ISSN: 2230-9926

Available online at http://www.journalijdr.com

IJDR

International Journal of Development Research
Vol. 14, Issue, 11, pp. 67098-67101, November, 2024
https://doi.org/10.37118/ijdr.28985.11.2024

RESEARCH ARTICLE **OPEN ACCESS**

EXPERIMENTAL STUDY TO EVALUATE THE BRIMHANA EFFECT OF VIDARIKANDADI YOGA W.R.T. TO ITS ANABOLIC ACTIVITY

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ARTICLE INFO

Article History:
Received 19th August, 2024
Received in revised form
17th September, 2024
Accepted 11th October, 2024
Published online 30th November, 2024

Key Words:
Brimhana, Vidarikandadi Yoga,
Anabolic activity.

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ABSTRACT

Athletes and professional sportsmen often misuse steroids, using chemicals like androgenic compounds and SARMs (selective androgen receptor modulators) which mimic the effects of testosterone for long periods of time.[1]In the ancient text *'MANASOLLASA,'* especially in the chapter called *'Mallavinoda*' (wrestling), King Somesvarawrote about using natural methods to build muscle and improve endurance. He mentioned using Ayurvedic herbs like *Vidarikanda*and *Ashwagandha*, mixed with ghee and sugar, to help build muscle.There have been no evidence-based studies conducted to demonstrate the combined anabolic activity of *Vidarikanda*and *Ashwagandha* in increasing muscle mass. Therefore, the herbs were evaluated in the present study.

Citation*: *Vidhya Vijayan, Harihara Prasad Rao, Rachana C, 2024. *"Experimental study to evaluate the brimhana effect of Vidarikandadi Yoga W.R.T. to its Anabolic Activity". International Journal of Development Research*, 14, (11), 67098-67101.

INTRODUCTION

In Ayurveda, *Vyayama* (physical exercise), is very important and is a key part of *Dinacharya* (daily routine). According to Ayurvedic principles, it is recommended to exercise only up to half of one's physical capacity.[2] Despite the changing trends in fitness, modern activities like wrestling, weightlifting, and powerlifting have become very popular. Young people, inspired by their favourite movie stars and sports heroes, are especially drawn to these activities to shape their bodies.The misuse of steroids is prevalent among athletes and professionals in various sports. Over the years, these substances, known as androgenic compounds and SARMs (selective androgen receptor modulators), have been abused for their ability to mimic the effects of testosterone.[3] By the 1980s, the use of anabolic steroids, also known as anabolic-androgenic steroids (AAS), had become widespread not only among athletes but also among the general population and young men seeking physical enhancement.[4]AAS usage is very common worldwide; among men, the lifetime frequency is estimated to be 6 %, and between 15% and 25% of male gym goers use it at any given moment.[5] However, the misuse of steroids is associated with a plethora of adverse effects, including hypogonadism, cardiac and hepatic dysfunction, alterations in blood lipid levels, gynecomastia, excess water retention, high blood pressure, as well as changes in behaviour and mood swings.[6] Despite the possibility of both direct and indirect impacts on mood, anabolic steroids and other APED's (appearance and performance enhancing drugs) usually do not result in a euphoric high. On the other hand, those who take these drugs run the risk of developing a substance use disorder, which is characterised by persistent usage despite negative effects.[7]Steroids may offer short-term benefits such as increased muscle mass and improved athletic performance, their abuse can lead to severe health complications. In the ancient texts of Ayurveda, holistic solutions have been explained to improve muscle mass and endurance. *"MANASOLLASA"* is an encyclopedic work of the Western Chalukya King Somesvara, where he has mentioned various *Vinodas* or royal sports.In the chapter on "*Mallavinoda"* (wrestling), he emphasizes the need for good nourishing food to improve the strength of wrestlers. In this context, King Somesvara mentioned the use of Ayurvedic herbs like *Vidarikanda* (Indian kudzu) and *Ashwagandha* (Indian ginseng or winter cherry) along with *ghritha* (ghee) and *sita* (sugar) to build muscle mass.[8] Both *Vidarikanda*and*Ashwagandha* are considered as *balya*(strengthening), *brimhaniya* (improves weight), *vatahara*(decreases Vata), *vajikara* (aphrodisiac), and *Rasayana*(nourishing).[9]They are mentioned in the *Brimhaniya Kashaya Gana* according to Charaka Samhita.[10] There is no evidence-based study done to show the combined anabolic activity of *Vidarikanda*and *Ashwagandha* in building muscle mass. Hence, the above herbs were evaluated in the present study.

Objective of the Study

- To prepare choornas of the trial drugs as mentioned in classics.
- To evaluate the analytical study of the trial drugs.
- To analyse the anabolic effect of the trial drugs in increasing muscle mass.

MATERIALS AND METHODS

Ayurvedic literature & Modern text were reviewed & screened at appropriate places totest the hypothesis mentioned. Related information from other sources such astextbooks of Modern Medicine, websites, authentic journals & studies conducted to related works were also compiled. Genuine raw materials were collected & screened. The formulation of *Vidarikandadiyoga* was prepared in the pharmacy attached to the institute. The standard operatingprocedure for *choornakalpana* was followed. Sample source for experimental study– Wistar albino rats were randomly taken and grouped into 5 groups consisting of 6 rats – the control group, *Ashwagandha* group, *Vidarikanda*group, *Vidarikandadi Yoga* group and the standard group.

Inclusion criteria: Healthy active albino rats of either sex weighing between 120 -235 g were selected.

Exclusion criteria: Diseased and infected rats, pregnant albino rats, albino rats under trial for other experiments, and rats weighing less than 120g or more than 235g were excluded.

Grouping: 30 Albino rats of both sexes were selected and grouped into 5 groups.

Table 1. Grouping of rats for the study

Groups	Group Name	Drug	No: of rats
I	GC	Distilled water	6
II	GT	*Ashwagandhachoorna*	6
III	GT	*Vidarikandachoorna*	6
IV	GT	*Ashwagandha &Vidarikandachoorna*	6
V	GS	Deca-Durabolin	6

Preparation of the trial drugs: *Vidarikanda*and *Ashwagandha* were freshly collected and dried. The *choorna* (powder) of the drugs were prepared according to the standard procedure mentioned in classics.

Table 2. Ingredients of *Vidarikandadi Yoga*

Drug	Scientific Name	Family	Proportion
Vidarikanda	Pueraria Tuberosa	Fabaceae	1 part
Ashwagandha	WithaniaSomnifera	Solanaceae	1 part

Dose fixation of the drug: The dose of the trial drugs was calculated from human dose by following Paget& Buren's 1964 formula involving body surface ratio.The dose of the*choornas* was fixed as 1.08g/20ml body weight. The dose of Deca- Durabolin was fixed as 0.2ml.

Route of drug administration: The drugs were administered by oral route with the help of a syringe.

Procedure: Each group of rats was housed in a different cage, with daily supplies of food and water provided.Rats in Group 1–the control group, were administered distilled water. Group 2 received *ashwagandha choorna*, Group 3 received *Vidarikandachoorna*, Group 4 received *Vidarikandadi Yoga*, and Group 5 – the standard group received deca-durabolin for a period of 28 days. Every week, anthropometric measurements were recorded.

List of experiments conducted to support *Brimhana Upakrama*[11]

1. Anthropometric measurements
2. Rotarod Test
3. Swimming Endurance Test
4. Open-field Behaviour
5. Histopathology of Adrenal Gland

Anthropometric Measurements: The weight and anthropometric measurements of every rat in each group were recorded on the 7th, 14th, 21st, and 28th day of the experiment. A thread and measuring scale were used to help with the manual anthropometric measurements. The study involved measuring the following bodily measurements: head to tail length, tail length, chest circumference, abdomen circumference, fore limb circumference, hind limb circumference, and neck circumference. The formula BMI= Body weight(g)/length(cm)^2 was used to determine the body mass index.

Rotarod Test[12]*:* The Rotarod test is used to evaluatemotor coordination and balance in rats. It provides a quick estimate of their neuromuscular coordination.The rats from each of the 5 groups were positioned one after other on the horizontal rod that rotated at a speed of 15 rotations per minute. The length of time the rats remained on the rod was recorded.

Swimming Endurance Test: The Initial rectal temperature of the rats in each group were noted before the swimming endurance test. They are then kept in containers with a height of 50 cm, and the water level is maintained at 40 cm, with the water temperature between 22-24°C. At first, the rats within the cylinder were very active. They would swim briskly in circles, attempt to scale the wall, and dive to the bottom. The activities started to taper off after 2-3 minutes and were broken up by periods of floating while adjusting posture. The rats usually stayed passively floating in the water and reached a plateau after 5-6 minutes. Following 30 minutes of exposure to a stressful environment, each rat was removed individually, and the rectal temperature was immediately noted.

Open-field behaviour Test: This test was carried out before and after the swimming endurance test. It is an experimental procedure used typically in rodents to measure general locomotor activity levels, anxiety and eagerness to explore. The open field apparatus are typically enclosed areas with surrounding walls which may be square, rectangular or circular in shape. The rats from each group are placed one by one in the apparatus. It will first avoid the middle and inner circles and stick to the outer circles. The rats that are more nervous spend more time near the outer circle, near the walls whereas the normal rats usually settle into the chamber and eventually investigate the middle and inner circles. The number of squares crossed in the outer, middle and inner circle were noted. The number of rearing, grooming, faecal pellets and freezing time were also noted.

Histopathlogy of Adrenal Gland: The rats were sacrificed after the study & the adrenal gland was removed for histopathology study. This is to note signs of hyperplasia, degeneration, necrosis and inflammation.

RESULTS

Anthropometric parameters: The groups 2,3,4 & 5 which were administered with *Ashwagandha*, *Vidarikanda, Vidarikandadi Yoga* &deca-durabolin respectively exhibited *Brimhana* effect as compared to the control group. However, *Vidarikandadi Yoga* statistically showed more significant results as compared to the other groups in terms of body weight and anthropometric measurements.In comparison to the baseline values recorded on the 1st day as opposed to the other groups, it was noted that there was a statistically significant rise in body weight of rats administered with *Ashwagandha choorna&Vidarikandadi Yoga* on the 1^{st,} 2nd, and 4th week of the trail. Measurements taken on the 3rd and 4th weeks revealed a statistically significant rise in the circumference of the chest and abdomen, which was statistically extremely significant when compared to the baseline of *Vidarikandadi Yoga* administered group.

Table 1. Effect of *Vidarikandadi Yoga* on body weight

VIDARIKANDADI YOGA	BODY WEIGHT(g)MEAN ± SEM	% CHANGE
Initial	177 ± 13.63	----
Final Reading	227.33 ± 23.49	(+)226.33↑

Data: MEAN±SEM

Table 2. Effect of *Vidarikandadi Yoga* on Body-Mass Index

VIDARIKANDADI YOGA	BODY WEIGHT(g) MEAN ± SEM	% CHANGE
Initial	177 ± 13.63	----
Final Reading	227.33 ± 23.49	(+)226.33↑

Data: MEAN±SEM

Table 3. Effect of *Vidarikandadi Yoga* on Abdominal Circumference

VIDARIKANDADI YOGA	BODY WEIGHT(g)MEAN ± SEM	% CHANGE
Initial	12.97 ± 0.37	(+) 11.97↑
Final Reading	11.98 ± 0.21	(+) 12.36↑

Data: MEAN±SEM

Table 4. Effect of *Vidarikandadi Yoga* on Chest Circumference

VIDARIKANDADI YOGA	BODY WEIGHT(g)MEAN ± SEM\	% CHANGE
Initial	10.38 ± 0.40	(+) 11.05↑
Final Reading	13.36 ± 0.64	(+) 12.36↑

Data: MEAN±SEM

Table 5. Effect of *Vidarikandadi Yoga* in Rotarod Test

VIDARIKANDADI YOGA	MEAN ± SEM	% CHANGE
	73.5 ± 7.75 (*)	(+)72.5↑

Data: MEAN±SEM, * P < 0.05

Table 6. Effect of *Vidarikandadi Yoga* on Swimming Endurance Test

VIDARIKANDADI YOGA	MEAN ± SEM	% CHANGE
	24 ± 3.86	(+)23↑

Data: MEAN±SEM

When comparing the BMI's of the various groups on different days, it was found that, on 1st week, the groups receiving *Ashwagandha* &*Vidarikandadi Yoga* had higher BMI's than the baseline values.

Rotarod Test: The time of fall was observed in all the groups. There was little variation in the 3groups falling times. However, it showed that the group administered with*Vidarikandadi Yoga* was the only group which could stay for nearly 97 secs, followed by *Ashwagandha* group with 88 secs, *Vidarikanda*group with 83 secs, control group with 69 secs & the group administered with deca-durabolin was just 25 secs.

Swimming Endurance Test: It was observed that the rats placed in the cylinder filled with water were initiallyactive in all the groups. But, in group administered with *Ashwagandha,* control & standard group showed phases of immobility after 10 minutes & couldn't swim for more than 15-20 mins. The group administered with *Vidarikandadi Yoga* &*Vidarikanda*survived for 30 mins. However, phases of immobility were more in the *Vidarikanda*group as compared to *Vidarikandadi Yoga* group. The rectal temperature noted before and after Swimming endurance test and showed only little variation in all groups.

Open-field Behaviour Test: Open-field behaviour was conducted before and after the Swimming endurance test. All the groups showed only slight variation in terms of locomotor activity & exploratory behaviour. The control group,the group administered with *Ashwagandha* & standard group showed increased freezing time, rearing, grooming &faecal pellets before and after Swimming Endurance test. *Vidarikanda*group was comparatively better than these groups.

However, *Vidarikandadi Yoga* group showed exceptional performance even after Swimming Endurance test with no freezing time & faecal pellets.

Histopathology of Adrenal Gland: All the slides showed adrenal tissue consisting of cortex and medulla. The cortex consists of 3 zones, Zona glomerulosa, Zona fasciculata and Zona reticularis. Compared to Group 1,2,3 & 5, Group 4 administered with *Vidarikandadi Yoga* showed mild increase in the number of cells (hyperplasia) in the Zona Reticularis area.

Statistical Analysis: Standard error of mean, MEAN ± SEM, was used to express all the numbers. ANOVA was used to analyse the data, and Dunnett's multiple "t" test post doc was used. P<0.05 was the threshold for statistical significance. The degree of importance was recognized and interpreted appropriately.

DISCUSSION

Mamsa dhatu is responsible for *Shareera Pushti.* Thus, a gain in weight suggests the augmentation of *Mamsa Dhatu.* Both *Vidarikanda* and *Ashwagandha* are considered as *balya*(strengthening)*, brimhaniya* (improves weight)*, vatahara* (decreases Vata)*, vajikara* (aphrodisiac), and *Rasayana* (nourishing). They are mentioned in the *Brimhaniya Kashaya Gana* according to Charaka Samhita. The increase observed in abdomen & chest circumference is in conformity to the increase in *Mamsa dhatu* ,thus showing *Brimhana*effect. The results in BMI showed more in *Vidarikandadi Yoga* group than the rest of the groups. In *Vidarikandadi Yoga* treatedgroup, there was statistically significant decrease in the number of immobility in comparison to the standard

group in SET. In evaluation to the rotarod test and open field behaviour also, *Vidarikandadi Yoga* showed exceptional performance

CONCLUSION

The misuse of steroids is associated with a plethora of adverse effects, including hypogonadism, cardiac and hepatic dysfunction, alterations in blood lipid levels, gynecomastia, excess water retention, high blood pressure, as well as changes in behaviour and mood swings.Steroids may offer short-term benefits such as increased muscle mass and improved athletic performance, their abuse can lead to severe health complications. Whereas *Vidarikandadi Yoga* not only helps in increasing muscle mass & strengthening the body, it also has a *Rasayana*effect ,thus helping in overall physical & mental well-being. From the experimental study, it was seen that there is *Brimhana*effect of *Vidarikandadi Yoga* w.r.t its anabolic activity.

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