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Research Article

Interrelationship of BMI and steroids on glycaemic levels in patient on chemotherapy

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ABSTRACT

Background: This study was conducted to determine the interaction and interrelationship of BMI and steroids on blood glucose levels.
Methods: To ascertain the interaction we had selected 383 cancer patients on chemotherapy. Inclusion criteria were Age : 12years - 70 years, FBS Between 100-126mg/dl, PLBS up to 140mg/dl, other routine parameters are checked like, Serum Creatinine, Microalbuminuria, HbA1c, Lipids Profile (Total cholesterol, Triglycerides, LDL, VLDL, HDL), Retinal examination, Chest X-ray , ECG. Patients having Hypertension, Coronary artery disease, CVD or acute and chronic complication of diabetes were excluded from the study.
Results: During the study we have seen that patients who were pre-diabetics along with higher BMI were prone to develop diabetes which could have been precipitated due to steroids. Patients with BMI of 25 and 30 should be viewed as medically significant and worthy of therapeutic intervention, especially in the presence of risk factors that are influenced by adiposity, such as hypertension, hyperglycemia, insulin resistance, dyslipemia, cancer.
Conclusions: The present study was done to highlight strict glycaemic control, (FBS <110 &PLBS <140-160 mg/dL). Patient on steroids during the chemotherapy with all these predisposing factors are vulnerable to develop Diabetes. This study is very significant as it outlines the necessity of awareness and precautions to be observed when dealing with patients with raised BMI without diabetes mellitus who are also likely to go in to hyperglycaemic and in extreme cases even ketoacidosis. Patients with high BMI and Prediabetes are prone to develop diabetes. Patient on these chemotherapy drugs like L- Asparginase, Streptozocin and Cytokine interferon – alpha are associated with drug induced insulin dependent diabetes mellitus.

Keywords: Hyperglycemia, Steroids, Glycaemic, BMI, Diabetes, Prediabetes

INTRODUCTION

Glucocorticosteroids (steroids) have profound effects on glucose metabolism, particularly on postprandial hyperglycemia. Patients with cancer often receive steroids as a component of their chemotherapy, and also as a measure to treat or prevent nausea, or as an adjuvant therapy.[1]

Instances of hyperglycemia during chemotherapy are known. Incidents, implications and literature on this subject are not easily available in India. Hence this study was conducted to make chemotherapists in India aware of the incidence and measure the blood sugar level before, during and after chemotherapy in diabetes and more so in un-established cases of diabetes as revealed in this study. Occasionally an unknown diabetes mellitus case can even develop severe complications like DKA.

During the study we have seen that pre-diabetic and persons with high BMI are prone to develop diabetes which could have been precipitated by steroids.[2,3]

METHODS

383 cases undergoing chemotherapy in BIACI& RC were selected randomly and studied. Their pre, concurrent and post-chemo blood sugar levels were recorded at 2nd, 3rd, 7th and 14th day.

Criteria

- Age : 12years - 70 years
- Sex
- FBS
- PLBS
- HBA1C
- Serum Creatinine
- Microalbuminuria
- Lipids Profile (Total cholesterol, Triglycerides, LDL, VLDL, HDL)
- Retinal examination
- Chest X-ray
- ECG

Patients having Hypertension, Coronary artery disease, CVD or acute and chronic complication of diabetes were excluded from the study.

RESULTS

Among the 383 patients studied, 291 (75.97%) cases remained at normal glycemic levels throughout chemotherapy and 92 (24.02%) developed a derangement of their blood sugar levels (Figure 1).

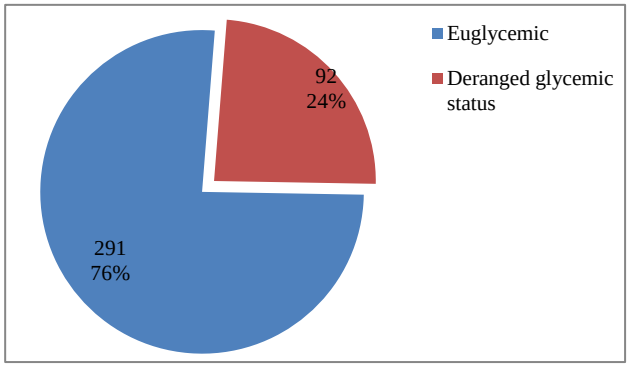

Figure 1: Pie chart shows 76% of euglycemic patient (n=291) and 24% of derranged glycaemic status (n-92).

Out of 92 patients, average BMI was (Figure 2).

- 30 patients with average BMI of 27.45 +/- 2,
- 48 patients with average BMI of 34.95 +/- 3,
- 14 patients with average BMI of 42.50 +/- 2.

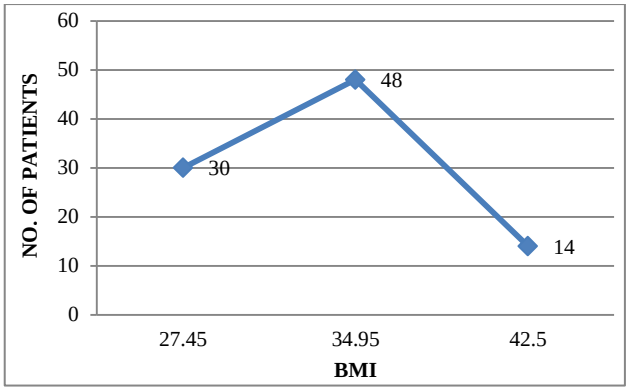

Figure 2: BMI status of patients.

68 cases (17.75%) reverted to normal glycemic status & 24 patients (6.26%) developed diabetes. Out of these 24, 15 cases (7.5%) developed diabetes and 4 cases (2%) developed acute complication like Diabetic ketosis. These patients have BMI more than 32+/- 5 (Figure 3).

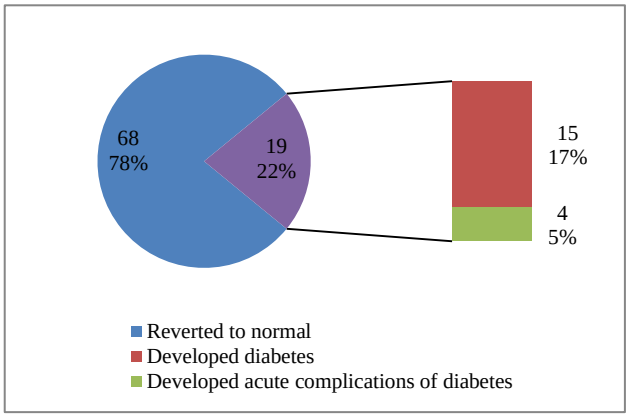

Figure 3: Pie Diagram shows 78% patients were reverted to normal (n=68), of the 22% patients who developed diabetes (n=19), 5% developed acute complication like DKA.

Only one case having normal BMI went in to complications and developed DKA in our study. The patient was a case of acute lymphocytic leukemia, which was given L-Asparginase and High dose steroid. The majority of patients who developed diabetes had BMI which was higher than normal and had various maladies like Carcinoma Breast, NHL, and Multiple Myeloma for treatment with chemotherapy.

DISCUSSION

After going through all the references which were predominantly from western literature, many a times managing hyperglycemias is complicated. These patients may require higher doses of insulin to get blood sugar under control. Especially, patients who require large doses of steroids like multiple myeloma, acute lymphocytic leukemia, Non-Hodgkin's lymphoma, CNS

lymphoma. In these cases the insulin requirement may vary from 100- 150 units of insulin per day.[3]

It has been shown that patients on L - Asparginase, Streptozocin and Cytokine interferon - alpha[4-6] are associated with drug induced insulin dependent diabetes mellitus.

The possible mechanism which was attributed to hyperglycaemia and DKA and HONK were as follows:

1. Steroid induced diabetic ketoacidosis
2. Chemotherapy induced insulin dependent diabetes mellitus leading to diabetic ketoacidosis
3. Steroid induced glucose intolerance superadded to ketoacidosis (probability of early starvation may lead to it).

As all of us know that steroid do cause diabetes and certain chemotherapeutic agents also induce diabetes which could be temporary.

We have observed and found there is also an important role of high BMI in patients who are receiving chemotherapy. Hence, the idea of highlighting the importance (of patients with high BMI) developing diabetes; particularly under these conditions.[7,8]

Obesity is a state of excess adipose tissue mass. The most widely used method to gauge obesity is the body mass index (BMI), which is equal to weight/height^2 (in kg/m^2). Other approaches to quantifying obesity include anthropometry (skin-fold thickness), densitometry (underwater weighing), CT or MRI, and electrical impedance.

BMI

1. <18.5 → Underweight
2. 18.5 -24.9 → Normal
3. 25 – 29.9 → Overweight
4. 4)30 -39.9 → Obesity
5. > 40 → Morbid obesity

A BMI between 25 and 30 should be viewed as medically significant and worthy of therapeutic intervention, especially in the presence of risk factors that are influenced by adiposity, such as hypertension and glucose intolerance, insulin resistance, dyslipedmia & cancer.[8-10]

However the present study was done to highlight the importance of maintaining strict glycemic control, (Target glucose levels are < 110 mg/dL pre-meal and < 140–160 mg/dL 2 hours postprandial) regular follow up of cases who have developed drug induced diabetes and maintaining strict glycemic control which prevent any further target organ damage due to uncontrolled glycemic status.[8-10]

We are continuing our study to establish the interrelation of diabetes and cancer chemotherapy agent.

CONCLUSIONS

Many Physicians and Endocrinologists do know that obese persons (high BMI) are prone to develop diabetes during the course of chemotherapy (as shown in the study), Hypertension, CAD, dyslipedmia, etc.

This study is very significant as it outlines the necessity of awareness and precautions to be observed when dealing with patients with raised BMI without diabetes mellitus who are also likely to go in to hyperglycaemic and in extreme cases even ketoacidosis. They need urgent identification and management otherwise they are likely to go into complications. Patients without diabetes mellitus can become diabetic and may require regular management like any other diabetic patient. Patients with high BMI and Prediabetes are prone to develop diabetes. We have given special attention to such patients as these patients can be prevented from developing diabetes.

A BMI between 25 and 30 should be viewed as medically significant and worthy of therapeutic intervention, especially in the presence of risk factors that are influenced by adiposity, such as hypertension, hyperglycemia, insulin resistance, dyslipemia, cancer. The present study was done to highlight strict glycemic control, (FBS< 110 & PLBS< 140-160 mg/dL).

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