Carbohydrate counting-1: South Asian framework
Lovely Gupta,1 Deepak Khandelwal,2 Sanjay Kalra3

Abstract
Carbohydrate counting or "carb counting" is a meal planning technique for persons with diabetes for managing blood glucose levels by tracking the grams of carbohydrate consumed at meals. It has shown to improve glycaemic control and glycaemic variability and decreases risk of hypoglycaemia in persons with diabetes especially on insulins. It needs basic education of the patient regarding meal plan, assessment of carbohydrate content of various foods and also exchange lists. It also gives flexibility of food choice, helps to identify patterns in blood glucose levels and adjustment of pre meals short acting insulins as related to food intake. In this short review we have summarised basic principles of carbohydrate counting, its application in clinical practice and also exchange lists primarily pertaining to South Asian population.

Keywords: Carbohydrate counting, Exchange list, Diabetes, Glucose monitoring, Insulin.

Introduction
Carbohydrate counting or "carb counting," is a meal planning technique for managing blood glucose levels by tracking the grams of carbohydrate consumed at meals and snacks. It focuses on carbohydrate as the primary nutrient affecting postprandial glycaemic response. Foods that contain higher carbohydrates have the greatest effect on post-prandial blood glucose levels as compared to foods that contain primarily protein or fat.1 This concept has been used since 1960s and was even used as meal planning approach in Diabetes Control and Complications Trial (DCCT) for intensive glycaemic management.2

Concept of Exchange List
Exchange lists are foods listed together under different food groups because each serving of a food has about the same amount of carbohydrate, protein, fat, and calories as the other foods on that list. It helps patients to learn carbohydrate counting.

Once the carbohydrate allowance per day is decided, different carbohydrate foods can be 'exchanged' with one another to provide flexibility and variety in the standardized calorie-level meal pattern in the individual diet plan.3 One carbohydrate exchange (approximately 20 grams) contributes to approximately 80 Kcal which is considered as one serving of carbohydrate (regardless of the source) in carbohydrate counting. Exchange list of various food items pertaining to South Asian population has been shown in Table-1.

Clinical Significance of Carb Counting
The allotment of carbohydrates ensures sufficient supply of exogenous carbohydrate in each meal throughout the day. It is a desirable method for individuals who wish to have a more flexible eating regimen, an inconsistent carbohydrate intake, have been unsuccessful with past diet plans and have willingness or ability to learn a new approach.2

Usually the amount of carbohydrate for each meal and snack is adjusted based on the pre-meal blood glucose reading. Depending on the reading, more or less carbohydrate may be eaten and insulin dose is adjusted. Also on occasional days when patient is willing to eat a much larger meal than usual, carbohydrate counting determines the extra insulin units required.

Requisites of Carb Counting

A. Meal plan
The first step is to get a meal plan. A meal plan is a guide that signifies the amount of calories, carbohydrates, proteins and fats to be consumed per day at each meal-time and snack-time. Such kind of information can be presented in the tabular form with the help of professionals/dieticians for better understanding for individuals.

B. Assessment of Carbohydrates
The next step involves learning which foods contain carbohydrate. Considering the foods groups, except fats, all the food groups contain certain amount of carbohydrates, with sugars, cereals and pulses containing maximum amount. It is mandatory to
consider following points:

- Know which foods contain carbohydrates
- Learn to estimate the amount of carbohydrate in each food item
- Add the amount of carbohydrate from each food item at one meal.

C. Measuring Tools

This step necessitates accurate carb counting with precise calculation of the portion sizes of foods. Measuring cups or common household measures can even be used by a lay man. Some of the common challenges faced during
Clinical Evidence

Day-to-day consistency in the amount of carbohydrate eaten at meals and snacks is reported not only to improve glycaemic control but also glycaemic variability and decreases both hypoglycaemic or hyperglycaemic episodes, in persons on either medical nutrition treatment (MNT) alone, oral glucose lowering medications, or fixed insulin regimens.\(^4,5\) It enables patients to adjust their mealtime insulin doses (in patients on either pre-meal short acting insulins or those on insulin pump) to match actual carbohydrate intake, known as the insulin-to-carbohydrate ratios.\(^6,7\) It helps in evaluating the impact of carbohydrate intake and food choices on blood glucose and setting nutrition goals.\(^2\) All such factors in fact contribute to 'primary self-care activities'.\(^8\)

Carb counting has shown to significantly improve glycaemic level even in patients with end stage renal disease.\(^1\) In spite of better glycaemic control, it does not cause increase in weight or in insulin requirements in children and adolescents with type 1 diabetes.\(^9\) Moreover it may result in improvement in certain lipid parameters like increased HDL levels and decreased cardiovascular disease risk.

Conclusion

Carb counting gives flexibility of food choice and helps to identify patterns in blood glucose levels as related to food intake. It helps individuals to take action based on blood glucose patterns. Furthermore, it helps assess carbohydrate/insulin ratio especially useful for persons on multiple daily insulin injections to understand the relationship between food eaten and insulin injected and to adjust pre-meal insulin. All primary care providers should make an attempt to teach patients basic principles of carb counting and empower patients in self-management of diabetes.

References