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EVALUATION OF EFFICACY OF ASHWAGANDHADI GRANULES IN IMPROVING PHYSICAL FITNESS THROUGH $V0_2$ MAX (MAXIMUM OXYGEN CONSUMPTION) IN HEALTHY SUBJECTS

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ABSTRACT

Introduction: Physical fitness is a state of health and well-being and more specifically, the ability to perform aspects of sports, occupations and daily activities. Considering nutritional aspect of physical fitness, supplements are required to bridge the nutritional gap due to faulty food habits. But in the present scenario the supplements available in the market are not meeting the required standards and many are not scientifically researched for its nutrient content. Hence there is a need for a health supplement which meets the daily requirements, is tasty, and provides optimum nutrients for improving the physical fitness. **Materials and methods:** Ashwagandhadi granules was formulated with a combination of food and Rasayana dravyas, consisting of Ashwagandha *(Withania somnifera)*, Shatavari *(Asparagus racemosus)*, Ragi (*Eleusine coracana)*, Mudga *(Vigna radiata),* Jeeraka (*Eleusine coracana)* and Shunti (*Zingiber officinale)* can be a promising health supplement. In this regard an open label double arm control clinical study with convenient sampling and modified wait listed cross over design was conducted among 23 subjects. While in the study group they were administered with 20 gms of Ashwagandhadi granules with 100ml milk for a month. **Results and conclusion:** The result revealed that the administration of Ashwagandhadi granules demonstrated statistically significant change in VO2 max (maximum oxygen consumption) in the study group. Hence the Ashwagandhadi granules can be a potential health supplement to improve the physical fitness.

Keywords: Ashwagandha, Jeeraka, Mudga, Ragi, Shatavari, Shunti

INTRODUCTION

Physical fitness is a state of health and well-being and more specifically, the ability to perform aspects of sports, occupations and daily activities.[1]It relates to any movement produced by the individual's skeletal muscles that results in energy expenditure. It is a set of attributes a person have to achieve which is linked to person's capability to do physical activity. It provides important health benefits and can enhance the quality of life in adults. It is also a sense of wellbeing and the capacity to deal with emergencies demanding unaccustomed physical effort. Fitness is divided into health and skill related components with the health component further consists of cardiovascular endurance, muscular endurance, muscular strength and flexibility.[2]It is generally achieved through proper nutrition, moderate physical exercise, hygiene and sufficient rest.[3]Among these the important modifiable factors are the exercise and the nutrition. Due to busy schedule the health is being ignored and the nutritional status is being left unnoticed.

Considering nutritional aspect of physical fitness, supplements are required to bridge the nutritional gap due to faulty food habits. It helps to enhance the nutrient density of the daily diet and make sure that the body gets the right amount of nutrients tailored to dietary needs. But in the present scenario the supplements available in the market are not meeting the required standards and many are not scientifically researched for its nutrient content. Hence there is a need for a health supplement which meets the daily requirements, which is tasty, health promotive and provides optimum nutrients for improving the physical fitness.

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MATERIALS AND METHODS

Source of Data

Clinically healthy individuals visiting Out Patient Department of Sri Dharmastala Manjunatheshwara College of Ayurveda and Hospital, Hassan was selected for this study.

Method of Collection of Data

Clinically healthy individuals who fulfilled inclusion and diagnostic criteria attending the out-patient Department of Swasthavritta, Sri Dharmastala Manjunatheshwara College of Ayurveda and Hospital, Hassan.

Diagnostic Criteria:

- Clinically healthy subjects with no known diseases

Inclusion Criteria:

- Subjects of the age group of 18- 40 years irrespective of gender was

selected.

- Subjects who were not on any other health supplements.
- Clinically healthy subjects who were ready to sign the consent form and were interested and willing to take Ashwagandhadi Granules.

Exclusion Criteria:

- Pregnant and lactating women.

STUDY DESIGN:

An open label double arm control clinical study with convenient sampling and modified wait listed cross over design was conducted among 23 subjects who reported at the Out Patient Department of Sri Dharmastala Manjunatheshwara College of Ayurveda and Hospital, Hassan. In this regard, they were allocated to control group of 23 subjects and after a period of one month of observation were shifted to study group and were administered with Ashwagandhadi granules with milk.

PLAN OF THE STUDY

Source and authentication of raw drug:

Ashwagandha, Shatavari, Ragi, Mudga, Jeeraka and Shunti were procured from local vendor and were authenticated by the Department of Dravyaguna at Sri Dharmasthala Manjunatheshwara College of Ayurveda, Hassan. These were used to prepare Ashwagandhadi Granules.

Table 1: Ashwagandhadi Choorna ingredients

S.No.	Name of the Drug	Botanical Name	Part used	Proportion
1	Ashwagandha	*Withania somnifera*	Root	30%
2	Shatavari	*Asparagus racemosa*	Root	20%
3	Ragi	*Eleusine coracana*	Seed	20%
4	Mudga	*Vigna radiate*	Seed	20%
5	Jeeraka	*Cuminumcyminum*	Seed	5%
6	Shunti	*Zingiber officinale*	Root	5%
7	Sugar			Q.S

METHOD OF PREPARATION[4]

The process of preparation of Ashwagandhadi Granules

- Step 1: Ragi and Mudga was soaked in water for 12 hours for sprouting.
- Step 2: The sprouted Ragi and Mudga was kept for drying.
- Step 3: The dried Mudgha and Ragi was milled sieved and roasted.
- Step 4: The fine powders of Ashwagandha, Shatavari, Jeeraka (roasted) and Shunti was added to this and mixed well to obtain Ashwagandhadi churna.
- Step5: This is then added into Sharkarapaka in definite proportion and stirred well to obtain Ashwagandhadi granules.

Preparation of Ashwagandhadi Beverage

- Step 1: 20gms of Ashwagandhadi Granules was added to a cup of hot milk (150ml).
- Step 2: Mixed well and served as Ashwagandhadi beverage.

ASSESSMENT CRITERIA

- VO_2 Max(Maximum oxygen consumption)[5]

  Calculation: VO_2 = 132.853 – (0.0769 x weight in lb) - (0.3877 x age) + (6.315 x gender) - (3.2649 x walk time in minutes) - (0.156 x heart rate).

  If male, use the number 1, if you are female, use the number 0 for the calculation.

STATISTICAL METHOD:

Data was collected using specially designed case report form (CRF). Data was tabulated and analysed by using statistical software. The statistical analysis included descriptive statistics, Friedman test, Wilcoxon test and Mann-Whitney U test.

RESULTS

Table 2: Descriptive Statistics of Friedman test in VO2 Max

VO2 Max	Control Group			Study Group		
	N	Mean	SD	N	Mean	SD
BT (0^{th} day)	23	4.00	.928	23	3.13	.919
AT (30^{th} day)	23	3.78	.951	23	4.04	.928

Table 3: Friedman Test in VO2 Max

VO2 Max Control Group	N	MR	X^2	Df	P	Remarks
BT (0^{th} day)	23	1.61		1		
AT (60^{th} day)	23	1.39	3.571		0.059	NS
Vo2 max Study Group	N	MR	X^2	Df	P	Remarks
BT (0^{th} day)	23	1.13				
AT (60^{th} day)	23	1.87	17.000	1	<0.0001	S

Note: BT – Before intervention, AT- After intervention, N- Number, SD- standard deviation, MR- Mean Rank, X^2- Chi-square, df-degree of freedom, S- significant, NS- not significant.

Table 4: Ranks for Wilcoxon test in Vo2 Max

VO2 Max		Control Group			Study Group		
		N	MR	Sum of Ranks	N	MR	Sum of Ranks
AT – BT	NR	6	4.00	24.00	0	0.00	.00
	PR	1	4.00	4.00	17	9.00	153.00
	Ties	16			6		
	Total	23			23		

Note: BT – Before intervention, AT- After intervention, , N- Number, MR- Mean Rank, PR- positive rank, NR- negative rank.

Table 5: Wilcoxon signed rank Test in VO2 max

VO2 Max	Control Group	Study Group
	AT – BT	AT – BT
Z value	-1.890	-3.827
Asymp. Sig. (2-tailed) (P value)	0.059	<0.0001
Remarks	NS	S

Note: BT – Before intervention, AT- After intervention, N- Number, S- significant, NS- not significant.

Control Group - There was statistically not significant difference in VO2 Max recorded at two intervals i.e. BT (0^{th} day) to AT (30^{th} day), $\chi^2 = 3.571$, $p = 0.059$. For post hoc analysis, Wilcoxon signed-rank tests were utilized. There was no significant

improve in VO2 Max in between BT (0^{th} day) to AT (30^{th} day) (Z = -1.890, p = 0.059).

Study Group- There was statistically significant difference in VO2 Max recorded at two intervals i.e. BT (0^{th} day) to AT (30^{th} day), χ^2 =17.00, p<0.0001. For post hoc analysis, Wilcoxon signed-rank tests were utilized. Ashwagandhadi Granules was significant in improving VO2 max in differences between BT (0^{th} day) to AT (30^{th} day) (Z = -3.827, p<0.0001).

Compare results in between control group and study group (Mann-Whitney U test)

In the parameter N was fixed to 23 in each group Total 46 subjects. The initial significance level considered in this study is 0.05. The subjects were analyzed at interval of BT (Before Intervention- i.e. on baseline or 0^{th} day), AT (After Intervention i.e. on 30^{th} day).

Table 6: Descriptive Statistics and Mann-Whitney U testin VO2 Max between group (Control group and study group) After Intervention

	VO2 max	Group
Mean	**3.587**	**1.50**
Std. Deviation	**1.023**	**0.506**
	Control group	**Study Group**
Mean rank	**29.33**	**17.67**
Sum of ranks	**674.50**	**406.50**
Mann Whitney U	**130.500**	
Wilcoxon W	**406.500**	
Z	**-3.077**	
Asymp. Sig. (2 tailed)	**0.002**	
Remarks	**S**	

This study found that in the study group there is statistically significantly increase in VO2 Max after intervention compared control group, U=130, Z=-3.077, p=0.002**.**

There was a statistically significant difference in VO_2 Max of the study group after the intervention. On analysing the data of the study group, there was statistically significant change in the VO_2 max (z value = -2.492, p value = 0 .017).

DISCUSSION

The statistically significant result in VO2 Max (maximum oxygen consumption) may be due to the chemical constituents present in Ashwagandha, Shatavari, Ragi, Mudgha, Jeeraka and Shunti. Clinical studies demonstrated that Ashwagandha posseses two primary withanolides, Withaferin A (WA), Withanolide D (WD) and Shatavari posseses Steroidal sapogenins and steroidal saponins which endows it with immuno-stimulatory effect.[6] Shatavari posseses steroidal sapogenins and steroidal saponins which endows it with immuno-stimulatory effects.[7]

The anabolic, immuno-modulatory, antioxidant and metabolic

activity of the components in the Ashwagandhadi granules also support the action of improvement VO_2 max. Ragi, Mudga are foods to which the four herbs are added as supplements. They are rich in proteins, micro and macronutrients and when sprouted gets enhanced with metabolites and many health benefiting bioactive compounds which endows it with antioxidant property.[8]It also enhances the palatability and acceptance of the compound. The phytochemical study of Ashwagandhadi granules also revealed the presence of various classes of phytochemical constituents such as Alkaloid, Steroid, Carbohydrate, Tannin, Flavanoids, Terpenoid, and Coumarins.[9]

Ashwagandha possess 26 alkaloids and steroidal lactones called as withanones which shows antioxidant property.[10] Shatavari has antioxidant compound named Racemofuran, together with known compounds asparagamine A, and racemosol. The major antioxidant principle, catechin is present in ragi.[11] The sprouted Mudgha contains enormous amount of macro and micronutrients (flavinoids, phenolic acids, sterols, triterpenes) which exerts potent anti-oxidant properties. Polyphenols as the major antioxidant principle present in Jeeraka and shunti.[12, 13]

Ashwagandha and Shatavari are having strong immuno-modulatoryaction added along with foods like Ragi, Mudgha, which are powerful antioxidants and Jeeraka and shunti that enhances the metabolism, palatability and acceptance of the compound.[14]

CONCLUSION

Administration of Ashwagandhadi granules showed a significant increase in VO_2 max indicating the enhancement physical fitness. Hence it can be a promising health supplement in improving physical fitness.

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