

Review

Adherence to Diet in Youth with Type 1 Diabetes

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ABSTRACT

This article reviewed current findings on dietary adherence in youth with type 1 diabetes mellitus (T1DM), discussed factors predicting dietary adherence, and presented directions for future research. The included studies involved youth with T1DM, presented dietary adherence data specifically, and/or described usual dietary patterns in youth. Articles that explored predictors had to focus exclusively on dietary adherence. The final sample was 23 articles. Adherence articles were organized into two categories: eating behaviors and macronutrients and dietary recommendations. Rates of adherence to eating behaviors ranged from 21% to 95%. Studies examining macronutrients and dietary recommendations revealed higher than recommended intakes of fat and saturated fat and lower than recommended intakes of fruits, vegetables, and whole grains. Six studies investigated factors predicting dietary adherence. These studies revealed associations with child behavior problems and knowledge deficits. The available literature identified many youth with T1DM struggling with adherence and not meeting dietary guidelines for their disease. Future research should examine diet in youth exclusively on intensive insulin regimens, community-based predictors of diet, and the influence of mood on dietary adherence. *J Am Diet Assoc.* 2011;111:550-555.

Type 1 diabetes mellitus (T1DM), the most common metabolic disorder of childhood, is characterized by a decline in and later an absence of insulin production by the pancreas that leads to chronic insulin deficiency (1,2). Without insulin, youth with T1DM are unable to metabolize glucose, which leads to a rise in glucose levels (1,2). Treatment of T1DM involves replacement of insulin in an effort to achieve blood glucose levels that approximate the normal range (2). This is important because near-normal blood glucose levels can reduce the risk for

diabetes-related micro- and macrovascular complications (2-4). Medical nutrition therapy (MNT) is also an important component of modern diabetes treatment. MNT describes a process of individual counseling to teach patients and families about healthful eating practices to maintain near-normal blood glucose levels and to prevent or treat comorbid medical conditions such as obesity, dyslipidemia, and hypertension (2). Thus MNT, with its focus on dietary management, provides an important foundation for diabetes self-care (2).

DIETARY MANAGEMENT IN T1DM

Central to dietary management in T1DM is monitoring carbohydrate intake and balancing carbohydrate intake and insulin levels (5). Close adherence to carbohydrate intake recommendations is associated with better glycemic control (6,7). Moreover, a mismatch between carbohydrate intake and insulin can result in immediate and long-term complications from hypo- and hyperglycemia (2). It is also important for patients to consume a healthy diet. Although there are no disease-specific nutrition guidelines for youth with T1DM, youth are at risk for dyslipidemia and cardiovascular disease and several epidemiology studies have demonstrated that many youth with T1DM already had abnormal lipid levels and other risks factors for cardiovascular disease (8-10). Thus, it is recommended that youth with T1DM eat a healthful diet according to the 2005 Dietary Guidelines for Americans (11). These guidelines call for a diet that incorporates fruits and vegetables, whole-grain foods, and foods low in fat (Figure 1). The American Diabetes Association further recommends that all youth with T1DM should attempt to consume no more than 7% of energy from saturated fat (5). Within the literature, several studies have examined adherence to dietary recommendations in youth with T1DM, but no review of these studies has previously been reported. In the absence of a review to synthesize and evaluate the available research, it is difficult to appreciate the scope of this literature and to identify directions for future research. Thus, the purpose of this article is to complete a narrative review of the current literature examining dietary adherence in youth with T1DM. As a secondary goal, this article presents research identifying factors predicting dietary adherence for youth with T1DM.

METHODS

Articles in this review were identified through an electronic database search. The inclusion criteria were: studies that recruited a sample of youth with T1DM (youth including patients aged 0 to 22 years), studies that reported usual dietary intake and/or adherence to diet therapy, and studies written in English. Both observation and intervention studies were eligible for review. Similarly,

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Food group/macronutrient	Recommendation
Fruits/vegetables	2 c fruit and 2½ c vegetables per day for a reference diet of 2,000 kcal (higher or lower intake required depending on energy levels). Children should consume a variety of fruits and vegetables. Children should emphasize intake from five vegetable subgroups (dark green, orange, legumes, starchy vegetables, other vegetables).
Dairy	Children ages 2-8 y should drink 2 c fat-free or low-fat milk or equivalent milk products per day. Children aged 9 y and older should drink 3 c/day.
Whole grains	At least half of grains eaten should be whole grains.
Meat and beans	Children should eat lean or low-fat meat, chicken, turkey, and fish. Other sources of protein include nuts, seeds, beans, and peas.
Carbohydrates	To eat sufficient amounts of fiber, try to eat whole fruits, vegetables, and whole grains. Try to avoid excessive amounts of energy from added sugars.
Fat	Limit intake of fats and oil high in saturated and/or <i>trans</i> fatty acids. Try to consume fats that come from sources of polysaturated and monosaturated fatty acids. Young children (age 2-3 y) should strive for a diet that has 30%-35% of energy from fat, while older children (ages 4-18 y) should consume 25%-30% of energy from fat.

Figure 1. Dietary recommendations for youth according to the Dietary Guidelines for Americans, 2005 (11).

there was no restriction on studies that recruited newly diagnosed youth with T1DM. Studies were excluded if they did not report usual dietary intake, if they did not provide data specific to dietary adherence, and/or if they recruited a mixed sample of youth and adults with T1DM. The electronic search of studies was conducted using PubMed. The search terms used for this review included *type 1 diabetes mellitus; youth (0-22 years); diet; dietary adherence; nutrition; dietary intake; and complications*. Seventy records were initially identified as potentially relevant for this review. An additional screening of the titles and abstracts was completed by the author leading to the exclusion of 47 records. Thus, the final sample for this review included 23 articles (Figure 2). Four articles focused exclusively on adherence to eating behaviors in youth with T1DM, whereas 13 studies reported on adherence to recommendations for macronutrient intake and dietary quality. Six articles examined predictors of dietary adherence in youth with T1DM (Figure 3). The studies used different strategies to measure adherence, including standardized food records (8,12-16), 24-hour recall (17-22), weighed diet diaries (6,21), food frequency questionnaires (23), and standardized adherence measures (7). Eleven studies sampled youth from a wide age range (eg, ages 2 to 19 years) (8,12,15,17,19,21,23,24,26,29,30), while the remaining studies targeted youth from specific age groups (eg, adolescents or young children) (6,7,13,14,16,18,20,22,25,27,28). In the discussion of results in this review, the specific age group is named, if applicable.

RESULTS

Eating Behaviors

Studies focused on adherence to eating behaviors examined how well youth balanced their intake of carbohydrates with their blood glucose and insulin levels. In addition, two older studies examined how well youth followed a prescribed schedule for meals and snacks. In two studies that measured adherence using a standardized interview conducted with youth and parents, researchers

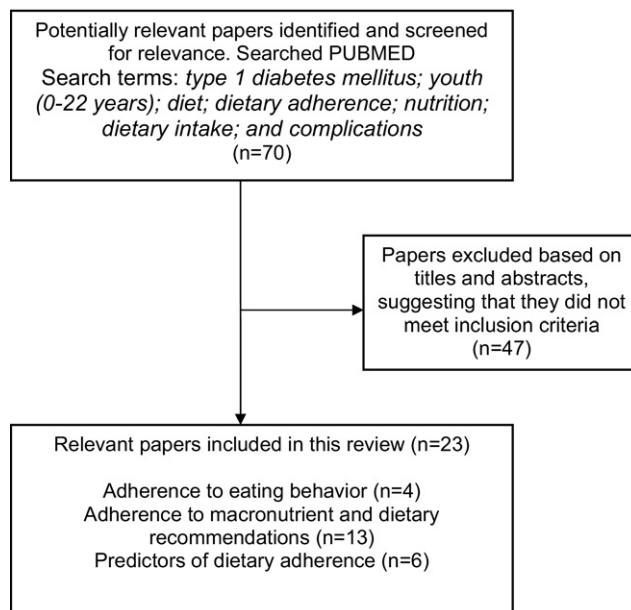


Figure 2. Flow chart for search for articles discussing dietary adherence in youth with type 1 diabetes mellitus and factors predicting dietary adherence in this group.

found adherence rates ranging from 21% to 66% with higher values suggesting better adherence (7,24). In the first study (24), youth followed a fixed carbohydrate regimen and their adherence rates ranged from 21% to 56% for their regimen. In contrast, Mehta and colleagues (7) interviewed youth who were primarily following a flexible insulin (and carbohydrate) regimen and their adherence rate was 66% for their regimen.

Overby and colleagues (12) measured dietary adherence according to the number of meals or snacks consumed by youth in a week. Using standardized food records, the results identified only 5% of youth skipping breakfast and dinner more than five times per week,

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