Eating Behaviors 21 (2016) 172–178

Contents lists available at ScienceDirect

Eating Behaviors

Description of an intensive nutrition therapy in hospitalized adolescents with anorexia nervosa

Cecilia Pettersson [a,*], Bojan Tubic [b], Anna Svedlund [b], Per Magnusson [c], Lars Ellegård [d], Diana Swolin-Eide [b], Heléne Bertéus Forslund [d]

[a] Anorexia-Bulimia Unit, The Queen Silvia Children's Hospital, Sahlgrenska University Hospital, Göteborg, Sweden
[b] Department of Pediatrics, Institute of Clinical Sciences, The Queen Silvia Children's Hospital, Sahlgrenska Academy, Gothenburg University, Göteborg, Sweden
[c] Department of Clinical Chemistry and Department of Clinical and Experimental Medicine, Linköping University, Linkoping, Sweden
[d] Department of Internal Medicine and Clinical Nutrition, Institute of Medicine, Sahlgrenska Academy, Gothenburg University, Göteborg, Sweden

ARTICLE INFO

Article history:
Received 28 July 2015
Received in revised form 26 February 2016
Accepted 1 March 2016
Available online 4 March 2016

Keywords:
Anorexia nervosa
Nutrition therapy
Energy intake
Energy balance
Body composition
Food related anxiety

ABSTRACT

Objective: To describe an intensive nutrition therapy for hospitalized adolescents and young adults with anorexia nervosa (AN) in terms of body weight, body composition, energy balance and food related anxiety.
Method: Twenty-six young females, 16–24 years of age, with AN were invited to participate at admission to a specialized eating disorder unit in Göteborg, Sweden. Intensive nutrition therapy comprised 12 weeks on a structured meal plan. Six meals were served daily, in combination with high-energy liquid nutritional supplements from start. Energy and nutrient intakes, energy expenditure, body composition and food related anxiety were measured during the study. A 3-month follow-up of body weight and food related anxiety was conducted.
Results: Twenty-one patients participated. The total daily energy intake was, during the first week of treatment, (mean ± SD) 3264 ± 196 kcal (74 kcal/kg), and decreased gradually during treatment to 2622 ± 331 kcal (49 kcal/kg). Total daily energy expenditure was initially 1568 ± 149 kcal and increased gradually to 2034 ± 194 kcal. Patients gained on average 9.8 ± 2.1 kg and body mass index increased from 15.5 ± 0.9 to 19.0 ± 0.9 kg/m^2. Body fat increased from 13 ± 6% to 26 ± 6%. Fat free mass remained unchanged, but skeletal muscle mass increased from 16.7 ± 2.0 to 17.6 ± 2.4 kg, $p = 0.009$. Patients' food related anxiety decreased significantly during treatment and was still unchanged 3 months later.
Conclusion: The presented intensive nutrition therapy with initially high energy and nutrient intakes produced substantial weight gain, increased fat and muscle mass and decreased food related anxiety in AN patients, without any clinical side effects.

1. Introduction

Anorexia nervosa (AN) is one of the most severe psychiatric disorders found in adolescence. In most cases, teenagers will gradually recover from the illness, although AN is known for its high relapse rates and severe complications (Wentz, Gillberg, Anckarsater, et al., 2009). AN is associated with numerous medical complications, of which most are reversible with weight restoration via nutritional rehabilitation. The earlier AN patients are diagnosed and treated, the better are the long-term chances of full recovery (Brown & Mehler, 2015). Guidelines for the treatment of AN (American Psychiatric Association, 2006; NICE, 2004; Klump, Bulik, Kaye, et al., 2009) emphasize the importance of nutrition intervention to restore weight, and to help patients normalize their eating habits. However, evidence-based guidelines on the best and safest method to achieve normal body weight during inpatient treatment are currently not available. In addition, reviews of refeeding studies are inconclusive regarding the most effective quantity or delivery of energy intake (Hart, Franklin, Russell, & Abraham, 2013; Rocks, Pelly, & Wilkinson, 2014).

Current nutrition recommendations for hospitalized AN patients are conservative, starting with low calories and advancing slowly to increase the amount of calories to avoid refeeding syndrome (Hofer, Pozzi, & Joray, 2014; Mehler, Winkelman, Andersen, & Gaudiani, 2010; Ornstein, Golden, Jacobson, & Shenker, 2003). Guidelines recommend an initial refeeding rate of between 10 and 40 kcal/kg per day, or between 20 and 80% of total daily requirements, with slow caloric increases (American Psychiatric Association, 2006; NICE, 2004). Daily or weekly caloric increases are a challenge for anorectic adolescents. Patients struggle to maintain control over their food choices and they also find it difficult to make basic menu selections to meet their caloric goals (Mehler, Winkelman, Andersen, & Gaudiani, 2010). A handful of studies have begun to challenge the "start low, advance slow" approach

* Corresponding author at: Anorexia-Bulimia Unit, The Queen Silvia Children's Hospital, SE-416 85 Göteborg, Sweden.
E-mail address: cecilia.pettersson@vgregion.se (C. Pettersson).

http://dx.doi.org/10.1016/j.eatbeh.2016.03.014
1471-0153/

to initial weight restoration and it has been reported that a higher caloric intake at admission is associated with faster weight gain and reduced length of hospital stay, but not with an increased proportion of refeeding syndrome (Garber, Mauldin, Michihata, & Buckelew, 2013; Garber, Michihata, Hetnal, & Shafer, 2012; Golden, Keane-Miller, Sainani, & Kapphahn, 2013; O'Connor & Nicholls, 2013; Whitelaw, Gilbertson, Lam, & Sawyer, 2010). Garber and colleagues (Garber, Michihata, Hetnal, & Shafer, 2012; Garber, Mauldin, Michihata, & Buckelew, 2013) showed that a higher caloric intake at admission and during treatment was associated with faster weight gain in addition to a shorter hospital stay. Adolescents were, in that study, served 1764 kcal/day from start and the energy intake increased every day during the first two weeks of treatment. Golden, Keane-Miller, Sainani, and Kapphahn (2013) evaluated retrospectively initially prescribed calories for 310 adolescents with AN. Patients who were prescribed a high-calorie diet in that study were initially served 1557 kcal/day, which increased by 200 kcal every other day, and the conclusion was that a higher calorie intake at admission was associated with shorter hospital stay and no increased rates of refeeding symptoms. Whitelaw, Gilbertson, Lam, and Sawyer (2010) described a hospital treatment with a prescribed initial energy of 1900 or 2200 kcal/day with increasing amounts during treatment, and suggested a more aggressive approach to nutritional rehabilitation in hospitalized adolescents with AN. A limitation for that study was that the energy and nutrient intakes were calculated from what were prescribed and not from what actually were consumed. A newly developed NRP (Nutrition Rehabilitation Protocol), with an initial energy intake of 1500 kcal/day that gradually increases during the first week, showed no clinical signs of refeeding syndrome but a steady weight gain of 0.24 kg/day and on average 1.7 kg/week during the first 14 days (Leclerc, Turrini, Sherwood, & Katzman, 2013). In a rapid refeeding protocol, adolescent AN patients (Madden, Miskovic-Wheatley, Clarke, Touyz, Hay, & Kohn, 2015) started on 2400 kcal/day from continuous nasogastric feeds followed by an energy intake of 2500–2800 kcal/day from a mix of food and nasogastric feeds. From day 15, patients were served only food from a meal plan on 2400–3000 kcal/day. All patients were commenced on oral phosphate supplementation with 1000 mg phosphate/day. This refeeding protocol resulted in immediate weight gain and was tolerated with no indicators of refeeding syndrome.

Taken together, many studies have shown that a higher initial energy intake does not show clinical signs of refeeding syndrome. In these studies patients initially have been prescribed 1500–2400 kcal/day and energy intake was gradually increased up to 3400 kcal/day. However, there are currently no studies that demonstrate results and safety in a standardized, rapid refeeding program with non-selected menus where patients begin with high energy (>3000 kcal/day) and nutrient intakes which gradually descend to obtain energy balance and healthy body weight.

Surprisingly, there are few studies regarding food choice in individuals with AN (Schebendach, Mayer, Devlin, et al., 2011). Patients restrict their food consumption, which leads to decreased energy and nutrient intakes (van der Ster Wallin, Norring, Lennernas, & Holmgren, 1995). In addition, patients restrict their food choice, which affects the variety of the diet. Inpatient programs typically provide varied diets of sufficient energy content to promote the restoration of a healthy body weight. Nevertheless, the high relapse rate for AN patients suggests that many patients have difficulties maintaining a healthy diet after hospital discharge (Schebendach, Mayer, Devlin, et al., 2008; Schebendach, Mayer, Devlin, et al., 2012). There are few publications on food attitude and food related anxiety apart from the total fear of calories, fat and carbohydrates, which is assessed by 7 out of 40 of the questions in the Eating Attitudes Test (Garner & Garfinkel, 1979), a test commonly used in diagnostics and treatment of patients with eating disorders.

Energy expenditure is an important factor when treating AN. High intensity training is common among AN patients and it has been shown that physical activity is underestimated by subjective assessment when compared with objective measurement (Alberti, Galvani, El Ghoch, et al., 2013). Thus, validated monitoring advises are needed to assess the physical activity in AN patients.

This aim of this study was to describe a 12-week intensive nutrition therapy for hospitalized AN adolescents and young adults in terms of energy balance, nutrient intake, body weight, body composition and food related anxiety.

2. Materials and method

2.1. Participants

Subjects were adolescents and young adults with severe AN referred to the Child and Adolescent Psychiatry department at the Queen Silvia Children's Hospital, Gothenburg, Sweden, for a scheduled 12-week in-patient treatment with a structured behavioral program aimed at normalising and improving eating behavior and restoring body weight. During the first day at the specialized eating disorder unit each patient received full information about the study and was asked to participate. Participation was offered to all female patients who met the inclusion criteria for the study. Inclusion criteria were 16–24 years of age, body mass index <17.5, and diagnoses of AN according to the DSM-IV, including low body weight, intense fear of gaining weight and disturbance in the way which one's body weight or shape is experienced (American Psychiatric Association, 2000). Exclusion criteria included diabetes mellitus and inflammatory bowel disease. All eligible subjects, and if under 18 years their parents, were approached for assent and written informed consent at the time of admission. This study was approved by the local research ethics committee at Gothenburg University.

Twenty-six patients met the eligibility criteria for inclusion during the study period. Two patients declined to participate since they did not plan to stay at the unit for 12 weeks. Thus, between January 2012 and July 2014, 24 female patients (92%) agreed to participate in the study. Three subjects did not complete the in-patient treatment, two because they did not want to go through the 12 week program and one because the diagnosis of AN was reconsidered. The final study group comprised 21 female patients mean age 19.9 ± 2.4 years. Baseline clinical characteristics are presented in Table 1.

2.2. Intensive nutrition therapy protocol

The energy and nutrient intakes were planned, served and supervised for all patients during 12 weeks. Six meals were served every day; breakfast, snack, lunch, snack, dinner, and night meal. The menu was planned by the dietitian and all patients were on approximately the same menu. Lunch and dinner were hot meals, with a great variety of different kinds of foods and dishes, cooked by the same chef at the

Table 1
Description of participants at baseline.

Variable[a]	AN patients before treatment (N = 21)
Age (years)	19.9 ± 2.4
Duration of illness (years)	3.9 ± 3.1
Amenorrhea (%)	16 (76%)
ANR/ANBP (ANR%)[b]	18/3 (86%)
Cigarette smokers	3 (14%)
Omnivores	16 (76%)
Lactovegetarians	3 (14%)
Demivegetarians	2 (9%)
Celiac disease	1 (5%)
Height (m)	1.69 ± 0.04
Weight (kg)	44.4 ± 3.7
BMI (kg/m^2)	15.5 ± 0.94
Iron deficiency (%)	7 (33%)
Anemia (%)	2 (9%)

[a] Data are presented as mean ± SD, or frequency (%).
[b] ANR, anorexia nervosa restricting type; ANBP, anorexia nervosa binge eating/purging type.