

A Medical Nutritional Supplement Improves Fatigue and Muscle Strength in Adults Complaining of Generalized Weakness and Fatigue

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ABSTRACT

OBJECTIVE

The aim of this study was to determine the effect of 3 months consumption of Medical Nutrition Supplements (MNS) in adults complaining of generalized weakness and fatigue.

BACKGROUND

Despite its high prevalence, fatigue remains an often-neglected symptom. Fatigue is strongly associated with poor physical performance. Proper balanced daily nutrition is vital for adults, which includes adequate levels of essential high - quality proteins, amino acids and complex carbohydrates to help meet adult nutritional needs. Therefore, in the present study, the short-term effects of MNS rich in proteins, hemo - nutrients and biotin in adults complaining of generalized weakness and fatigue were studied.

DESIGN

This was a retrospective observational study where MNS (Maxvida™) was given to 289 subjects (aged 18 - 45 years) between 1st March to 30th April 2019 and evaluated for their clinical data (age, weight, and BMI), Modified Fatigue Impact Scale (MFIS) and Hand - Held Dynamometry (HHD) at 1, 2 and 3 months.

RESULTS

The mean age of patients was 33.5 years in this study. No significant change in BMI was observed from baseline 22.3 ± 0.3 to 22.8 ± 0.2 at 3 months ($p = 0.166$). Weight was found to increase from baseline 55.5 ± 0.7 kg to 57.7 ± 0.6 kg at 3 months ($p = 0.017$). A statistically significant increase in Hb levels was observed from baseline 9.6 ± 0.1 to 11.6 ± 0.1 at 3 months ($p = 0.0001$) due to MNS intake. There was a significant reduction in MFIS score from baseline 48.8 ± 0.9 to 31.4 ± 1.2 at 3 months ($p=0.0001$), and improvement in HHD score from 21.6 ± 0.5 to 26.4 ± 0.5 at 3 months ($p = 0.001$). No serious adverse effects were noticed during consumption.

CONCLUSION

A medical nutrition supplement used in the study was found to be efficacious in improving the fatigue levels and muscle strength in subjects with no deleterious effects.

KEYWORDS

Medical nutrition, Pathological states, Micronutrients

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INTRODUCTION

Energy reflects on the feeling of well-being, stamina, and vitality to carry out day-to-day activities. Fatigue not only affects the physical functioning, but also psychological well-being.^{1,2} One of the physical manifestations of fatigue is general muscle weakness. Certain physical conditions or pathological states could drain the energy and lead to a lower state of vitality. Vitality strongly correlates to mental health and perceived physical well-being. Mental fatigue affects cognitive functioning and affective functions such as a change in mood and lack of motivation. Physical fatigue is perceived as a lack of energy with reduced stamina and weakness (lack of strength).³ Energy expended during grueling working conditions, stressful working environment, physical activities such as sports, dance or walking renders the body in a state of fatigue.

Fatigue is a state of lack of energy, stamina, or vitality.³ Fatigue is reported in almost one-fifth of the patients visiting the general medicine department. The frequency of fatigue is much more among adolescents as one-third of them report fatigue at least four times a week.⁴ In one-third of the cases, there is no known cause for fatigue. A few of the causes for fatigue include overexertion, illness, infection, anemia, medications and depression. Imbalance in sleep, exercise/activity and diet could also lead to physiologic fatigue.

Food provides energy to sustain biological and structural integrity of the body. Mental and physical fatigue ensues when the body fails to meet the energy demands of the brain or muscle. Under the resting condition, certain basal energy is necessary to maintain the basic functioning of organs such as the heart, muscle, brain and liver. Approximately 13 kcal/kg of energy is consumed by the resting skeletal muscle and with an increase in physical activity, the energy requirement also increases. Fatigue surfaces when metabolic reserves are exhausted. Owing to a metabolic challenge, the energy levels in skeletal muscles could be depleted to less than 30 % of its resting energy state.⁵ Brain consumes 20 % of the energy from direct glucose while muscles derive energy from stored glycogens.

The body requires protein and energy (in the form of glucose and fat) to meet basic energy needs. When the body stores of nutrients are broken down in excess to provide energy, then there is depletion of body fat and muscle.⁶ consequently, weight loss and poor nutrition lead to fatigue, muscle weakness, or tiredness. Poor nutritional status can be a cause and consequence of fatigue. Subjects with poor nutritional status would show fatigue while fatigued subjects are likely to be at risk of under nutrition. On the contrary, over-eating leading to obesity also causes fatigue through several processes that cause monogenic effects and an increase in pro-inflammatory cytokines.⁶ Vitamins and minerals are functionally required at

the several molecular levels of the energy-production system within the cell. Fatigue is widely prevalent in subjects with some micronutrient deficiencies. Mounting evidence shows that low dietary intake of micronutrients is associated with a higher risk of mental fatigue, and cognitive and psychological impairments. As energy replenishment and adequacy of micronutrients are key to overcoming fatigue or muscular weakness, nutritional interventions enabling the recovery of depleted muscle energy would be beneficial in overcoming fatigue.

MaxvidaTM is a balanced nutritional supplement with 32 key nutrients that cater to adult nutritional needs. It contains high quality soy protein isolate (SUPRO), milk protein; soluble dietary fibers, antioxidant, and other nutrients that support bone growth and blood formation. We conducted a retrospective analysis to study the impact of a 3-month supplementation of a medical nutrition supplement (MNS) in adults complaining of generalized weakness and fatigue.

Design

This study is a non-interventional observational study. Subjects who complained of generalized weakness and fatigue were included in the study and were offered MNS.

Participants

Two hundred and eighty-nine subjects aged between 18 and 45 years were recruited for the study from 1st March to 30th April 2019 at the multiple clinics, India (Figure 1). Subjects with significant generalized weakness and fatigue were included in the trial. Subjects who were taking any nutritional supplement based on dietary consultation during the past year were excluded from the study. Subjects undergoing treatment for any metabolic disorder at the time of recruitment as well as those with a history of comorbid conditions were also excluded from the study.

Ethical Considerations

All ethical permissions related to data collection and research was sought.

MATERIALS AND METHODS

All the participants were instructed to consume MNS MaxvidaTM 30 g in 100 mL of water. They were instructed to take the supplement twice daily in the morning and evening. The subjects were allowed to follow a normal, healthy diet during the three-month study period. No other dietary or lifestyle changes were recommended. The participants were regularly scheduled and assessed at the end of 1, 2, and 3 months. Participants were not followed up after the completion of the research.

Data Collection

Baseline assessments included age, weight, Body Mass Index (BMI), Modified Fatigue Impact Scale (MFIS), Hand - Held Dynamometry (HHD), hemoglobin levels, and demographic characteristics. At the end of 3 months, anthropometric parameters and hemoglobin levels were re-evaluated. The Modified Fatigue Impact Scale (MFIS) and Hand - Held Dynamometry (HHD) were used for collecting data related to fatigue levels, and muscular strength and physical function of the participants. All the data collected during the study was compared with that collected at the baseline.

Data Analysis

Data were analyzed with the help of the SPSS version (10.1). Relevant tests including t-tests and chi-square tests were performed to determine the statistical significance of the results.

RESULTS

Two hundred and eighty-nine subjects (155 men and 134 women) were initially included in the study, but the final data analyzed 266 subjects. (Table 1). The mean age of the subjects included in the study was 33.5 ± 10 years. After 3 months of supplementation with MNS, there was no significant change in BMI from baseline 22.3 ± 0.3 to 22.8 ± 0.2 at 3 months ($p = 0.166$). Weight was found to increase from baseline 55.5 ± 0.7 kg to 57.7 ± 0.6 kg at 3rd months ($p = 0.017$; Figure 2). A statistically significant increase in hemoglobin levels was observed from baseline ($p = 0.0001$; Figure 3) after supplementation with MNS intake. There was a significant reduction in MFIS score from baseline 48.8 ± 0.9 to 31.4 ± 1.2 at 3 months ($p = 0.0001$), and improvement in HHD score from 21.6 ± 0.5 to 26.4 ± 0.5 at 3 months ($p = 0.001$) (Figure 4).

Safety

Throughout the duration of the study, no adverse effects were observed. There were no deleterious impacts on the normal diet of the participants, and their daily activities were not affected.

DISCUSSION

Proper balanced daily nutrition is vital for adults, which includes adequate levels of essential high-quality proteins, amino acids, and complex carbohydrates to help meet adult nutritional needs.^{7,8} In this study, a 3 months supplementation with MNS significantly reduced MFIS score by 17.4 points ($p = 0.0001$) and improved HHD score by 4.8 ($p = 0.001$). This confirms an increase in muscular response and improvement from fatigue. Additionally, there was a significant increase in hemoglobin levels (by 2.0 %) at the end of 3 months.

Nutrients and their Role in Cellular Energy Production

Nutrients, especially proteins or amino acids, and exercise play a key role in maintaining muscle protein metabolism. A negative protein balance owing to inadequate intake of protein can affect muscle mass.⁸ With the exception of foliate; all vitamin B complex is actively involved in all levels of cellular energy production, that is, the macronutrient oxidation, citric acid cycle, and oxidative phosphorylation pathways. Vitamin C plays a key role in energy production through beta-oxidation and hence insufficient intake of vitamin C could affect the carnation metabolism and account for muscle weakness and pain. Iron is an integral part of home enzymes involved in cellular energy production. Minerals such as magnesium regulate several enzymes in the citric acid cycle of energy production.²

Anemia is related not only to iron deficiency but also to deficiency of certain B vitamins, especially vitamins B₆, B₉, and B₁₂.² Anemia per se could cause fatigue and weakness.

Role of Nutrition Alleviating Fatigue and General Weakness

Poor nutritional status and advancing age can be the contributing factor of fatigue and decrease muscular strength. In fact, energy intake decreases with age. Compared to younger people, the energy intake in older people is reportedly lower by 16 % - 20 %. Hunger is reduced by 25 % in older people in comparison to younger people.⁹ As the nutritional status reflects on the energy status, reduced food intake with age could reflect on the decrease in stamina and vitality.

The net protein balance can be increased with a meal or a supplement containing protein or amino acids.⁸ In addition to proteins and amino acids, soy contains many antioxidants and serves as an alternative source of protein for vegetarians.¹⁰ Although, soy proteins have lower quantity of amino acids compared to whey protein, there is no difference between the two types of protein in terms of improving the lean body mass or changing the muscle size, strength, and body composition.¹¹ A review of the literature shows that nutritional supplements in conjunction with some form of exercise could improve muscle strength and muscle mass.^{12,13} A randomized control trial showed that five-nutrient supplement containing whey, micelle casein, creatine, vitamin D, and omega-3 fatty acids could improve the lean and appendicular mass, lean mass to fat ratio, and muscle strength and function when compared to or an is caloric/is nitrogenous placebo containing collagen and sunflower oil.¹⁴ The subjects were also recommended to perform routine home-based resistance exercises in addition to regular diet and supplementation. A meta-analysis of oral nutritional supplements showed that supplements were beneficial in terms of improving

nutritional intake, especially protein intake. According to the individual studies included in the meta-analysis, the oral nutritional supplement has a positive effect on BMI, lean mass, albumin levels, mobility, and muscle strength.¹⁵

Health professionals often see patients, who frequently complain of fatigue and psychological or cognitive difficulties. In the absence of a pathological basis for fatigue, improving any subclinical deficiencies with nutritional intervention should be considered in improving fatigue and general weakness (Figures 1-4 and Table 1).

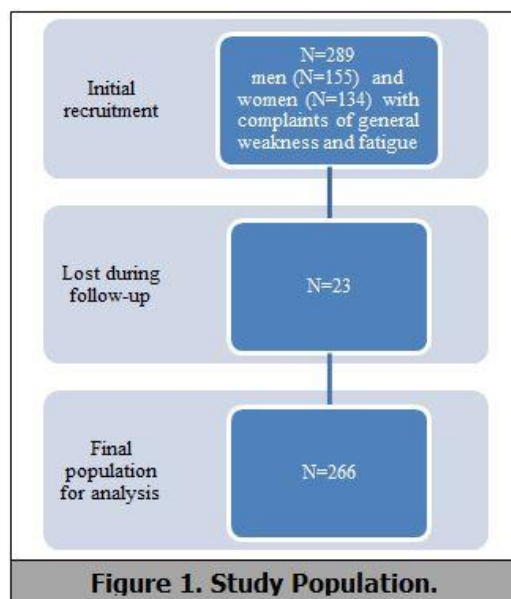


Figure 1. Study Population.

Parameter (n = 266)	Baseline	1 month	2 month	3 month	P value
Weight (kg)	55.5 ± 0.7	56.2 ± 0.6	55.9 ± 0.7	57.7 ± 0.6	0.017
BMI	22.3 ± 0.3	22.3 ± 0.2	22.6 ± 0.2	22.8 ± 0.2	0.166
Hb %	9.6 ± 0.1			11.6 ± 0.1	0.0001
MFIS score	48.8 ± 0.9			31.4 ± 1.2	0.0001
HHD score	21.6 ± 0.5			26.4 ± 0.5	0.001

BMI: Body Mass Index; Hb: Hemoglobin; HHD: Hand-Held Dynamometry (HHD); MFIS: Modified Fatigue Impact Scale.

Table 1. Patient Assessment Data

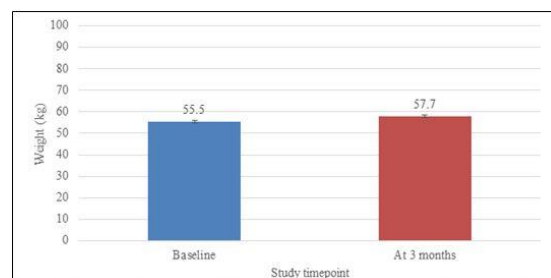


Figure 2. Weight Gain In 3 Months Following Supplementation With Medical Nutrition Supplement (P=0.017).

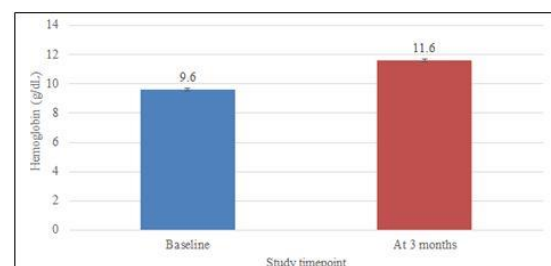


Figure 3. Hemoglobin Levels Significantly Increased In 3 Months Following Supplementation With Medical Nutrition Supplement (P=0.0001).

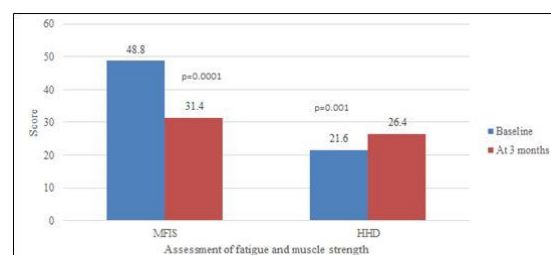


Figure 4. Change in MFIS and HHD Score in 3 Months Following Supplementation with Medical Nutrition Supplement.

CONCLUSION

Despite its high prevalence, fatigue remains an often-neglected symptom. Fatigue is strongly associated with poor physical and mental performance. As the energy component of the body is dependent on the nutritional intake, subclinical deficiencies or suboptimal intake of nutrition could contribute to fatigue and weakness. A 3-month supplementation with MNS was associated with a significant reduction in fatigue and muscle fatigue as assessed by MFIS score and HHD score. Further large-scale trials are recommended to substantiate the finding of this study.

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