

Nutritional status and effect of seaweed chocolate on anemic adolescent girls

A. Thahira Banu^{a,*}, S. Uma Mageswari^b

^a Dept of Home Science, Gandhigram Rural University, Gandhigram, India

^b Dept of Food Service Management and Dietetics, Avinashilingam University, Coimbatore, India

Received 7 September 2014; received in revised form 5 December 2014; accepted 17 March 2015

Abstract

The study was carried out to study the nutritional status, develop a product incorporating seaweed and assess its impact on anemic adolescent girls. Five hundred adolescent girls in the age group of 15–18 years were selected from a women's college at Kilakarai, Tamil Nadu, India as the target group to find the prevalence of anemia. Among the 500 subjects 100 with a hemoglobin level of 7–9 g/dL (moderate anemia) were selected by purposive sampling technique for supplementation. Seaweed incorporated chocolate was formulated, standardized, tested for consumer acceptability and in vitro iron bioavailability and supplemented to the selected subjects. The result of the study indicates that seaweed chocolate developed obtained the highest score for overall acceptability, 56 mg of iron/100 g and 11.80 mg of bioavailable iron. The results were found to be promising as there was a significant increase in hemoglobin, TIBC, MCH, MCV, serum iron and serum ferritin levels in the selected subjects. Seaweeds are a less consumed natural resource but abundantly available in the coastal areas of India as they are rich source of nutrients and can be used as an effective therapeutic and nutrient adjunct.

© 2015 Beijing Academy of Food Sciences. Production and hosting by Elsevier B.V. All rights reserved.

Keywords: Adolescent; Iron deficiency; Anemia; Green seaweed; Bioavailability

1. Introduction

Globalization has led to healthy living consciousness in the most recent years. Simple diet changes have been proven to lower the incidence of non-communicable diseases worldwide. Eating trends of natural food sources have been augmented to bring health and vitality and one such natural resource is seaweeds. Seaweeds are a fascinating and diverse group of organisms which contains treasures for the benefits of human race. Exploiting natural food resources is an easy and quick solution to prevent the rising prevalence of lifestyle and nutritional disorders. Iron deficiency is one of the most prevalent nutritional deficiencies in the world and it affects 20–50% of world population [1]. According to statistics from World Health Organization, 60–70% of Indian adolescent girls are suffering from anemia [2].

* Corresponding author at: Dept of Home Science, Gandhigram Rural University, Gandhigram, India. Tel.: +91 9940917039.

E-mail addresses: thaaze@gmail.com (A. Thahira Banu), magikrish@redifmail.com (S. Uma Mageswari).

Peer review under responsibility of Beijing Academy of Food Sciences.

Possible ways to improve iron status may include food fortification, diet, anti-helminths treatment and supplementation [3]. Seaweeds are promising natural resources in terms of availability and nutrient density. The benefits of seaweeds are numerous and profound. Harvested in pure seawater, seaweeds can be considered as nature's most complete and balanced nutrient food source [4]. Seaweeds draw an extraordinary wealth of mineral elements from the sea that can account for up to 36% of its dry mass. The mineral macronutrients include sodium, calcium, magnesium, potassium, chlorine, sulfur and phosphorus; the micronutrients include iodine, iron, zinc, copper, selenium, molybdenum, fluoride, manganese, boron, nickel and cobalt. Gram for gram, they are higher in vitamins and minerals than any other class of food. Seaweeds are best used in treating mineral deficiency diseases [5]. *Ulva reticulata* a green seaweed was found to have high iron content and incorporated the seaweed in chocolates, this was done to improve the palatability of the product and chocolate is an all time favorite for all age groups and the ease of packaging and supplementation, chocolate was used as a carrier to supplement the seaweed for anemic adolescent subjects. Moreover it is reported that 40 g chocolate contains six percent of iron recommended for an adult. Hence seaweed chocolate along with grains and nuts were developed

and assessed its impact on supplementing to anemic adolescent girls.

2. Materials and methods

2.1. Development of seaweed chocolate

The iron content of *U. reticulata* is reported to be 40–50% of the total mineral content. A value added chocolate was developed with the incorporation of seaweed *U. reticulata*. Ethical clearance from the Government Rajaji Medical College and Hospital, Madurai, Tamil Nadu, India was obtained. The ingredients used for the development of seaweed chocolate are bajra, roasted bengal gram, rice flakes, green gram dhal, dry powder of *U. reticulata*, dark chocolate and nuts the selected ingredients are given in Plate 1. The seaweed chocolate was prepared by melting the dark chocolate in a microwave oven for 0.5 s to liquid consistency. Roast and powder all the grains add seaweed powder and half of the nuts to the liquid chocolate, transfer into molds and mix the remaining nuts and freeze for 2 h. Demold the seaweed chocolate and wrap with chocolate paper.

2.2. Standardization of the recipe

Standardization of recipes is a formula specifying the quality of each ingredient required to produce a specific quantity and quality of a particular food item [6].

A written set of description was followed for each recipe. Each ingredient was weighed using a weighing scale before and after preparation. Portion size and duration of preparation were noted in each case. The recipes seaweed chocolate and chocolate were standardized for one serving and repeated thrice to get consistent results. The recipes were then subjected to acceptability tests.

The acceptability test was rated by one hundred female students of a private college, Kilakarai, Ramanathapuram District. The selected subjects were asked to score the product using a

score card. A score card is defined as an evaluation card, sample coded with letters or numbers with descriptive terms such as excellent, very good, good, fair and poor. The attributes scored were appearance, color, texture/consistency, flavor and taste [7]. A maximum score of five was given for each attribute.

2.3. Estimation of nutrient content and in vitro iron bioavailability of the value added seaweed chocolate

The developed seaweed chocolate was analyzed for nutrients namely carbohydrate [8], protein [9], lipid [10] and iron [11]. The energy values were computed using the nutritive value of Indian foods [12]. The in vitro iron bioavailability was carried out on *U. reticulata* extract, plain chocolate without seaweed and *U. reticulata* incorporated chocolate. This was estimated by dividing dialyzable iron with total iron of the product and expressed as bioavailable iron [13]. In vitro iron bioavailability was carried out to understand the percentage of available iron from seaweed since the selected seaweed had a considerably high iron content than any commonly used land vegetables.

2.4. Selection of subjects

A random population of 500 adolescent girls in the age group of 15–18 years studying in a private women's college at Kilakarai, Ramanathapuram district, Tamil Nadu, India was selected to screen for anemia. From those students who were moderately anemic, 100 adolescent girls were selected by purposive sampling. Cyanmethohemoglobin method was used to estimate the blood hemoglobin. The classification given by World Health Organization [14] was applied to categorize the students as mild, moderate and severe anemic category. One hundred adolescent girls, who were moderately anemic were selected by purposive sampling. The one hundred adolescent girls were divided into 50 each with one group serving as the control and the other as the experimental.

2.5. Socio-economic status of the anemic adolescent subjects

An interview schedule was formulated to collect information regarding the socio economic status, age, education and occupational status and income status of the family.

2.6. Assessment of nutritional status

Anthropometric measurements namely height and weight were recorded for all the one hundred anemic adolescents girls. Body mass index (BMI) was calculated by using the formula:

$$\text{BMI} = \text{Weight (kg)} * \text{Height (m}^2\text{)}$$

The values were compared with standard percentile chart given by Center for Disease Control [15].



Plate 1. Ingredients used for preparation of seaweed chocolate with *Ulva reticulata*.

Download English Version:

<https://daneshyari.com/en/article/2688404>

Download Persian Version:

<https://daneshyari.com/article/2688404>

[Daneshyari.com](https://daneshyari.com)