Care Set Up

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ABSTRACT

Introduction: Acute hyperglycemic response to stress that has been observed in clinical settings, which exemplifies obligatory metabolic rearrangements needs to cope with critical stress. Study aimed to determine the frequency of stress hyperglycemia and its complications in patients admitted for major gastro-intestinal operations.

Material and methods: This cross-sectional study of one year duration, was conducted at tertiary care hospital, Sambalpur. All patients between 30-65 years of age were included in the study after taken consent. All the cases had detail history, physical examination and routine biochemical investigations: a random testing blood sugar was advised at time of presentation in ward. Depending on the blood glucose level on admission, the HbA1C and past history of diabetes mellitus, these patients were categorized into Euglycemia, Stress Hyperglycemia (RBS>140 mg/dl), and Diabetes Mellitus Group. The frequency and percentages were calculated while the numerical statistics were used to compare mean ±SD.

Results: During one year study period, one hundred patients were recruited and enrolled for study. The mean age ± SD for whole patients was 56.37 ± 8.93 years, while it is 52.87 ± 8.86 and 57.84 ± 9.73 years in male and female patients respectively. The mean ± SD for HbA1C for whole patients was 6.71 ± 1.53. Regarding glycemic status, the euglycemia, stress hyperglycemia and diabetes mellitus 24%, 46%, 30% patients respectively, while mean ± SD are 129.23 ± 8.92, 219.72 ± 11.43, and 281.03 ± 31.54 respectively.

Conclusion: Stress hyperglycemia identified as a common finding in patients with major gastro intestinal operations and associated with poor outcome.

Keywords: Normoglycemia, Euglycemia, Stress hyperglycemia, Diabetes mellitus

INTRODUCTION

Stress hyperglycemia(SH) defined as raised blood glucose level in previous euglycemic subjects that reversed to normal once the acute phase resolves and recovery occured misleading the subjects with new onset or an unidentified diabetic mellitus.[1-4] Acute insulin resistance is seen as a major cause of intraoperative hyperglycemia due to surgical stress response, having the release of catecholamines, cortisol and glucagon resulting stress hyperglycemia.

Hyperglycemia occurs in about 15-45% of those subjects without prior diagnosis of diabetics mellitus.[5,6] Although it is compensatory response and imposes variety of adverse events includes immune dysfunction, increase risk of infections (like pneumonia, sepsis, skin infection, urinary tract infection), hemodynamic disturbances, electro-myocardial impairment, cerebrovascular accidents, postoperative delirium, impaired cognition and predicts higher mortality, morbidity.[7,8,9]

Study aimed to determine the frequency of stress hyperglycemia and its complications in patients admitted for major gatro-intestinal operations, and by comparing values between euglycenic, stress hyperglycemic, and diabetes mellitus groups.

MATERIAL AND METHODS

Study was conducted on patients admitted in General Surgery department, V.S.S. Institute of Medical Sciences And Research(VIMSAR), Burla, Sambalpur, Odisha for major elective gastro-intestinal surgery between September 2019 – August 2020. Calculated sample size was 100 (Male=44, Female=56).

Inclusion criteria

All patients who admitted for major elective gastro-intestinal surgeries in general surgery ward from September 2019 – August 2020

Exclusion criteria

1 Patients with outpatient surgical procedures
2 Patients with a length of stay less than 24 hours or with minor surgical procedures including endoscopic procedure or eye surgeries or ENT surgeries
3 Patients with age below 30 years and more than 65 years
4 Immuno-compromised patients
5 Patients with other co-morbid conditions, example-malignancy, other diseases

Method of collection of data

Details of cases were recorded including history, physical

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examination, in patient routine biochemical investigations. Preoperative blood sugar recorded as - Fasting blood sugar level, post-prandial blood sugar level within 1 hour, were advised at the time of presentation in ward and one day before surgery.

In all cases, prepared infusions of saline and carbohydrates (Isolyte Baxter 2000 ml/ day; glucose 50g/l – 200 kcal/l) and saline (1000 ml/day or Ringer lactate 1000 ml/day) were used in first 72 hours after surgery. No patients received parenteral nutrition through the use of preparations at higher carbohydrate content or with greater caloric content. No patient was fed through enteral nutrition. No patient resumed oral feeding before the fourth postoperative day. All patients were subjected to glycemic controls of serial blood glucose values using peripheral venous blood sampling and through the use of finger stick every 4 hours, and according to the highest recorded glycemic value, were divided into three groups,i.e. normoglycemic / euglycemic group (initial post-op glucose value <= 125 mg/dl), stress hyperglycemia group (RBS > 140 mg/dl), diabetics mellitus group (defined as presence of a known case of diabetic mellitus or HbA1c value greater than 6.5%).

Postoperative complications were considered in the time period of 3 days from surgery and classified according to the classification of Clavien – Dindo.[10] Postoperative mortality was defind as death within 30 days of surgery, and patients were monitored till discharge from the hospital.

Ethical approval was taken from Department of Surgery, Veer Surendra Sai Institute of Medical Science And Research (VIMSAR), Burla, Sambalpur, Odisha before starting the study.

	Frequency (n = 100)	Percentage (%)
Age in years		
30 – 39	12	12
40 - 49	30	30
50 - 59	34	34
60	24	24
Gender		
Male	44	44
Female	56	56
Residence		
Urban	30	30
Rural	70	70

Table-1: The demographic profile of the patients

Glycemic status	Frequency (N = 100)	Percentage (%)
Normoglycemia/Euglycemia	24	24
Stress hyperglycemia	46	46
Diabetes mellitus	30	30

Table-2: Frequencies of glycemic status

Glycemic status	RBS in post-operative period Mean±SD
Normoglycemia/Euglycemia	129.23±8.92
Stress hyperglycemia	219.72±11.43
Diabetes mellitus	281.03±31.54

Table–3: Mean±SD of glycemic status in patients admitted for surgery

STATISTICAL ANALYSIS

Data was collected on predesigned proforma and analysed in SPSS 16 with the calculation of frequencies and percentages(%), and mean +- standard deviation (SD). To compare the data student t test, Fisher exact test, p-value are used.

RESULTS

The mean age ± SD for whole population was 56.37 ±8.93 years while it is 52.87 ± 8.86 and 57.84 ± 9.73 years in male and female population respectively. The mean ± SD for HbA1c in overall population was 6.71 ± 1.53. The results of the study are presented in Table 1 – 4.

Of the 100 patients studied, 44% were male and 56% were female (table-1).

Glycemic status revealed 24(24%) with Normoglycemia, 46(46%) with Stress hyperglycemia, 30(30%) with Diabetes mellitus (table-2).

Mean ± SD of glycemic status in post-operative period

	Normoglycemic (n=24)	Stress hyperglycemic (n=46)	Diabetes mellitus (n=30)	p-value
Complications	(9)36%	(21)45.65%	(22)73.26%	< 0.001
Length of hospital stay (days, median range)	8 (6-25)	9 (6-31)	11 (6-39)	
Wound infections	(2)8%	(5)10%	(7)23.3%	
Intra-abdomonal abscess	(1)4%	(3)6.5%	(6)19.9%	
Ileus	(1)4%	(3)6.5%	(5)16.66%	
Pneumonia	(3)12%	(5)12.7%	(8)26.64%	
Anastomotic leak	(2)8%	(6)13%	(8)26.64%	
Re-operations	(1)4%	(2)4.3%	(4)13.32%	
Other complications	(3)12%	(5)12.7%	(8)26.64%	
Clavien Dindo I/II	(5)55.55%	(13)61.90%	(15)68.18%	
Clavien Dindo III/IV	(4)44.44%	(8)38.09%	(7)31.81%	
Mortality	(1)4%	(2)4.3%	(4)17.6%	< 0.001

Table–4: Peri-operative outcomes

for Normoglycemia, Stress hyperglycemia, and Diabetes mellitus group are 129.23±8.92, 219.72±11.43, and 281.03±31.54 respectively (table-3).

Some patients had more than one complications. Post-operative complication rate, mortality rate, and length of hospital stay were significantly higher in patients who experienced hyperglycemia post-operatively (table-4).

DISCUSSION

The age of the patients ranged from 30-65 years with mean age 56.37 ± 8.93 (SD) years, where this finding was comparable to Guillermo et al; where the mean age was 57.73 ± 4.73 (SD) years.[10]

In present study the glycemic status revealed 30 (30%) with diabetes, 46 (46%) with stress hyperglycemia and 24 (24%) with normoglycemic /euglycemic patients (Table-2)

The incidence of stress hyperglycemia in the present study was 46% and which is consistent to previous study Kushner et al, Gray et al, Guillermo et al, Candelise et al where the stress hyperglycemia varies from 30-35%.[11,12,13] The diabetes observed in this study as 30%. But according to Hart CL et al and Janghorbani et al study group, higher prevalence of stress hyperglycemia among female patients i.e. 56%.[14]

Gentile NT et al opined that stress hyperglycemia was an independent predictor of morbidity, mortality and disability even after controlling for disease severity.[15] The present study demonstrates stress hyperglycemia as a bad prognostic marker and it is consistent with the study by Candelise et al and Sarkar RN et al.[13] The individuals who had normal blood sugar level at post operative period had good recovery. Gray CS, et al observed complete functional recovery in patients with normal blood glucose level.[12] Kushner et al and Bruno A et al observed poor recovery in patients having stress hyperglycemia.[16] Capes SE et al[17] observed that stress hyperglycemia associated with poor functional recovery. Patients without history of diabetes mellitus also had an increase risk for short term mortality and increased risk of poor functional recovery than lower glucose levels patients.[17] Shafa MA et al noticed markedly increased stroke risk in people with HbA1C > 7% and this finding shown relationship between HbA1C levels and stroke risks.[18]

This study also reported that post-operative mortality rate, complication rate, and length of hospital stay were significantly higher in patients who experienced hyperglycemia post-operatively. (p-value < 0.001) (Table -4).

CONCLUSION

Stress hyperglycemia identified as a common finding in patients with major gastro-intestinal operations, and are associated with poor recovery, longer hospital stay, adverse complications and increased mortality. Thus we suggest that stress hyperglycemia could be a risk factor of worse outcomes in major gastro-intestinal operations.

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