Stress Response to Surgery Under General Anesthesia in Type 2 Diabetic Patient

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World map
Arctic OCEAN
ALASKA (USA)
North Pacific OCEAN
HAWAIIAN ISLANDS (USA)
South Pacific OCEAN
Bangladesh
National Capital
INDIA
BANGLADESH
DHAKA
INDIA
BAY OF BENGAL
24point
N
Antarctica

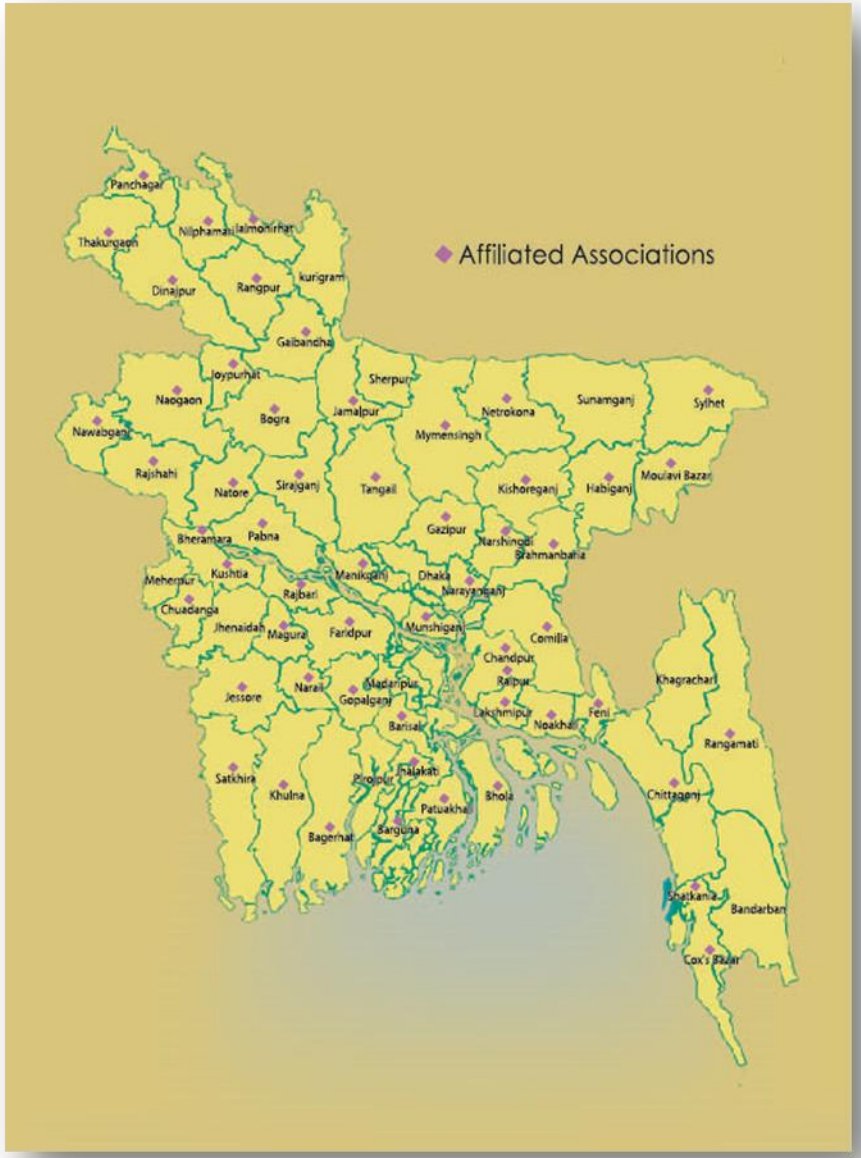
Bangladesh Institute of Research & Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM)

- Central Location
- 700-bed multidisciplinary hospital
- Very large OPD (4500 patients /day)
- 60-70 diabetic patients under went operative procedure everyday
- WHO Collaborating Centre for Research on Diabetes and its complications (Till 2014)

Uniqueness of BADAS

- One of Largest diabetes care provider in the world
- One of Largest non-profit health care network outside Govt. in the world
- Provide healthcare through a network of hospitals & educational institutions of its own

Our network all over the country



Diabetes Mellitus

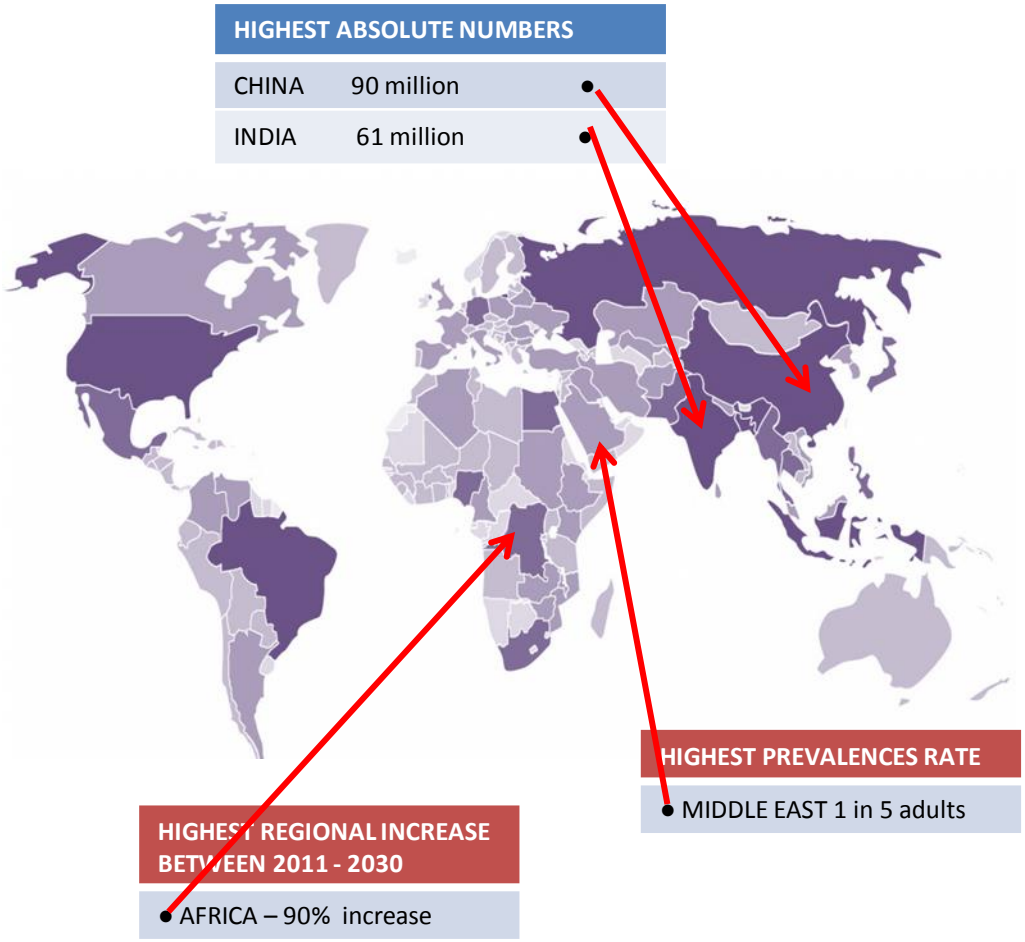
- One of the major chronic diseases affecting mankind all over the world

- It has been declared as an epidemic in developing countries by both the World Health Organization and International Diabetes Federation

Diabetes – Global Epidemic

Killer Facts:

- More than **382 million (8.3%)** people live with diabetes – by 2035 will be **592 (9.9%) million**
- **80%** live in low- and middle-income countries (LMCs)
- **4.6 million deaths each year**
- **Every 8 seconds**, someone in the world dies from diabetes



Diabetes Atlas

Diabetes in Bangladesh

- The estimated prevalence of diabetes in Bangladesh is around 6.8%

- Mostly Type 2 diabetes (99%)

Fifty percent of all diabetic patients present for surgery during their life time

Inevitably, diabetic patients presenting for incidental surgery, or surgery related to their disease, will place an increasing burden on anesthetic services

Perioperative morbidity and mortality are greater in diabetic than in nondiabetic patients

In response to stress during surgery and anesthesia- the biochemical parameters like stress hormone being altered

The neuroendocrine system comes into play to maintain fuel requirements by glycogenolysis and gluconeogenesis through stress hormones catecholamines, glucagon, cortisol, and growth hormone

The endocrine hormones like cortisol, thyroxin, glucagon, and growth hormone are released due to surgical stress under hypothalamopituitary control

Surgery elicits a stress response that is directly proportional to the degree of tissue trauma

Why Stress response to surgery under anesthesia is complicated in diabetic patients?

- Insulin deficiency
- Counter regulatory hormones activity
- Autonomic neuropathy
- Electrolytes transport
- Preoperative fasting states
- Dehydration

These lead to abnormal metabolism of carbohydrate, protein and fat as well as electrolyte imbalance

Anesthesia also principally affects glucose metabolism through the modulation of sympathetic tone

Our study

- **It was designed to explore the metabolic and stress response to lower abdominal surgery under general anesthesia in type 2 diabetic subjects with particular focus on**
  - **Serum glucose**
  - **C-peptide**
  - **Cortisol**
  - **Electrolytes**
- **It also investigated the stress response in different treatment variability**

OBJECTIVES

- **To investigate the glycemic response to surgery in type 2 diabetic subjects under general anesthesia.**
- **To investigate the serum cortisol response to surgery in type 2 diabetic subjects under general anesthesia.**

OBJECTIVES

- **To investigate the stress response in insulin and combined insulin-OHA treated type 2 diabetic subjects during surgery under general anesthesia.**
- **To investigate the stress response in hypertensive and normotensive type 2 diabetic subjects during surgery under general anesthesia.**

Study design

The study was a cross sectional prospective study

Study subjects

100 subjects who were admitted in BIRDEM hospital in fit physical condition (ASA Class II) were received total abdominal hysterectomy under general anesthesia

Exclusion criteria

- Influencing variable like patients taking steroid or analgesics
- Pre operative plasma glucose <5 mmol/l and >10 mmol /l
- Patients of ASA Class III, IV, V and E
- Obese and malnourish

Design of general anesthesia

- **Induction: Thiopental, fentanyl, vecuronium**
- **Maintenance: Halothane, nitrous oxide with oxygen**

Sample collection

Three samples (8-10 ml) were collected

- **The first sample- just before anesthesia**
- **2nd sample- 10 minutes after incision**
- **3rd sample- 10 minutes after extubation**

Control

First sample of each subject were served as a control

ANALYTICAL METHODS

- Plasma glucose was measured by glucose oxidase method (Randox, UK).
- Serum electrolytes were measured by Dry Chemistry method (DT-60, USA).
- Serum C-peptide was measured by chemiluminescent immunoassay (Immulite, USA).
- Serum cortisol was measured by chemiluminescent immunoassay (Immulite, USA).

STATISTICAL ANALYSIS

Statistical analysis was performed using SPSS (Statistical Package for Social Science) software for Windows version 17 (SPSS Inc., Chicago, Illinois, USA).

RESULTS AND OBSERVATIONS

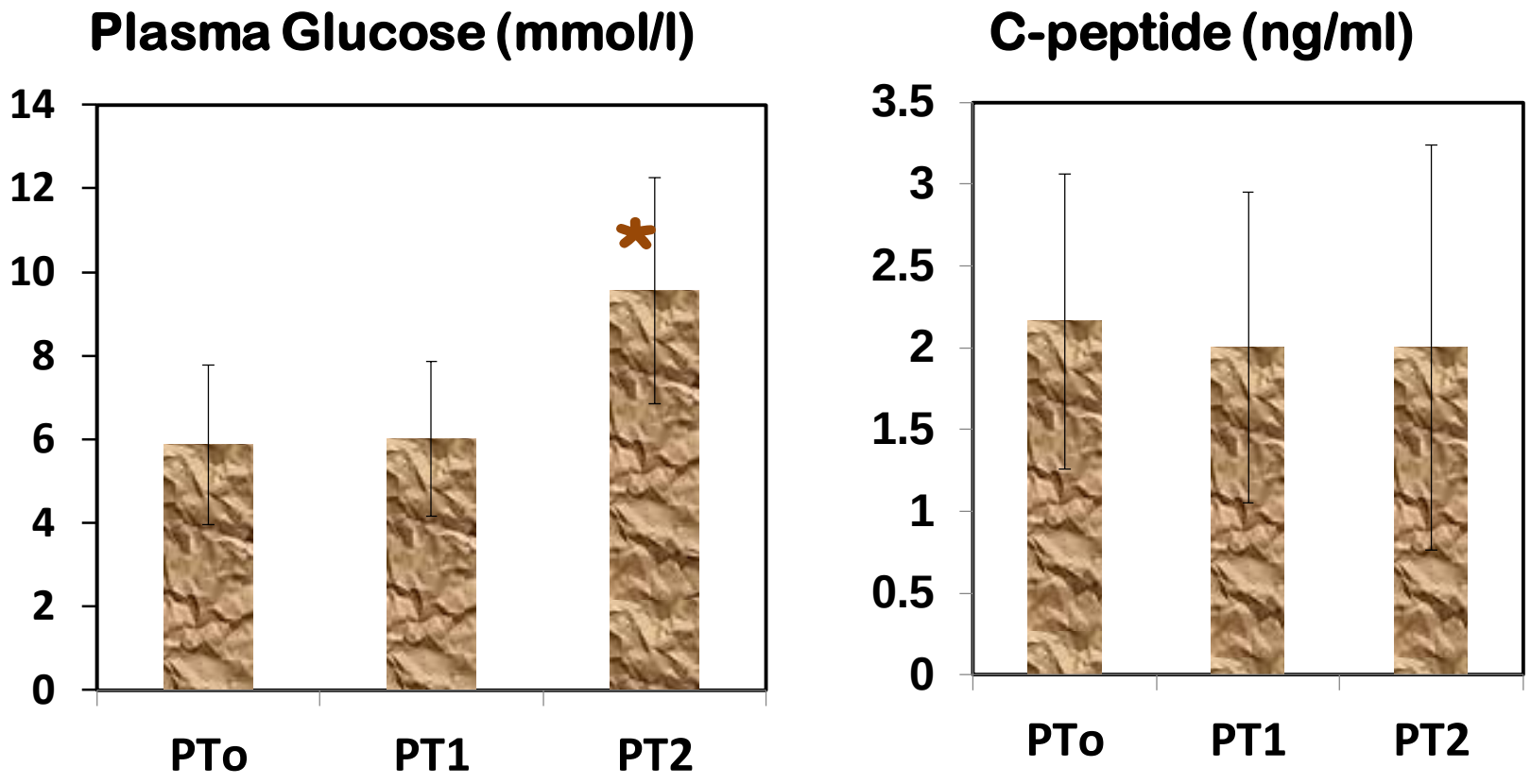


Figure: Perioperative glycemic and insulinemic status of the study subjects

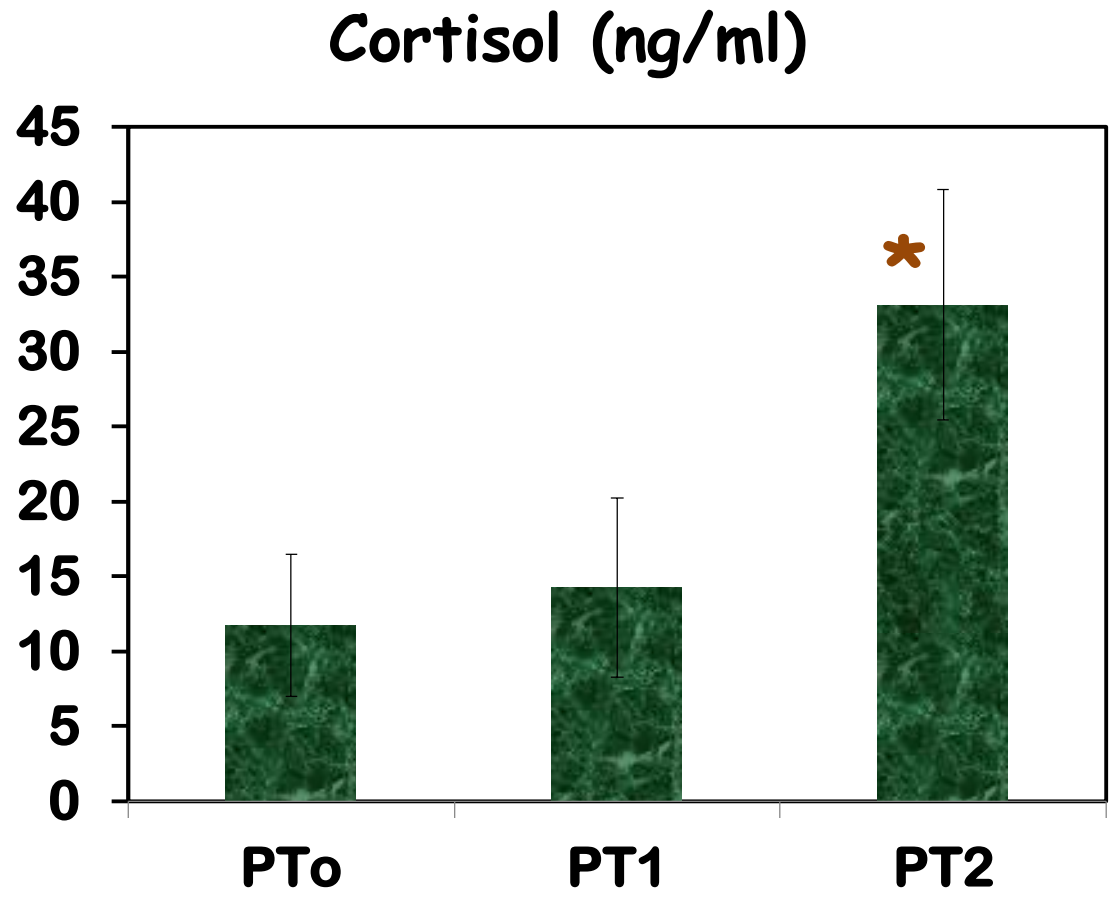
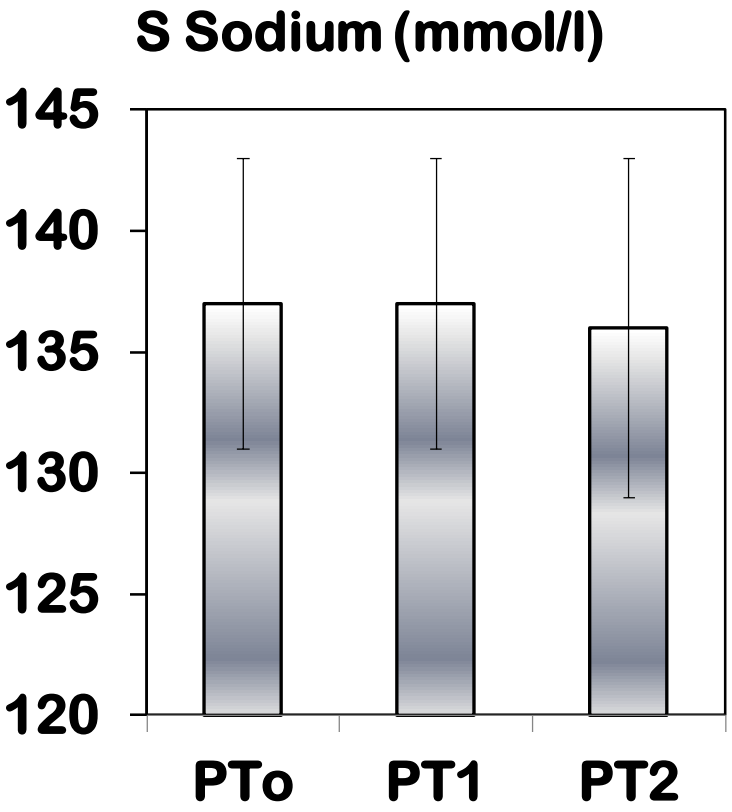


Figure: Perioperative serum cortisol status of the study subjects



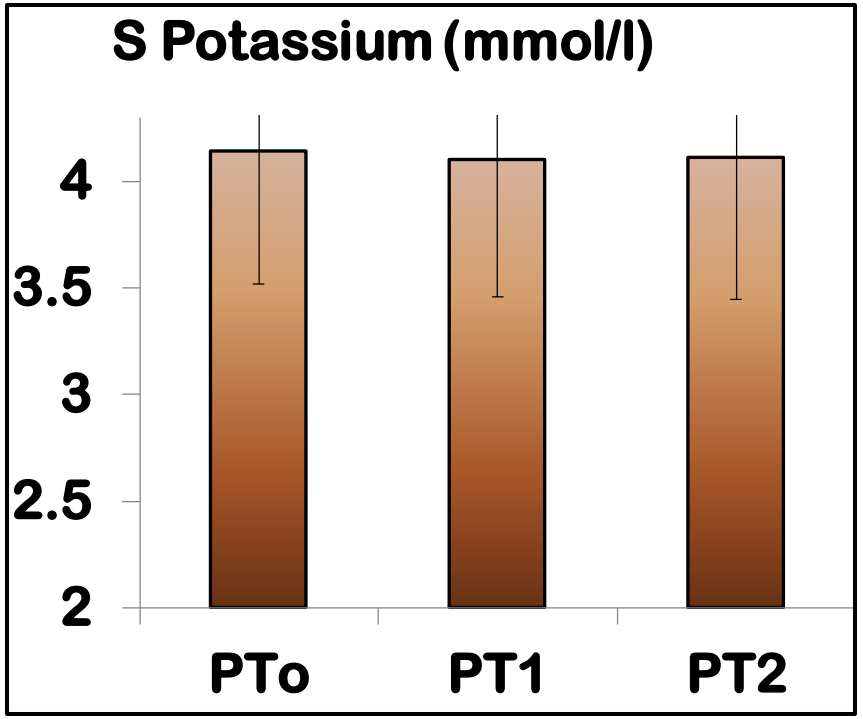
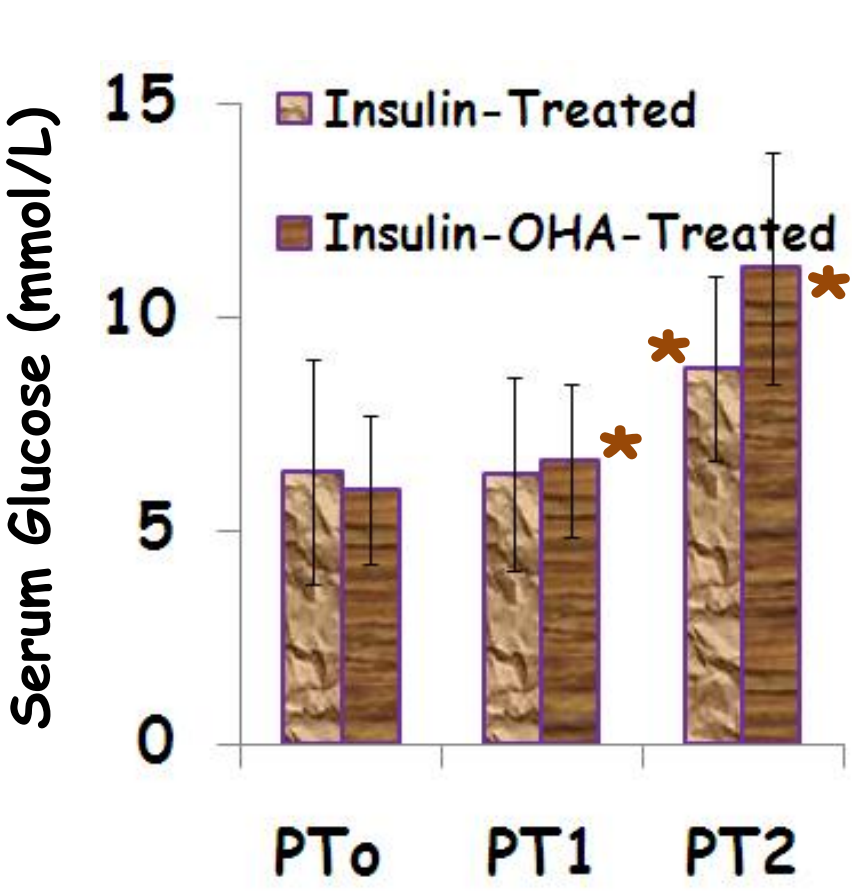


Figure: Perioperative serum electrolytes level of the study subjects



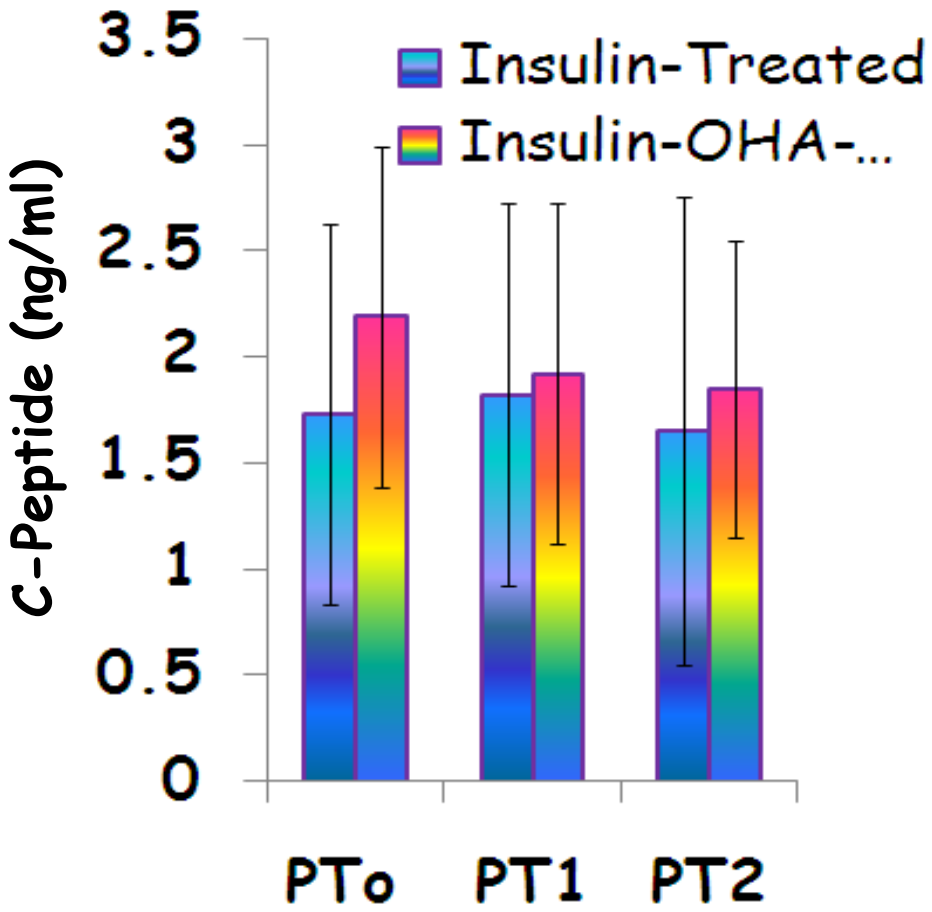


Figure: Perioperative glycemic and insulinemic status of insulin and insulin-OHA treated subjects

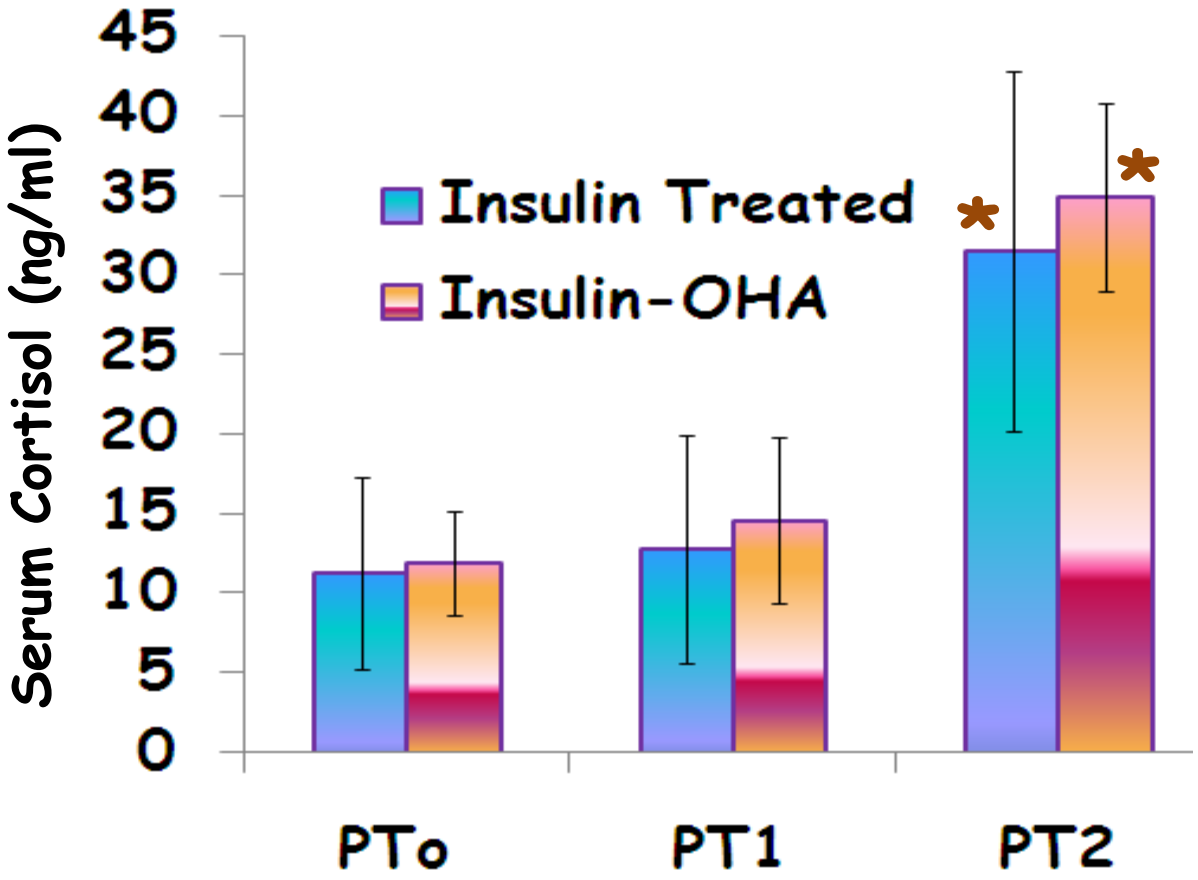
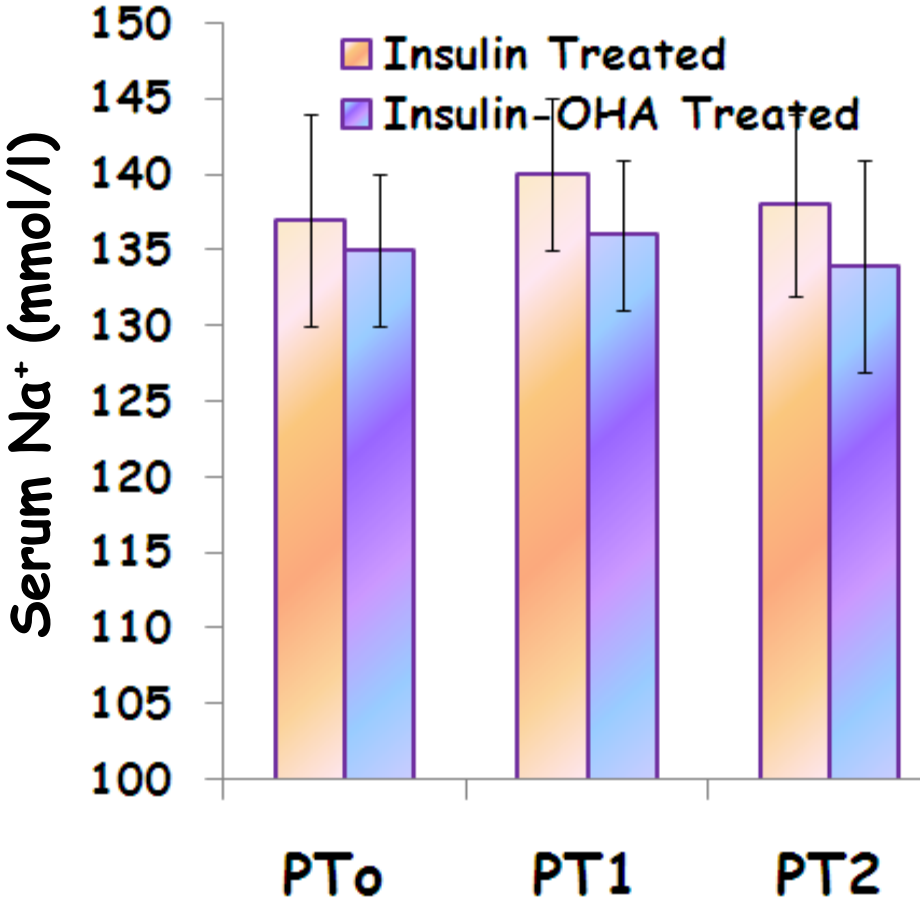


Figure: Perioperative serum cortisol status of insulin and insulin-OHA treated subjects



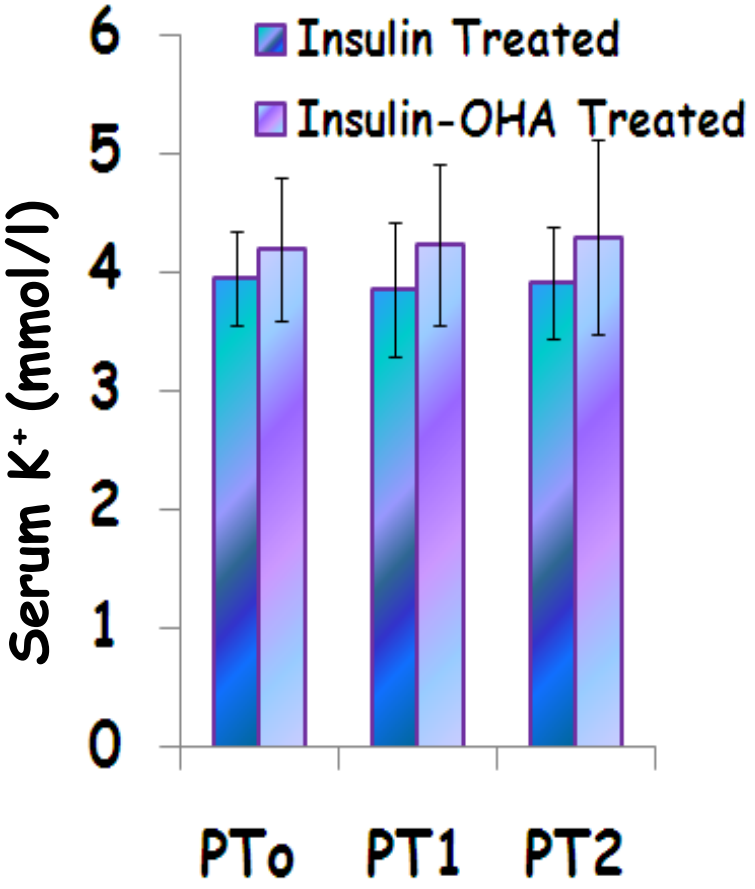
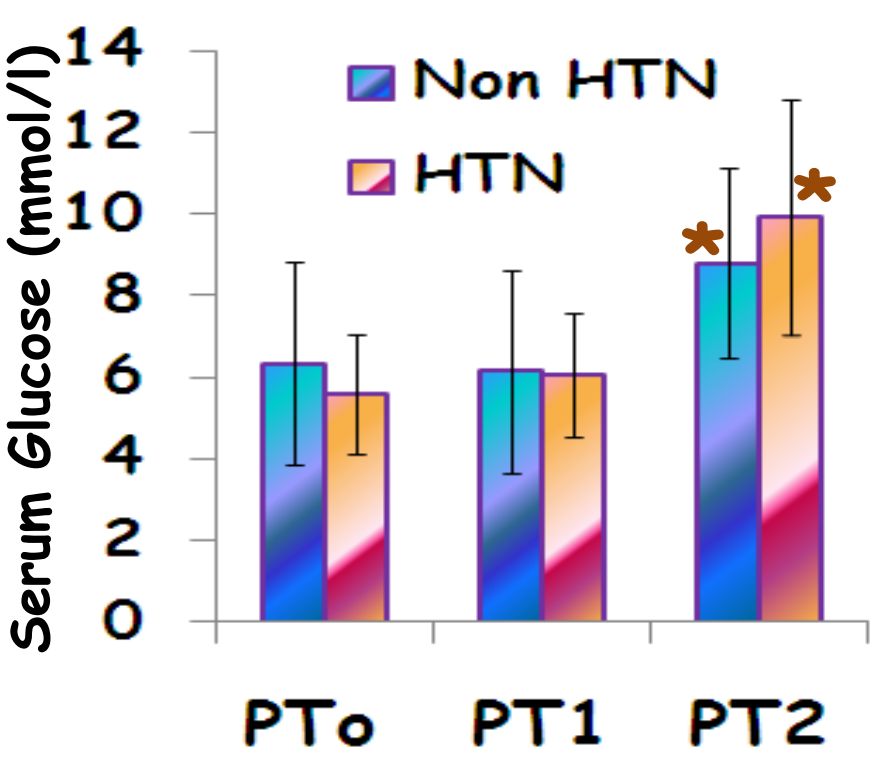


Figure: Perioperative serum electrolytes status of insulin and insulin-OHA treated subjects



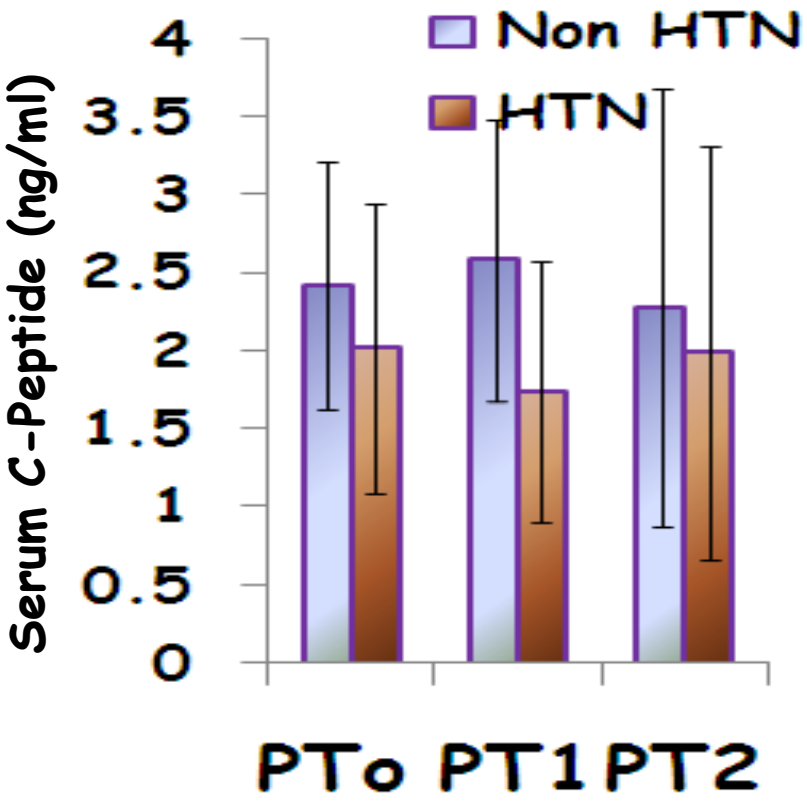


Figure: Perioperative glycemic and insulinemic status of hypertensive and normotensive study subjects

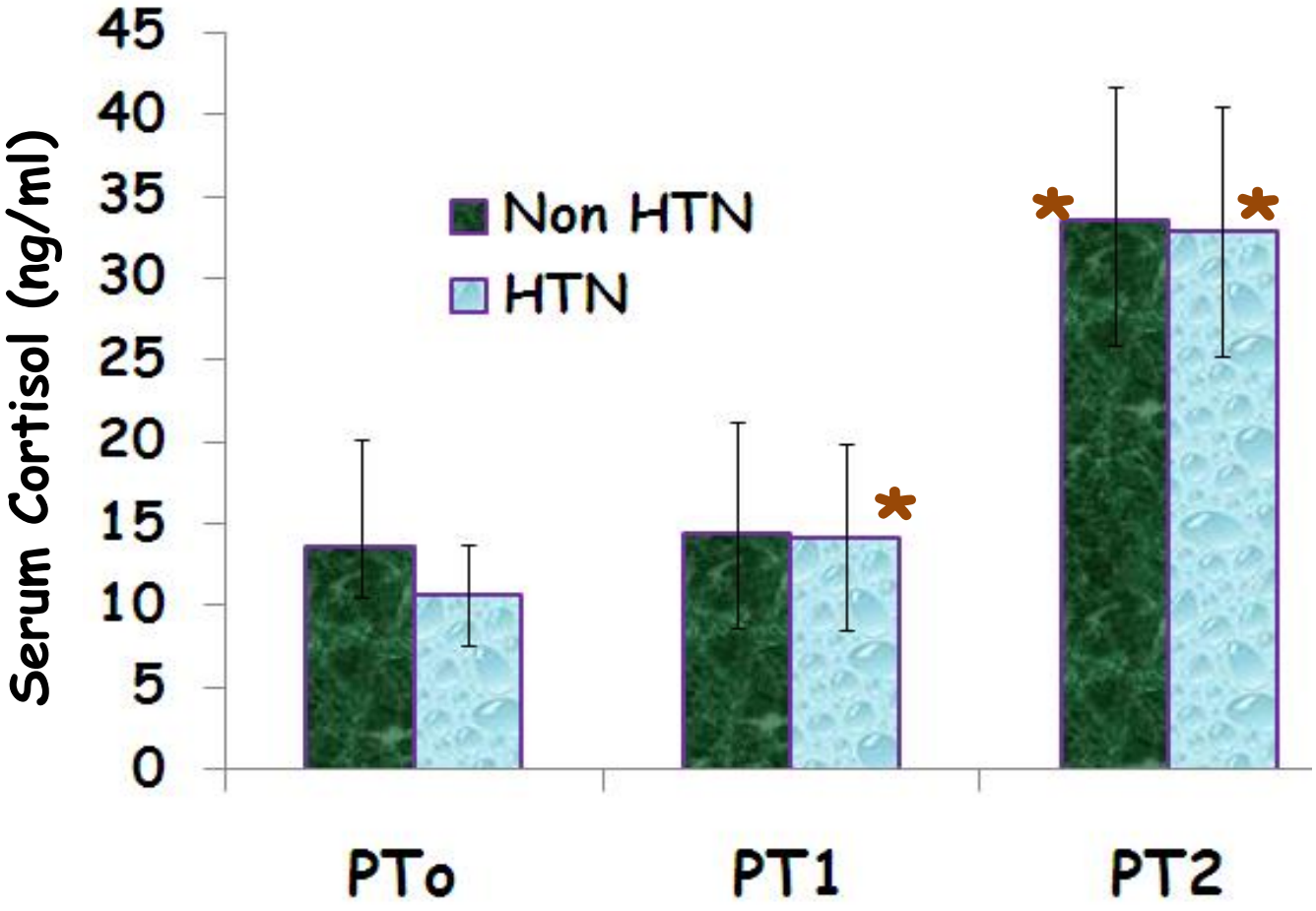


Figure: Perioperative serum cortisol status of hypertensive and normotensive study subjects

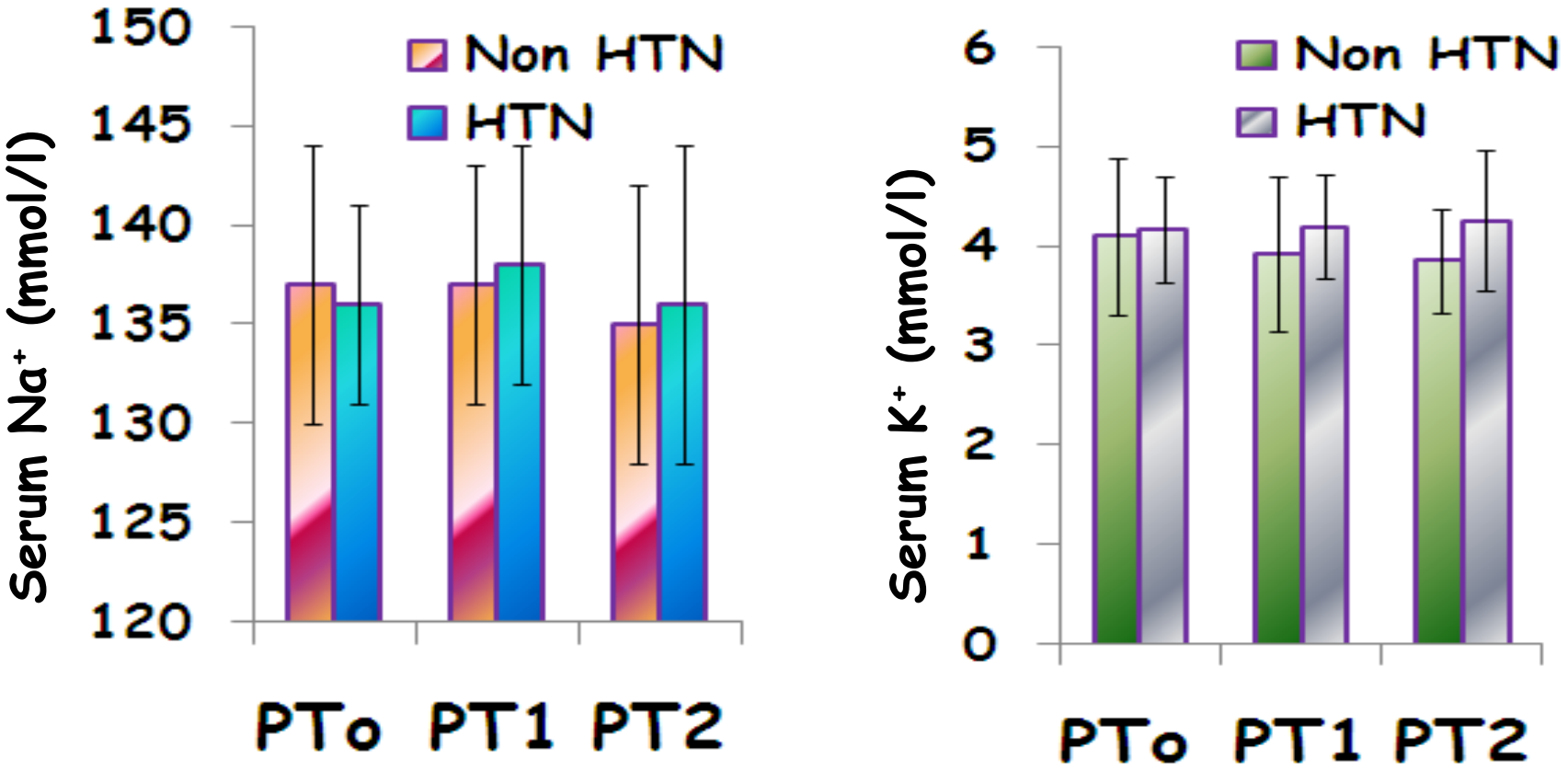


Figure: Perioperative serum electrolytes status of hypertensive and normotensive study subjects

The data lead to following conclusions

1. Lower abdominal surgery under general anesthesia in well controlled type 2 diabetic subjects is accompanied by a hyperglycemic response which results from rise of insulin antagonists like cortisol rather than fall of insulin secretion.

The data lead to following conclusions

2. Insulin treatment alone is more effective than insulin-OHA combination to control blood glucose in type 2 diabetic subjects undergoing surgery under general anesthesia; but the two treatment modalities lead to similar cortisol response.

3. Coexisting hypertension is associated with insulin hyposecretion leading to hyperglycemia in type 2 diabetic patients undergoing surgery under general anesthesia.

RECOMMENDATIONS

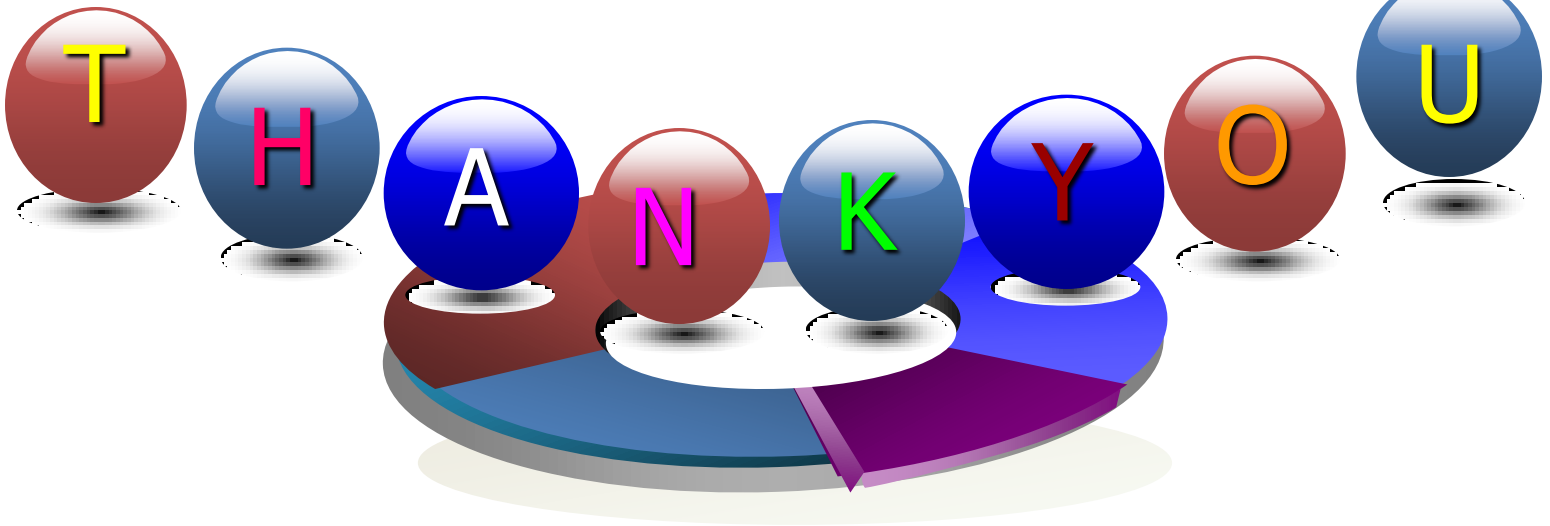
1. Insulin rather than insulin-OHA may be a good choice of treatment for preoperative glycemic control.

2. Special attention should be given regarding perioperative glycemic control in type 2 diabetic coexisting hypertensive patients.

RECOMMENDATIONS

3. Other stress hormones like glucagon, catecholamines, growth hormone and heat shock proteins may be measured for better quantification of the surgical stress.

4.To reduce the stress response- premedication and other anesthetic drugs, by increasing the dose of same anesthetic agents or anesthetic procedure may be applied for better management of type 2 diabetic subjects.


THANKYOU