ORIGINAL RESEARCH ARTICLE

Influence of Hot Extract of *Dolichos biflorus* (*Horse gram*) on Body Weight in Overweight or Obese Human Volunteers

Bhuvaneshwari S[1*], Sushmitha Dev K[2], Geetha V. Shastri [3], Bhuvaneswari k[4]

[1]*Professor, Department of Pharmacology,* [2]*Former MBBS Student,* [3]*Former Professor, Department of Pharmacology,* [4]*Professor & HOD, Department of Pharmacology, PSG IMS &R, Peelamedu, Coimbatore-641004,Tamilnadu,India*

ABSTRACT

Obesity, a global problem, has two important implications in an individual's life. The major one is the health risks exposed to and the minor one is the cosmetic value attached to it. The intensity of this problem was recognized globally. Research is going on in different directions to identify anti obesity potential in drugs already in use as well as screening newer agents for this aspect. So this study was planned to find out the influence of horse gram on body weight in human volunteers. Before conducting study Institutional Human Ethics Committee approval was obtained. Hot extract of *Horse gram* was prepared. It was given to Male and female group (ten per group). Overweight or Obese volunteers were included for the study. Daily monitoring of body weight prior to horse gram extract administration done to ensure correct dosing of *horse gram* extract every day. Weekly assessment of % gain or loss of body weight was calculated based on pretreatment body weight for each volunteer. It was found that Hot extract of *horse gram* has antiobesity activity. The onset of anti obesity effect was quicker in males than females. The magnitude of this activity was more pronounced in males than in females. Compliance was better among female than among male volunteers.

Key words: *Horse gram*, antiobesity activity, humans.

INTRODUCTION

Obesity, a global problem, has two important implications in an individual's life. The major one is the health risks exposed to and the minor one is the cosmetic value attached to it. The intensity of this problem was recognized globally. Obesity is doubling every five years in many parts of the world. So we have an epidemic that is coming at the health service like a tidal wave. Hence any measure that can end up in healthy weight reduction, even if it is only to a smaller degree, is most welcome by all. Research is going on in different directions to identify anti obesity potential in drugs already in use as well as screening newer agents for this aspect. While chemical agents as drugs are inherently associated with adverse side effects, alternative is edible natural food product with time proven safety potential along with anti obesity effect. *Dolichos biflorus Linn* is an appropriate choice in this regard. It is known as *horse gram* is a common twining plant all over India. In traditional medicine, the plant is sighted as astringent, diuretic and tonic. The decoction of the grain is indicated in scrofula (glandular swelling) and corpulence (obesity). A soup is a diet in sub acute cases of piles, enlarged liver and spleen. The pulse is eaten in the form of soup and porridge and is attributed to reduce weight in obese individuals [1]. The seed has the ability to reduce post-prandial hyperglycemia by slowing down carbohydrate digestion and reduce insulin resistance by inhibiting protein-tyrosine phosphatase 1 beta enzyme [2]. Horse gram and moth bean are the unexploited legumes of the tropics and subtropics grown mostly under dry-land agriculture. The chemical composition is comparable with commonly cultivated legumes. Like other legumes, these are deficient in methionine and tryptophan. Horse gram is an excellent source of iron and molybdenum. Comparatively, horse gram seeds have higher trypsin inhibitor and hemagglutinin activities and polyphenols than

*Corresponding Author: Dr. S. Bhuvaneshwari, **Email:** bhuvana1421@gmail.com

moth bean seeds. Dehusking, germination, cooking, and roasting have been shown to produce beneficial effects on nutritional quality of both the legumes [3]. A combination of *P. betle* leaf extract and *D. biflorus* seed extract in a ratio of 2:3, LI10903F also known as LOWAT demonstrated greater anti-adipogenic as well as lipolytic activities compared to the individual extracts. Supplementation with the herbal blend at 900 mg per day resulted in statistically significant reductions in body weight and BMI that exceeded those achieved via diet management and moderate exercise alone[4]. So this study was planned to find out the influence of horse gram on body weight in human volunteers.

AIM AND OBJECTIVES

The aim of this study was to find out the influence of *Horse gram* hot extract on body weight in overweight or obese human volunteers.

The objectives are:
1. To assess the anti obesity activity of *Horse gram* hot extract in male and female overweight or obese human volunteers.
2. To identify the influence (if any) of gender on such activity by comparing the above effect in male and female.

MATERIALS AND METHODS

Before conducting study Institutional Human Ethics Committee approval was obtained. After getting written informed consent from each volunteer the study was carried out.

Preparation of hot extract of *Horse gram* [5] for each volunteer daily:

20 g of horse gram was soaked in water overnight and then pressure cooked next day. The supernatant was filtered through sterile filter. The volume was adjusted so that the extract has essence obtained from 500mg horse gram in 1ml. This was used orally in a dose of 300mg/kg/day.

Selection of volunteers:

BMI was calculated for each volunteer. Volunteers having BMI 25 to 35 were included for the study. They were categorized as overweight or obese. They do not overtly suffer from any medical problem which may interfere with the study.

Study design:

Interventional longitudinal study design.

Grouping and dosing:

Human volunteers 10 males and 10 females with BMI 25-35 were included for the study. The same

volunteers were utilized for control and test groups. The assessment of normal weight gain pattern in both male and female was first assessed for four weeks (control group). The same group was assessed for change in weight gain pattern by administering the *horse gram* hot extract daily for six weeks (test groups).

1. Pre treatment Male (PM) and Female (PF) Groups:
   This comprised of the male and female volunteers who received only water daily for four weeks.
2. Treated Male (TM) and Female (TF) Groups:
   This comprised of the same male and female volunteers who additionally received measured volume of freshly prepared *horse gram* hot extract, calculated on the basis of their body weight, daily for six weeks continuously. The dropouts during the study were also recorded.

Parameters measured:

- Weekly recording of body weight for four weeks was done prior to start of *horse gram* extract administration in PM and PF groups
- Daily monitoring of body weight was done prior to horse gram extract administration to ensure correct dosing of *horse gram* extract every day in TM and TF groups.
- Weekly assessment of % gain or loss of body weight was calculated based on pretreatment body weight for each volunteer.

Statistical analysis:

- Student paired t test was used to analyse the weekly change in body weight before and after intake of *horse gram* between PM and TM as well as PF and TF groups
- Unpaired t test was used to analyse the difference in response to intake of *horse gram* between TM and TF groups

RESULTS

- The BMI and the body weight during the four weeks prior to horse gram administration were tabulated for PM and PF groups and analysed statistically using paired t test (**Table 1& 2**).
- From the analysis it was evident that there was no significant change (p> 0.05) in the body weight of both male & female

volunteers during the pre period of four weeks prior to horse gram

- Therefore, for each volunteer the mean of four weeks value was taken as the pretreatment body weight. Keeping this weight as base line at weekly intervals the weight loss/gain due to horse gram was converted into % for that volunteer using the following formula:

% weight loss/gain = Pretreatment mean – test value/Pretreatment mean X 100. It was tabulated in (**Table 3 & Figure 1**)

Table 1: Pretreatment Male Group

Case	BMI	Body weight in Kg				Mean ± SD	SEM
		Week 1	Week 2	Week 3	Week 4		
1	26.09	77	76.5	79	78	77.63 ± 1.11	0.55
2	26.53	74	75	74	75	74.5 ± 0.58	0.29
3	25	74	72	73	71	72.5 ± 1.29	0.65
4	29.06	88	88	90	90	89 ± 1.15	0.58
5	28.33	79	77	79	79	78.5 ± 1.00	0.5
6	30.8	90	90	91	90	90.25 ± 0.5	0.25
7	31.9	100	99	98	100	99.25 ± 0.96	0.48
8	25.5	80	80	83	82	81.25 ± 1.5	0.75
9	34.5	85	84	86	85	85 ± 0.82	0.41
10	31.6	92	92	92	92	92 ± 0.00	0.00

Table 2: Pretreatment Female Group

Case	BMI	Body weight in Kg				Mean ± SD	SEM
		Week 1	Week 2	Week 3	Week 4		
1	35	90	91	90	90	90.25 ± 0.5	0.25
2	28.05	65	64	64	64	64.25 ± 0.5	0.25
3	28.06	78	77	77	77	77.25 ± 0.5	0.25
4	27	72	72	71	71	71.5 ± 0.58	0.29
5	25	63	63	62	63	62.75 ± 0.5	0.25
6	27.2	66	67	66	66	66.25 ± 0.51	0.25
7	32.87	80	78	79	80	79.25 ± 0.96	0.48
8	30	74	74	73	74	73.75 ± 0.5	0.25
9	25	60	60	60	60	60 ± 0.00	0.00
10	28.04	70	70	71	70	70 ± 0.5	0.25

Table 3: % Change in body weight during intake with *horse gram*

Weeks	Male			Female		
	N	Mean ± SD	SEM	N	Mean ± SD	SEM
1	10	-0.45% ± 1.86	0.59	10	0.64% ± 1.11	0.34
2	7	-2.21% ± 1.88	0.71	10	-0.81% ± 1.48	0.47
3	6	-2.22% ± 2.19	0.89	8	-0.84% ± 1.38	0.49
4	6	-1.88% ± 2.74	1.12	7	-0.96% ± 3.08	1.17
5	6	-2.72% ± 2.46	1.00	7	-0.73% ± 2.73	1.03
6	6	-2.48% ± 2.48	0.95	7	-1.19% ± 3.84	1.45

DISCUSSION

Pretreatment period (Table 1 & 2):

There was no statistically significant loss or gain in body weight during this period, indicating that with their routine diet habit and exercise, volunteers were able to keep their body weight constant. Therefore it was implied that any change in weight during intake of *horse gram* period can be attributed to intake with *horse gram* extract.

Interventional Period (Figure 1):

Treated males:

There was loss of weight throughout. Statistically significant loss (p <0.01) started only after two weeks of treatment. This indicates that there is a latent period of two weeks in initiating the anti obesity effect. Once initiated, the effect continued with a slight dip at the fourth weekend and a slight

hike at the fifth week end and again a slight dip in effect at sixth weekend in its anti obesity effect.

Treated females:

In contrast to males, in treated females there was significant increase in weight by at the end of 1st week (p<0.05). But on continued treatment, the weight started decreasing gradually but the decrease in weight was at no point statistically significant (p>0.05).

In contrast to females, the anti obesity effect of *Horse gram* in male, not only manifested quickly but also lasted as long as the extract was administered. In females first a brief weight gain followed by an insignificant weight loss, all despite continued Horse gram intake, was the pattern seen. This clearly indicates an influence of gender over the anti obesity effect of *Horse gram* extract. The reason for this difference may be an interaction between *Horse gram* extract and female hormones, estrogen and progesterone causing metabolic interference.
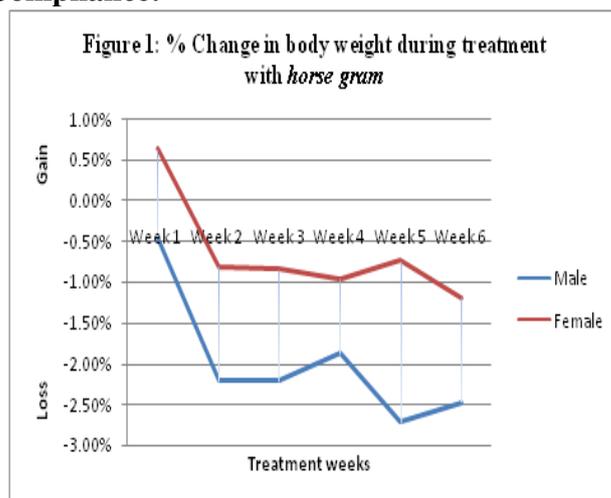
Compliance:

Figure 1: % Change in body weight during treatment with *horse gram*
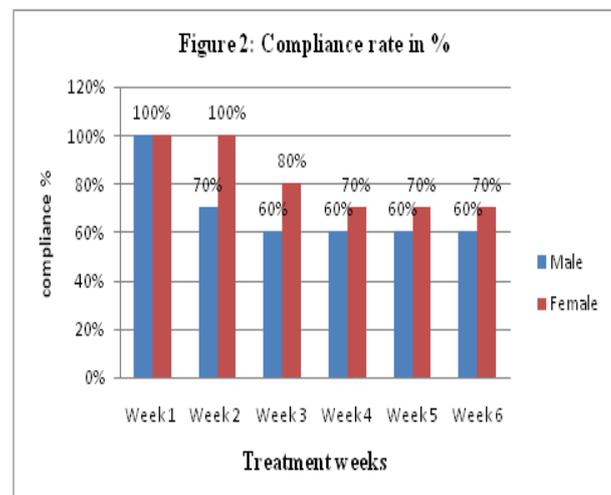

Figure 2: Compliance rate in %

The (**Figure 2**) reflects among the male volunteers, there was 30% drop outs after 1st week itself and this increased to 40% after two weeks. Among female volunteers the drop outs rate was 20% and 30% at the beginning of 3rd week and 4th week respectively. Thus the compliance was better in females than in males.

Scope for Future Research:

- In view of some gender influence on the anti obesity effect of *Horse gram*, the reason underlying this has to be probed further.
- The mechanism underlying its anti obesity activity as to whether it is appetite suppression or enhanced energy expenditure or both has to be sorted out.
- An analysis of the hot aqueous extract of *horse gram* to identify the active principle can pave way for potential anti obesity drug.
- The study has to be extended to a larger population of human volunteers to confirm the conclusions drawn from this study.

REFERENCES

1. *Dolichos biflorus Linn*. By A K Nadkarni in Dr K M Nadkarni's Indian Materia Medica with Ayurvedic, Unani & Home Remedies (Vol. 1), 3rd Revised & Enlarged Edn.(1992) pp 458-459. Popular Prakashan Bombay.

2. http://www.thehindu.com/sci-tech/health/diet-and-nutrition/raw-horse-gram-good-for-diabetics/article4651090.ece.

3. Kadam SS, Salunkhe DK (1985). "Nutritional composition, processing, and utilization of horse gram and moth bean". *Crit Rev Food Sci Nutr* 22 (1): 1–26.

4. Sengupta K, Mishra AT, Rao MK, Sarma KV, Krishnaraju AV, Trimurtulu G. Efficacy of an herbal formulation LI10903F containing *Dolichos biflorus* and Piper betle extracts on weight management. Lipids Health Dis. 2012 Dec 27; 11:176.

5. Pharmacognosy by C K Kokate, A P Purohit & S B Gokhale, 27th Edn. (2004) pp 36-112. Nirali Prakashan & Company, Pune.