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Efficacy of Multi-Nutrient Supplementation on Improving Nutritional and Hemoglobin Status of Physical Education Students, University of Mysore

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ABSTRACT

The present study was designed to comprise of three phases as follows; Phase I-Baseline information which included selection of the participants and preliminary assessments i.e. socio-demographic, economic, dietary intake, food habits and Hemoglobin status. This was then followed by phase II which involved development of the nutritional supplement and its' sensory and acceptability analysis. The final phase was phase III which entailed supplementation intervention for the study group participants. This phase included; deworming of the participants, pre-intervention nutritional status assessment (anthropometric and haemoglobin status assessment) and actual supplementation followed by post-intervention assessment.

The study was conducted on 12 male students from the department of studies in physical education and sports sciences, university of Mysore. First, a population of 100 students from both undergraduate and post-graduate classes was assessed for nutritional status by analyzing their blood samples for hemoglobin (Hb) levels and taking their anthropometric measurements.

Then a sample of 12 male students belonging to the age group 21-25 years were randomly selected from the post graduate class for the clinical trial intervention. All the participants took part in two different games each day, with one game taking a period of 2 hours in the morning and the other game 2 hours in the evening.

Keywords: Hemoglobin status, nutritional supplement, multi-nutrient supplementation, physical education students

INTRODUCTION

Studies indicate that some sports' persons do not consume adequate nutrients to meet the RDA, which would immensely affect their performance in competitive games. Therefore, there is need to demonstrate this aspect through supplementation for it to be taken seriously by the sports' persons. The department had a total of 100 students from which a convenient sample of 12 male students was randomly selected from the post graduate class for the clinical trial intervention. The participants were engaged in two different games daily. All the participants were dewormed before supplementation intervention was done. Nutritional status was assessed by use of Body Mass Index, Waist-Hip ratio, Triceps Skin Fold Thickness, Biceps Skin Fold Thickness and hemoglobin assessment, at pre- and post-supplementation intervention.

MATERIALS AND METHODS

Supplement development.

The supplement was prepared by use of wheat, ragi, rice, green gram dhal, flax-seed, coconut milk powder, palm oil, whey protein and 30% sugar. All the ingredients apart from palm oil and whey protein were first roasted and milled into flour before all the ingredients were then thoroughly mixed together to obtain a homogenous product.

Sensory and acceptability analysis

Before supplementation, sensory analysis was done to assess the acceptability of the supplement. This was done by developing a hedonic scale score card which consisted of the following; colour, appearance, texture, consistency, taste, aroma and overall acceptability. The supplement was subjected to sensory analysis by a trained 6-member panel in two forms i.e. in one preparation the powder was reconstituted by stirring it in boiling water for a short period of 10 seconds and the other one with the powder (supplement) reconstituted by stirring it in Luke warm water.

The panel members were then asked to define and characterize each parameter separately. The panel rated the variation made by stirring the powder in boiling water for a short time as the most acceptable.

Proximate Composition analysis

The nutrition supplement was analyzed for; Protein, Moisture, Crude fat, Dietary fibre (insoluble, soluble & total dietary fibre), starch (total starch, available starch & resistant starch), Ash content, Iron, Calcium and Phosphorus to determine its' proximate composition by used of Standard AOAC methods.

SUPPLEMENTATION INTERVENTION

Deworming the participants and pre-intervention assessment:

Before starting the intervention programme, all the participants were given deworming tablet each, to reduce chances of poor results due to worm infestation. This was followed by pre-intervention assessment which included Body Mass Index, Waist-Hip ratio, Biceps Skin Fold Thickness, Triceps skin fold Thickness and hemoglobin status.

Pre-intervention assessment

Nutritional Anthropometry:

The anthropometric measurements viz. height, weight, mid-upper arm circumference, waist circumference, Hip circumference and skin fold thickness taken at four sites i.e. triceps, Biceps, sub-scapular and Suprailiac, were recorded as per the guidelines recommended by ICMR / WHO standards.

The height was measured using a standiometer and recorded to the nearest 0.1 cm. A calibrated portable platform balance (spring) was used to measure weight in kilogram and recorded to the nearest 0.5kg with the subjects standing on it without support, with light sports clothing and without shoes. Mid-upper arm, waist and hip circumferences were measured using a non-stretchable measuring tape in centimeters, to the nearest 1 cm. Skin fold thickness measurements were taken using a special Vernier caliper, designed for skin fold thickness measurements and reading done to the nearest mm.

Hemoglobin status assessment:

The haemoglobin (Hb) levels were assessed by cyanmethaemoglobin method. The blood (20µl) was drawn with the help of hemoglobin pipette.

The blood was then transferred into a test tube containing 5ml of Drabkin's solution (reagent). The contents of the tube were mixed and the reading was taken using a photoelectric calorimeter (Kleth Summerson) at 540 nm.

The results were then used to determine those that were anemic using the normal Hb range for men (14-18 mg/dl).

Administration of the supplement.

After the pre-intervention nutritional status (Body Mass Index (BMI), WHR, & SFT

and hemoglobin status) assessment was done, supplementation intervention was started. The intervention period was 8 weeks and each of the 12 participants was given 50g of the supplement powder per day and was advised to reconstitute it by stirring in 200ml of boiling water (i.e. in the ratio 1:4 respectively) for short period of 10 seconds and then drink it. They were advised to stir the supplement in the boiling water thoroughly until they get a porridge consistency, and then take it 30 minutes before each of the morning exercises. The participants consumed the supplement along with their daily diet, throughout the intervention period.

Post-intervention assessment

All the pre-intervention assessments i.e. Body Mass Index, waist-Hip Ratio, Skin Fold Thickness and hemoglobin assessments, were repeated at the end of the supplementation period (2 months) for the purpose of efficacy test analysis. To monitor progress, anthropometric measurements were taken at pre-intervention, mid-intervention (after 4 weeks) and post-intervention. The data obtained was used to determine the efficacy of the nutrition supplement on improvement of nutritional status of sports persons.

Data Analysis.

Data analysis was done by use of SPSS method where paired t- test was used to determine the significance of mean difference between before and after supplementation data, with respect to anthropometric parameters, hemoglobin (Hb) levels and physical endurance capacity.

RESULTS AND DISCUSSION

Sensory and acceptability analysis

Study subjects were randomly sampled for the supplementation intervention (n=12) and were used in sensory evaluation. They were provided with a sensory evaluation score card each and requested to analyze the product for sensory attributes viz. colour, appearance, texture/mouth feel, taste, aroma, flavor, consistency and overall acceptability, using the rating scale provided.

According to the responses, 66.6% of the respondents rated colour of the supplement as good, 50% rated appearance as good with 41.6% and 25% rating taste as good and excellent respectively. 41.6% of the respondents rated texture/mouth feel, aroma and flavor as fairly good. 66.6% of the respondents rated overall acceptability as good with 25% of them rating overall acceptability as excellent.

Proximate analysis.

Proximate composition of Nutrisport.

Nutrisport was analyzed for proximate composition and it was found to contain 14.5% protein, 8% fat, 64.8% total starch and 11.2% total fiber out of which soluble fiber was 3.85% and insoluble fiber was 7.35%. Out of the total starch, available starch was 52.38% whereas resistant starch was 12.42%. Ash content of the product was 1.84%. Iron, phosphorus and calcium contents of the product were 5.83mg, 174mg and 128mg per 100g of the sample respectively.

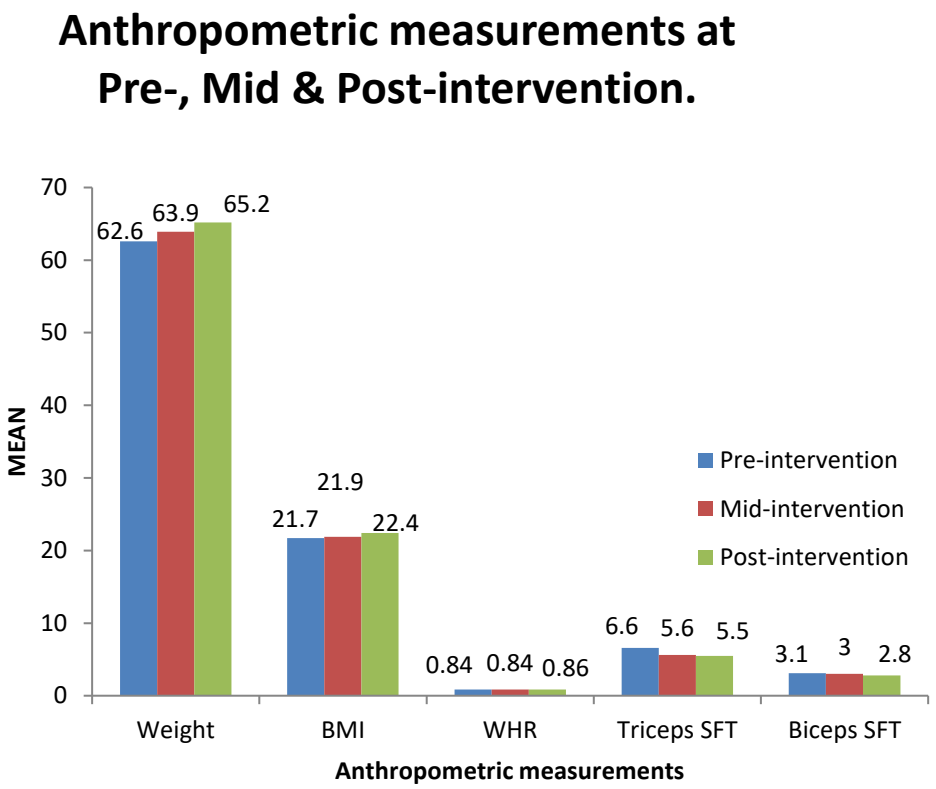
Nutrisport was also analyzed for its' bioavailability of iron and calcium. Iron and calcium bioavailability were 0.7 and 117mg per 100g of the sample respectively.

Anthropometric and hemoglobin status of the subjects.

During the first and the second assessments, the mean Mid-Upper Arm Circumference (MUAC) remained unchanged (26.6cm) whereas in the third assessment the mean Mid-Upper Arm Circumference increased to 27.5cm, which was within the normal range (27-32cm). There was consistent increase in both mean sub-scapular and Suprailiac skin fold thickness measurements. The mean sub-scapular skin fold measurements were 9.7, 10 and 10.5mm respectively, whereas mean Suprailiac skin fold measurements were 8.6, 10.1 and 10.7mm respectively.

The results show that there was a gradual increase in the mean abdominal fat of the subjects over the three assessments. There was a reduction in mean triceps skin fold measurement from 6.7mm to 5.6mm, whereas the mean biceps skin fold measurement remained constant throughout the intervention period. There was a significant increase in the mean BMI of the subjects with the three assessments indicating BMI mean of 21.7, 21.9 and 22.4 respectively (P=0.002)

There was a significant increase in the mean hemoglobin levels between pre-intervention and post intervention assessments (P=0.001). The mean hemoglobin increased from 14.0 to 15.2 during the post-intervention period. There was also a correlated increase in mean weight of the subjects i.e. 62.5, 63.9 and 65.5Kg respectively.



DISCUSSION

In the present study a multi-nutrient supplement named Nutrisport was formulated for sports personnel to test its' efficacy on increasing physical endurance and sports performance. The study was conducted in three phases where in the first phase it was developed and analyzed for its' proximate composition and sensory attributes. It was formulated with locally available, cost-effective cereals and pulses along with an added high biological value protein source namely, whey protein concentrate. Proximate analysis results found out that Nutrisport contained 14.5% protein, 8% fat, 11.2% fibre, 5.83mg of iron and 128mg of calcium per 100g sample, which was found to be comparatively high in nutrient content when compared to other commercially available sports drinks. Nutrisport also had high acceptability ratings in terms of colour, appearance, Texture, flavor and overall acceptability as shown by the sensory evaluation results.

A convenient sample of 12 active sports persons was randomly selected from a population of 91 male students of the department of studies in physical education and sports sciences, University of Mysore, all in the age group 21-25 yrs.

The research found out that, with use of the multi-nutrient supplementation there was a consistent improvement in the mean Body Mass Index (BMI). The mean BMI increased significantly from 21.7, 21.9 and 22.4 at pre-intervention, after one month and post-intervention (after two months) respectively (P=0.042). The results also indicated a significant improvement in the mean hemoglobin levels from 14.0 to 15.2 mg/dl during the pre-intervention and post-intervention periods respectively (P=0.001).

CONCLUSION

According to the research findings, the supplementation with Nutrisport resulted in significant improvement of nutritional status of the subjects as reflected in both the Body Mass Index and Hemoglobin results.

Declaration by Authors

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Conflict of Interest: The authors declare no conflict of interest.

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