

Protein and fat effects on post - prandial glucose responses among Egyptian children and adolescents with Type 1 diabetes mellitus

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Background

- Currently, carbohydrates are considered the predominant macronutrient affecting postprandial glucose control and the primary determinant for calculating mealtime insulin doses in type 1 diabetes.
- In the light of emerging recent researches and the use of continuous glucose monitoring it was shown that other nutritional properties of food, including fat, protein, and glycemic index (GI), can significantly affect postprandial glucose excursions.
- These findings highlight the need for alternative mealtime insulin dosing algorithms and have important implications for nutrition education and counseling in patients with diabetes.

Objective and hypothesis

The current study was conducted to determine the effect of high protein and fat content on postprandial glycemic response in Egyptian children and adolescents with type 1 diabetes.

Patients and method

- Each patient was served each of three breakfast meals designed by dietitian on three separate days; the standard meal, high protein meal 31.25 gm (with extra 125 kcal protein) and high fat meal (with extra 125 kcal fat).
- Blood glucose was measured preprandial and every half an hour for 5 hours after each kind of meals using calibrated glucometer.
- The preprandial blood glucose values before the three test meals were comparable which allowed the testing of the effect.
- The bolus insulin dose for test meal for each participant was calculated according to the carbohydrate content using each participant individualized insulin to carbohydrate ratio.
- As all patients were using regular insulin as a bolus, the dose was given half an hour before the test meal at 8 a.m immediately after the first reading. Injection was away from areas of lipodystrophy.

Patients characteristics

- The current study included 51 children and adolescents with type 1 diabetes following up at Diabetes, Endocrine and Metabolism Pediatric Unit (DEMPU), at Children's hospital, Cairo University.
- The age of the patients ranged from 6 to 18 years (11.24 ±2.413) with a mean diabetes duration of 4.76.

Demographic data	No (%)
Sex : Male	28(54.9%)
Female	23 (45.1%)
Age (Years)	11.24±2.413
Duration of diabetes (Years)	4.76± 2.680
BMI (SDS)	-0.096±0.91
HbA1c %	8.35±0.996
Insulin to carbohydrate ratio (Units/gm)	1: 14.58±6.075
Types of insulin used :	
- Bolus (Regular)	51 (100%)
- Basal NPH	44 (86.3%)
Glargine	7 (13.7%)
Total daily insulin dose (unit/Kg/ day)	1.076±0.39

Results

- After the standard meal, the blood glucose started to rise gradually till reached its peak at 3 hours postprandial then decreased gradually till the end of 5 hours but didn't reach the preprandial level.
- After high protein meal (31.25 gm protein) ; plasma glucose levels gradually rose post prandial till reached peak glucose excursion at 4.5hrs, then started to decline at 5 hours but didn't reach the preprandial level.
- However after high fat meal, the blood glucose levels rose to reach a peak level at 2 hours then started to decline gradually to reach the preprandial level at 5 hours.

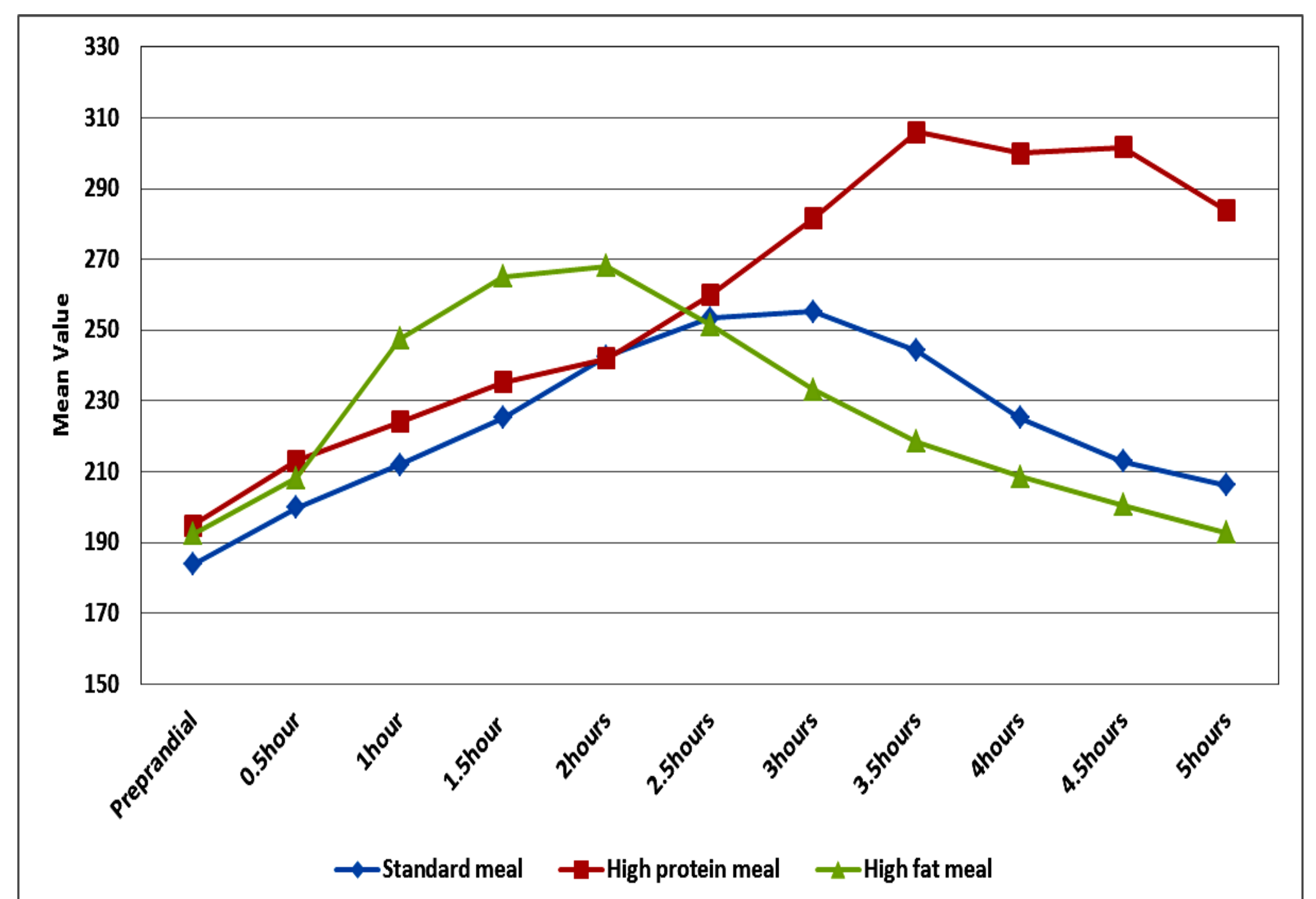


Figure (1): Comparison of BG reading pre & postprandial following the three test meals

Comparison of BG readings pre & postprandial following the three test meals (standard, high protein, high fat) showed that:

- No statistically significant difference could be detected in the **preprandial plasma glucose values** and the values measured at **2.5 hours** (p- values were 0.053 and 0.39 respectively).
- **At 30 min**, the values were higher after the high protein diet followed by the high fat then the standard meal with (p value= 0.022).
- **At 1, 1.5 and 2 hours**, the measured glucose levels were significantly higher after consuming the high fat meals than after the high protein meals followed by the standard meal with (p values = 0.000)
- **At 3, 3.5, 4, 4.5 and 5 hours**, the plasma glucose levels were significantly highest after consumption of the high protein diet followed by the standard meals then the high fat diet (p values = 0.000)

Conclusion

Protein and fat contents of meals affect the timing and values of the peak excursion of blood glucose as well as the duration of postprandial hyperglycemia. Therefore fat protein unit should be taken in consideration in calculating the bolus insulin dose and the anticipation of postprandial glucose response.

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