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ORIGINAL ARTICLE

Comparative Effects of Spirulina with Iron Supplemented Sangobion Capsules among Anemic Females in Hafizabad

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ABSTRACT

Anemia is a most common health problem in women that causes a variety of disorders in individuals, especially in females. About 80% of females suffered from anemia during pregnancy. Spirulina is a superfood that contains macronutrients and micronutrients and has 70% iron in its composition. Sangobion is an Iron Supplement active compound is Ferrous Sulphate and treated Iron-Deficiency Anemia. The current study aimed to investigate the effect of Sangobion and spirulina could increase Hemoglobin levels and Ferritin levels compared to usual supplementation in anemic females. The pre-post-test design was conducted for 8 weeks to 10 women in Go (control group) and 10 women in the intervention group G1(spirulina)and 10 women in intervention group G2 (Iron Supplement) at DHQ Hospital in Hafizabad from 1 January to March 2022. Women with age (21-35) years and Hb concentration range of 7 to 9 g/dl were included in this study. 30 Anemic Females were included in this study. The mean of Hb before the intervention was 7g/day and increased significantly to 13.5g/dl after taking spirulina for 8 weeks(p=0.001). In Contrast, women who took iron supplemented sangobion show near to significant improvement in Hb concentration.

Keywords: Spirulina, Anemia, Iron supplemented Sangobion,

INTRODUCTION

Anemia is the most common medical condition that affects a section of the population today. According to the World Health Organization, anemia affects 40% of pre-school-aged children, 20% of school-aged children, and 40% of non-pregnant women. Acute and chronic anemia have a negative impact on cognitive development and growth in growing teenagers, [1].

Anemia has a negative effect on the overall growth, cognitive development, and academic performance of adolescents. Anemia can also result in fatigue and low productivity, which have a negative impact on the economy. Anemic adolescents who get pregnant also have an increased risk of morbidity, mortality, and poor birth outcomes such as low birth weight, premature birth, and stillbirth. Anemia can reduce cognitive and physical capacities and is associated with reduced economic productivity in pregnancy anemia has been suggested as a potential marker of increased risk of major hemorrhage and a risk factor for maternal death [2].

Algae is a small and adaptable bacterial species with a high level of reliability in food supplement utilization. Spirulina is known as colored algal cells (Blue-green algae) because to its form, which contains both greenish (carbon) and bluish (phycocyanin) components. The two most abundant with the highest nutritional content are Spirulina maxima and Spirulina planters. It is mostly grown in labs and vast natural swamps. Spirulina will not be toxic or carcinogenic. Polyphenols, flavonoids, flavones, and oral consumption are all examples of flavonoids present in spirulina. The tannic values found varied greatly. Spirulina's positive effects are primarily due to its chemistry, which comprises carbohydrates, polysaccharides, critical nutrients, ions (particularly iron), good fats, minerals, and colors. Spirulina's three key active elements, phycocyanin pigment, sulfated starches, and attain the ideal condition acid, all contribute to beneficial body systems, [2].

The consumption of 100-gram spirulina can fulfill 158% of the iron requirement for every day. Spirulina incorporates fatty lipids and phycobiliproteins, as well as vitamin C and phycocyanin, as well as necessary and non-necessary acids. Approximately 10.9 % of proteins are made up of dietary fibers, hydroxylation, and micronutrients such as zinc, selenium, calcium, and iron. Spirulina treatment has helped malnourished children and adults, three major bioactive components of Spirulina, the protein phycocyanin, sulfated polysaccharides, and γ-Linolenic acid, play the significant roles in imparting improved human body functions. Arthrospiraplatensis, also known as spirulina, is some blue-green micro-algae, from the Oscillatoriaceae family, indigenous to Africa [3].

Spirulina naturally grows in high-salt alkaline water reservoirs in subtropical and tropical areas including America, Mexico, Asia, and Central Africa. Spirulina as a diet supplement has health benefits in preventing or managing hypercholesterolemia, hyperglycerolemia, certain inflammatory diseases, allergies, cancer, environmental toxicant- and drug-induced toxicities, viral infections, cardiovascular diseases, diabetes, and other metabolic diseases. The potential beneficial effects of Spirulina on cardiovascular diseases with highlighted in Spirulina's hypolipidemic, antioxidant, and anti-inflammatory activities in preclinical and clinical studies [4].

Sangobion is the drug of choice as a hematinic. The main ingredient of sangobion is Ferrous Sulphate which treats iron-deficiency anemia. This supplement is not expensive as compared to Capsules Iron one 150 mg and Capsules Elezo 150 mg. During the study 30 out of 60 anemic females were given this iron supplement for the treatment of anemia. Most of these females showed improvement in Hb level by about 50% [6].

The constant supplementation of Spirulina for Old Adults with anemia increases MCH. Spirulina is rich in Oleic acid 5.26 %, gamma linolenic acid 17.43%, palmitoleic acid 1.26%, myristic acid 0.23% and palmitic acid 46.07%. Dried spirulina powder contains 74000µg of zeaxanthin and the dietary supplement of spirulina powder increases zeaxanthin levels in humans. Spirulina is rich in xanthophyll and zeaxanthin that exists in human eyes which decreases the risk of age-related macular degeneration and cataracts [7].

The aim of this study was to evaluate the efficacy of spirulina compared with iron-supplemented sangobion on anemia in Hafizabad.

MATERIAL AND METHODS

Study design: The Research was conducted at The University of Faisalabad, in the department of nutrition and dietetics. Spirulina powder was brought online from Daraz.pk in Pakistan. The sangobion capsule was brought from Care pharmacy Hafizabad.

This study was conducted at the DHQ Hospital Hafizabad. In the intervention group, each participant in G1 was given 120 capsules and each capsule containing 500 mg of spirulina twice a day for 8 weeks after breakfast while in another interventional group G2 each participant was given 60 capsules of 150mg of ferrous sulfate (sangobion).

Participants: The participants in the current study were recruited from the DHQ-Hospital Hafizabad. The inclusion criteria were Anemic Females of Age (21-35) years and their Hb level ranges from 7 to 10g/dl. Pregnant women and Lactating mothers were excluded from this study Anemic females have joined this study 10 participants in the control group ha not had any treatment and 20 participants in the intervention group. The spirulina planters powder was evaluated to analyze the proximate profile that included total fat content, total moisture content, total ash content, total crude protein, total crude fiber, and nitrogen-free extract according to the standard method of AOAC [9].

Proximate Analysis: The protein, fiber, fat, ash, moisture content of spirulina capsules was determined according to standard AOAC methods, [9].

Mineral Analysis: The minerals like sodium, magnesium, calcium, potassium, zinc, and iron were determined by coupled plasma optical emission spectrometry. Prepared spirulina was determined by using Atomic Absorption Spectrophotometer. According to the standard method of AOAC.

Hemoglobin level and Ferritin level of Anemic Females after taking Spirulina powder: The present study showed that spirulina powder exhibits anti-anemic properties and increases Hb and Ferritin levels in anemic individuals. Results of hemhemoglobin ferritin levels were very impressive with respect to the previous experiment.The level of hemoglobin level and ferritin in anemic females increased due to the use of spirulina capsules with no harmful effect on the kidney and liver. Another property came to light that Mean corpuscular Volume and white blood cells significantly raised when anemic females consume 10g Spirulina capsules.This study suggested that spirulina proves beneficial increase in Hb concentration from 8g/dl to 13.5 g/dl and reducing risk of anemia. Spirulina is added with the current iron-folic acid supplement, it may improve more beneficial improvements in nutritional anemia during pregnency with low ferritin level.

Hemoglobin level and Ferritin level of Anemic Females after taking Iron supplemented Sangobion: Results of Hemoglobin level of anemic females were near to significant due to consumption of sangobion capsule Hb level increase from 8g/dl to 12g/dl and there was a raise in the level of ferritin in low scale, with no toxic effects. Overall sangobion capsules with presence of ferrous sulphate shows significant results on anemia.The Ferritin level increased from 10 to 120ng/mL

Statistical analysis: The data was subjected to statistical analysis using statistics 8.1. [9].

RESULTS AND DISCUSSION

Proximate Analysis: There is a significant index of proximate analysis for evaluating the nutritional significance of the food product, for that reason spirulina plantensis powder sample was subjected to a variety of analytical procedures to assess their dietary composition, moisture content. crude protein, crude fibre, crude fat, crude ash and nitrogen free extract correspondingly The current conclusions as regarding proximate description of spirulina plentensis powder were in close by consistency with the ranges that were mentioned in the iterature with slight differences. Possibly the explanation following the variations in ranges could be due different handling techniques or could be due to different environmental factors such as climate, humidity and location. Moreover, variation in the genetic makeup might also provide as a contributing aspect for differences in values. But still the results of current research are much closed to other studies.

Table 1 showed the proximate features of spirulina powder. Spirulina powder contains a handsome amount of moisture (5%), dry matter (95%), nitrogen (19%), crude protein (56.3%), crude ash (14.6%) and crude fat (25%). Similar results were obtained by a researcher who found out the crude protein, crude fat, ash and moisture to be 56.3 ± 0.57, 25 ± 1.24, 14.6 ± 0.64 and 5 ± 0.38 of microalgae spirulina dry weight respectively (Table 1).

Table 1: Proximate analysis of spirulina powder

Proximate attributes	Proximate values (%)
Moisture	5 ± 0.38
Dry Matter	95 ± 0.14
Nitrogen	19 ± 0.48
Crude Protein	56.3 ± 0.57
Crude Ash	14.6 ± 0.64
Crude Fat	25 ± 1.24
Crude Fiber	14.98 ± 0.89

Mineral analysis: The mineral analysis of spirulina (spirulina platensis) is not much done in literature. The results of present research showed that spirulina powder contain sodium 19.45+0.89% mg/100g, potassium 24.45+ 1.45% mg/100g, iron 17.89+ 1.457% mg/100g, calcium 14.56+ 1.245% mg/100g and magnesium 1.89+ 0.897% mg/100g. Mineral analysis of spirulina powder (spirulina platensis) was also measured by another researcher, their results showed that mineral content were as calcium 363.7 ± 0.73, sodium 216.7 ± 4.41, potassium 170.0 ± 2.89,and iron 12.4 ± 0.16 respectively. According to another research the values of minerals in spirulina powder were potassium (K) 1352.26 ± 0.90, sodium (Na) 1185.36 ± 9.72, calcium (Ca) 105.40 ± 0.73, magnesium (Mg) 142.82 ± 0.19 and iron (Fe) 15.26 ± 0.02 (Table 2).

Table 2: Mineral Composition of Spirulina (mg/100g) DW

Calcium	14.56 ± 1.245
Iron	17.89 ± 1.457
Magnesium	1.89 ± 0.897
Zinc	12.33 + 2.457
Sodium	19.45 ± 0.89
Potassium	24.45 + 1.45

The studies were conducted in past not only on spirulina but also on its juices, powder, capsules, and extract to observe its anti-anemic and anti-oxidant effects. The present study showed that spirulina powder exhibits anti-anemic properties and increases Hb and Ferritin levels in anemic individuals. To observe a Complete Blood Count that involves RBCs, WBCs, MCH, MCV, and Hb and along with checking for their Ferritin level for 8 weeks of study. Results of hemeglobin and ferritien level was very impresive as respect to previous experiment.The le vel of hemoglobin level and feritien in Anemic females increased due to the use of spirulina capsules with no harmful effect on the kidney and liver system. Another property came to light that Mean corpusclar Volume and white blood cell significantly raised which anemic females consume 10g Spirulina capsules. If we compare the results of both the Spirulina snd sangobian Capsules there was a similar effect on the red blood cells because in both cases the level of red blood cells increased.

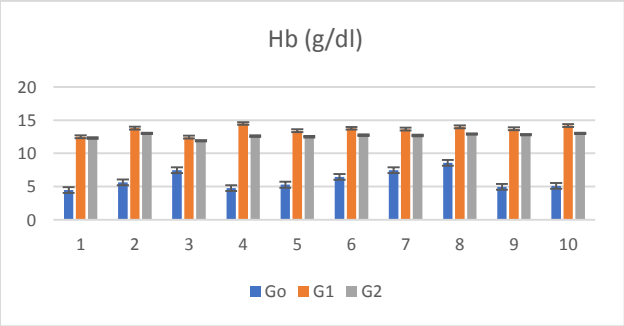

Fig 1: Hb (g/dl) of different groups after two months

Hb and RBC level after two months were recorded and it was found that through use of spirulina and sangobion Hb and RBC level was increased as compared with Go where neither spirulina nor sangobion was applied (Fig. 1). RBC is a quite important factor for betterment of human health (Fig 2).

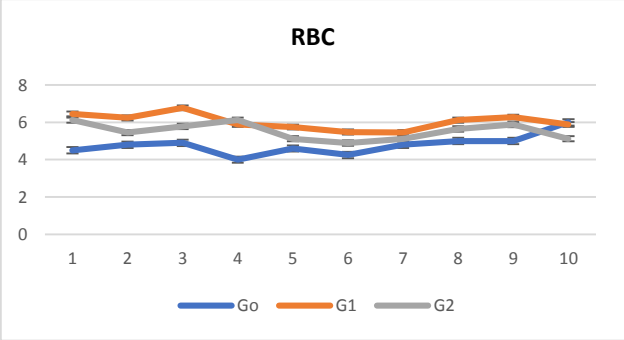

Fig 2: RBC of different groups after two-month experiment

For 8 weeks spirulina powder and sangobion capsules with different dosages were given to patients classified into 2 different groups and the outcomes in contrast with the control group, the powder capsules of spirulina have significantly improved in Hb and Ferritin levels. In between the experimental groups, G_1 and G_2 almost similar trend was observed in Hb, MCH, MCV and RBCs.

A full blood count includes the mean corpuscular volume (MCV), often known as mean cell volume (CBC). The average size of red blood cells in a blood sample is indicated by the MCV value. Different forms of anaemia and other medical disorders can be diagnosed with its aid. The results of MCV through application of sangobion and spirulina are described in Fig 3.

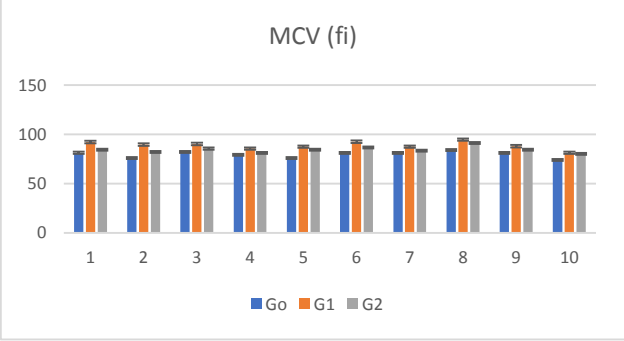

Fig 3: MCV (fi) of different groups after a two-month experiment

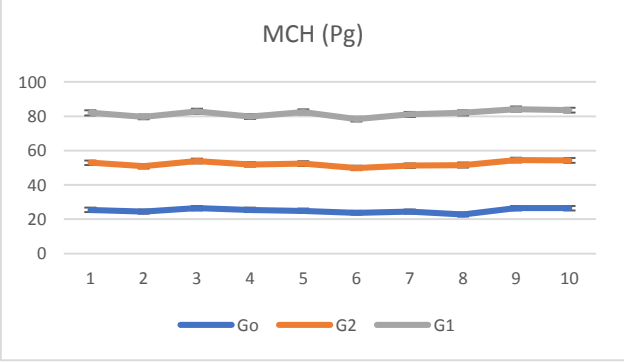

Fig 4: MCH (Pg)of different groups after the two-month experiment

The average quantity of haemoglobin in each red blood cell is shown by MCH levels. Your blood is red because of the protein called haemoglobin. It transfers oxygen out of your lungs and into other bodily regions. It also aids in the removal of carbon dioxide from your body. Having a high MCH score is frequently indicative with macrocytic anaemia. This problem develops when the blood cells become abnormally large, which can happen when the body is deficient in folic acid or vitamin B12. Liver conditions might potentially contribute to high MCH scores. MCH (Pg) results are described in fig 4.

A blood protein with iron in it is called ferritin. Your doctor can determine how much iron is stored in your body by ordering a ferritin test. Your body's iron reserves are low and you have iron deficiency if a ferritin test finds that your blood ferritin level is lower than normal. You could thus be anaemic. Iron that your body can utilise when necessary is stored in it. If your ferritin level is low, you probably don't get enough iron. Ferritin results are depicted in Fig 5.

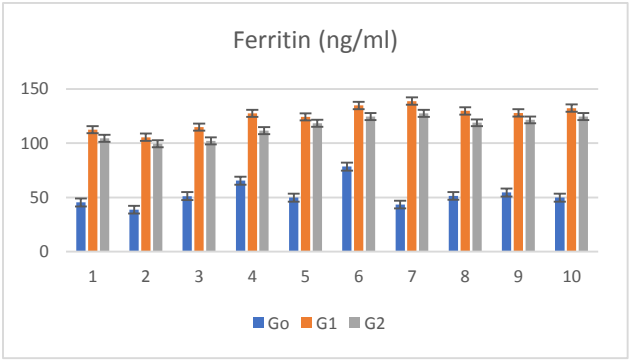

Fig 5: Ferriin(ng/ml) of different groups after the two-month experiment

Your body is protected against infection by white blood cells. Your white blood cells detect the infection site as they move through your circulation and tissues, acting like an army general to alert other white blood cells of the infection's location to aid in defending your body against an attack by an unknown creature. The immune system of the body includes white blood cells. They support the body's defences against illness and infection. WBC results are displayed in Fig 6.

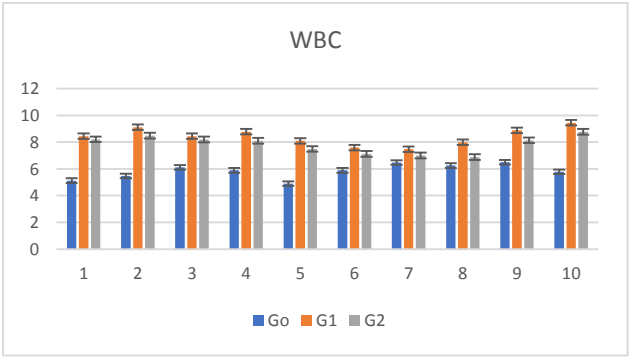

Fig 6: WBC of different groups after the two-month experiment

By throughly, studied the aspect of both capsules are nearly same. In the senario of Sangobion capsules the level of hemoglobin, feritien, white and red blood cells, MCV were improved. Both the amendments were almost at par with respect to effect on each other.

CONCLUSION

The study indicated that spirulina can be utilised to prevent anaemia. According to Proximate and Mineral analyses, as well as Biochemical Test CBC and Ferritin Blood Test, Spirulina produced overall positive results. For 8 weeks, patients were divided into two

groups and given different dosages of spirulina powder and sangobion capsules. In comparison to the control group, the powder capsules of spirulina dramatically improved Hb and Ferritin levels. Spirulinapowder and sangobion capsule showed almost similar results towards biochemical tests. It was determined that Spirulina Capsules serve an important function in the treatment of anaemia by boosting haemoglobin and ferritin levels.Spirulina is added with the current iron-folic acid supplement, it may improve nutritional immunity against anemia during pregnency with low ferritin level.

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Conflict of Interest: All the authors have no conflict of interest.

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