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Research Article

A COMPARATIVE STUDY OF ANTIOBESITY PROPERTY OF BARLEY AND OAT FLOUR

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ABSTRACT

The present study was designed to evaluate the effect of flour barley and Oat (Family-*Poaceae*) on body weight and associated metabolic disorder in over weight human volunteers. The study participants comprised of 48 healthy, over weight (defined as BMI>23/m^2) human volunteers divided in two groups, of age group 20-60 years, in a dosage of 150 g, in a form of chapatti once in a day for two months. Anthropometrics, hematological and subjective parameters were carried out ~~on~~ in the beginning and also at the end of the trial. The single blind trial was conducted for 2 months. Significant improvement in Body weight, BMI, BMR, Visceral fat, Body fat, Lipid profile, Skin fold thickness was observed in both Barley flour group and Oat flour group, but Barley flour group is found to be more effective than Oat flour group. Barley flour in the form of chapatti to overweight human volunteers shown favorable impact on body weight and a variety of parameter characteristic of the metabolic syndrome.

KEYWORDS: Barley, Oat, *Yava, Jai, Antiobesity, Ayurveda.*

INTRODUCTION

Now-a-days changes in dietary practices, physical activity levels and lifestyles associated with rising affluence contribute to increasing prevalence of overweight in all the age group of society. Obesity has reached epidemic proportions in India in the 21st century, with morbid obesity affecting 5% of the country's population[1]. The National Foundation of India undertook a study amongst the middle class (officers), lower middle class (clerks and peons) in a large office establishment, and amongst the poor class from a slum in Delhi. As against obesity of 1% for males and 4% for females in slums, the corresponding figures in the middle class were 32.3% and 50%. More females than males have been found to be overweight (BMI > 25) in all age groups, 44.5% in females vs 19.6% in males. Incidence of obesity was higher in people above 40 years. The prevalence of obesity (BMI >30) was about 3% in males and about 14% in females above 40 years of age[2]. 20 million Indians are obese and by 2025 the expected number shall be 68 million[3]. Obesity exists when adipose tissue comprises greater than normal fraction of body weight. The measurement of body fat is too complex to be of practical clinical application. Hence surrogate measures such as the Quetelet index (Body mass index - measured as weight in kg/height in meters), are used in daily practice. The World Health Organization guidelines define a BMI of 18.5 to 24.9 kg/m^2 as normal, 25 to 29.9 kg/m^2 as grade 1 overweight and greater than 30 kg/m^2 as grade 2 overweight (WHO, 1995)[4].

These have been developed by western researchers based on studies in Caucasian populations, and in no way are designed to be applicable to whole populations. Important differences exist in the form of higher/lower body fat content for a given BMI in South-east Asians, Polynesians, Micronesians and Asian Indians to give a few examples[5]. The International Diabetes Federation has accepted BMI value of >25 kg/m2 and 23 kg/m2 as the cut-off for obesity for Asian men and women respectively[6]. So for the present study the patient having BMI>23 are included.

With the current "back to nature" thrust, many obese patients also look for some help

from the traditional systems like Ayurveda. Traditionally, obesity was believed to be associated with life style, several studies have shown that changes in dietary pattern, physical activity levels, life styles are related to increasing frequencies of obesity and the risk of associated diseases. Present work was conducted on Barley (*Yava*) and Oat (*Jai*). Many preparations of barley are reported to widely use as weight reducing diet like *Sattu, Laja* etc. *Ayurvedic* texts prefer *Yava* (barley) over Jai (Oat) because Oat is considered as a *Kudhanya* (inferior type of cereals). But now a days, Oat is commonly used as a weight reducing diet. As per Indian traditional drug knowledge *Yava* and *Jai* both are used for "*Lekhana karma*". The drug which will reduces or scrapes away the unwanted *Dhatus* (tissue) and *Malas* (metabolic wastes) and thus helpful in removing extra fat (*Meda dhatu*) is known as "*Lekhana karma*"[7].

METHODOLOGY

The trial drugs Barley and Oat were authenticated by Botanical Survey of India, Arid Zone regional circle, Jodhpur-08 (Rajasthan) on date April 29, 2010 as *Hordeum vulgare* linn. and *Avena sativa* Linn. respectively. Preliminary Pharmacognostical, Phytochemical aspects and Nutritional value assessment of drugs were done in the laboratory of Department of Dravyaguna Vigyana, NIA.

A total 56 (28 in each group) overweight/obese sedentary men and women aged 18 to 60 years old patients and BMI >23 kg/m^2 after consenting to participate in the drug trial were recruited and randomly allocated in any one of the two groups in the Hospital of NIA. Patients of hypertension, diabetes, hypersensitivity, endocrinal diseases, pregnant or lactating woman (or those planning to become pregnant during the study), individuals with chronic disease, depression and patient aged more than 60 years were excluded from this study, volunteers with BMI ≤ 23 kg/m^2 or ≥ 40 kg/m^2, recent use of any weight loss medication, supplements or programs, a history of weight reducing surgery, or an eating disorder were also excluded from this study. A special performa was prepared incorporating all the signs and symptoms of obesity based on both *Ayurvedic* and modern descriptions and accordingly, the detailed history was taken and physical examination was done. Of the 56 participant screened 48 (25 in Group A and 23 in Group B) participants completed the whole study. So we compared and analyzed the data of 48 participants in the study. To check the significance of results parametric Student's't' test was performed for the parametric data and Wilcoxan rank sum tests for non parametric data by using software Graph Pad Instat, Version 3.

The patients undergone the treatment were assessed on the basis of symptom rating score depicted below for improvement in specific symptomatology as mentioned in Ayurvedic texts[8 9 10].

Scoring pattern (Subjective Parameters)

1. *Chala Sphika* (Movement of gluteal region)

0 : Absence of movement (Absence of *Chalatva*)
1 : Little visible movement (in these areas) after fast movement
2 : Little visible movement (in these areas) even after moderate movement
3 : Movement (in the areas) after mild movement
4 : Movement at normal gait

2. *Chala Udara* (Movement of Abdominal region)

0 : Absence of movement (Absence of *Chalatva*)
1 : Little visible movement (in these areas) after fast movement
2 : Little visible movement (in these areas) even after moderate movement
3 : Movement (in the areas) after mild movement
4 : Movement at normal gait

3. *Chala Stana* (Movement of Breast region)

0 : Absence of movement (Absence of *Chalatva*)
1 : Little visible movement (in these areas) after fast movement
2 : Little visible movement (in these areas) even after moderate movement
3 : Movement (in the areas) after mild movement
4 : Movement at normal gait

4. *Alasya / Utsahani* (Laziness)

0 : No *Alasya* (doing work satisfactorily with proper vigour in time)
1 : Doing work satisfactory with initiation late in time
2 : Doing work unsatisfactory with lot of mental pressure and late in time
3 : Not starting any work in his responsibility, even doing little work very slowly

4 : Does not have any initiation and not wants to work even after pressure

5. *Ksudrasvasa* (Dyspnoea on Exertion)

0 : Dyspnoea after heavy work (movement) but relieved soon and within tolerance
1 : Dyspnoea after moderate work but relieved later and within tolerance
2 : Dyspnoea after little work but relieved later and within tolerance
3 : Dyspnoea after little work but relieved later and beyond tolerance
4 : Dyspnoea in resting condition

6. *Daurbalya* (Weakness)

0 : Can do routine exercise.
1 : Can do moderate exercise without difficulty
2 : Can do only mild exercise
3 : Can do mild exercise with very difficulty
4 : Cannot do even mild exercise

7. *Nidradhikya* (Excessive sleep)

0 : Normal sleeps 6-7 hrs. per day.
1 : Sleep upto 8 hrs./day with *Anga gaurava*
2 : Sleep upto 8 hrs./day with *Anga* and *Jrimbha*
3 : Sleep upto 10 hrs./day with *Tandra*
4 : Sleep more than 10 hrs./day having *Tandra* and *Klama*

8. *Swedadhikya* (excessive sweating)

0 : Sweating after heavy work and fast movement or in hot season
1 : Profuse sweating after moderate work and movement
2 : Sweating after little work and movement
3 : Profuse sweating after little work and movement
4 : Sweating even at rest or in cold season

9. *Daurgandhya* (Foul smell)

0 : Absence of bad smell
1 : Occasional bad smell in the body removed after bathing
2 : Persistent bad smell limited to close areas difficult to suppress with deodorants
3 : Persistent bad smell felt from long distance is not suppressed by deodorants
4 : Persistent bad smell felt from long distance even intolerable to the patient himself/herself

10. *Snigdhagatrata* (Lustrous body)

0 : Normal *Snigdhata* (luster)
1 : Oily luster of body in summer season
2 : Oily luster of body in dry season
3 : Excessive oily luster of body in dry season which can be removed with difficulty
4 : Persistence and profuse stickiness all over body

11. *Gaurava* (heaviness)

0 : No heaviness in body
1 : Feels heaviness in body but it does not hamper routine work
2 : Feels heaviness in body which hampers daily routine work
3 : Feels heaviness in body which hampers movement of the body
4 : Feels heaviness with flabbiness in all over body which causes distress to the person

12. *Ati Pipasa* (Excessive thirst)

0 : Normal thirst
1 : Up to 1 litre excess intake of water
2 : 1 to 2 litre excess intake of water
3 : 2 to 3 litre excess intake of water
4 : More than 3 litre intake of water

13. *Ati Kshaudha* (Excessive hunger) was decided on *Ruchi, Abhyavaranasakti* and *Jaranashakti.*

***Ruchi* (Willingness toward meal)**

0 : Totally unwilling for meal.
1 : Unwilling for food, but could take the meal
2 : Willing towards only most liking food, and not to other
3 : Wiling towards only one among *Katu*/*Amla*/*Madhura* food stuffs or specific *Ahara* or *Rasa Vishesa* (Specific taste)
4 : Equal willing towards all the *Bhojya padartha*

***Abhyavaranasakti* (Intake of Diet)**

0 : Eats full normal diet
1 : Eats 25% less than full diet
2 : Eats 50% less than full diet
3 : Eats 75% less than full diet

***Jaranashakti* (Digestion capacity)**

0 : Prompt and proper appearance of appetite in next meal hour
1 : Occasional feeling of hunger before next meal hour/hunger
2 : Frequent feeling of hunger even after

eating
3 : constant feeling of hunger even after eating

14. *Kricha Vyavayata* (Impaired libido)

0 : Unimpaired libido and sexual performance
1 : Decrease in libido but can perform sexual act
2 : Decrease in libido but can perform with difficulty
3 : Loss of libido and cannot perform sexual act

15. *Gatra Sada/Anga sada* (Fatigue)

0 : No fatigue
1 : Little fatigue in doing hard work
2 : Moderate fatigue in doing routine work
3 : Excessive fatigue in doing routine work
4 : Excessive fatigue even in doing little work

Group design: Eligible participants were randomly assigned to receive either Barley flour in a chapatti form (150 mg, OD) or Oat flour (150 mg, OD) in a chapatti form. Study drugs were packaged in identical, single serving containers. The study products were labeled and coded in such a manner that subjects were unaware of which product each participant was receiving.

Physical and Hematological parameters

All the patients were investigated before and after the study period for their physical parameters (anthropometric) like Body weight, BMI, Body fat %, Visceral fat, Waist, Hip, Waist Hip ratio and Skin fold thickness and Hematological parameters like Fasting Sugar, Serum Cholesterol, Serum Triglycerides, HDL, VLDL, LDL. All anthropometric parameter were measured at each study visit by using a non stretch anthropometric tape at the end of normal expiration[10]. Hematological parameters were measured by pathological lab of NIA on blood samples. Serum total cholesterol was measured on the basis of Chod- PAP method by measuring absorbance at 505 nm due to formation of Red quinoneimine complex[11]. Triglycerides were quantified on the basis of GPO- PAP method[12, 13]. The serum LDL- Cholesterol concentration was calculated according to the Friedewald equation[14]; LDL-C ¼ total-C - HDL-C - TG/2.2* LDL-C was not calculated when the TG concentration was >4.5 mmol/L.

RESULTS

Significant improvements were observed in both groups. Group A (Barley group) showed maximum improvement. Results are tabulated in Table No.3, 4, 5 and Table No.6.

Table 1: Incidence of Causative Factors (*Nidana*) in 48 Registered Patients of Obesity

Causative factors (*Nidana*)		Group-A	Group-B	Total	%
Guruvadi sevana / *Snigdhadi sevana* (curd, jaggery products, rice, fried eatables etc.)	0-3 days	5	14	19	39.58
	4-5 days	0	1	1	2.08
	6-7 days	13	2	15	31.25
Madhuradi sevana (Sweets)	0-3 days	5	6	11	22.91
	4-5 days	15	10	25	52.08
	6-7 days	0	1	1	2.08
Sitahara sevana (Intake of cold water and drinks etc)	0-3 days	12	8	20	41.66
	4-5 days	3	12	15	31.25
	6-7 days	5	4	9	18.75
Kshira product *Sevana* (Milk and dairy products)	0-3 days	1	15	16	33.33
	4-5 days	0	0	0	00
	6-7 days	14	0	14	29.16
Navanna sevana (Usage of fresh grains)	0-3 days	0	0	0	00
	4-5 days	5	9	14	29.16
	6-7 days	0	0	0	00
Pisttanna sevana (Cereals products as Rabri, Jalabi etc.)	0-3 days	0	13	13	27.08
	4-5 days	11	0	11	22.91
	6-7 days	0	0	0	00
Ati Bhojana Sevana (Overeating)	0-3 days	0	0	0	00
	4-5 days	16	14	30	62.5

	6-7 days	0	0	0	00
Anupa & Jaliya Mamsa sevana (Non vegetarian food)	0-3 days	0	0	0	00
	4-5 days	7	4	11	22.91
	6-7 days	0	5	5	10.41
Sarpi sevana (Intake of ghee & Oil)	0-3 days	12	9	21	43.75
	4-5 days	0	1	01	0.02
	6-7 days	0	4	04	8.33
Bread/Fast food	0-3 days	0	0	00	00
	4-5 days	17	7	24	50
	6-7 days	0	0	0	00
Tea/Coffee with sugar	0-3 days	0	0	0	00
	4-5 days	1	0	01	0.02
	6-7 days	24	23	47	97.91
Asya sukha (leisurely life)	0-3 days	0	1	01	2.08
	4-5 days	1	13	14	29.16
	6-7 days	15	0	15	31.25
Avyayama (Absence of exercise)	0-3 days	0	0	00	00
	4-5 days	11	12	23	47.91
	6-7 days	11	8	19	39.58
Diwaswapana (sleeping in a day time)	0-3 days	1	2	03	6.25
	4-5 days	17	10	27	56.25
	6-7 days	0	0	00	00
Avyavaya (Impaired libido)	0-3 days	2	2	04	8.33
	4-5 days	0	0	00	00
	6-7 days	0	0	00	00
Acinta (Free of stress/mental tension)		13	7	20	41.66

Table 2: Symptoms of *Sthaulya* in 48 Registered Patients of Obesity

Symptoms	**Group A**	**Group B**	**Total**	**%**
Chala Sphika	13	11	24	50
Chala Udara	10	8	18	37.50
Chala sthana	10	10	20	41.66
Alasya	16	13	29	60.41
Ksudra Svasa	3	4	07	14.58
Daurbalya	14	12	26	54.16
Nidradhikya	5	2	07	14.58
Swedadhikya	8	8	16	33.33
Daurgandhya	9	7	16	33.33
Snigdhagatrata	15	14	29	60.41
Gaurava	15	15	30	62.50
Ati Pipasa	14	11	25	52.08
Ruchi	9	6	15	31.25
Abhyavarana Shakti	6	4	10	20.83
Jarana Sakti	13	9	22	45.83
KrchaVyavayata	4	4	08	16.66
Gatra Sada	7	5	12	25.00

Table 3: Effect of Barley on Anthropometric Parameters (N=25) in Group A

Measurement	Mean± SEM		Percentage Decrease	Difference (Mean± SEM)
	Before Treatment	After Treatment		
Body wt (kg)	77.39±1.849	75.67±1.761	2.22	1.72± 0.351**
BMI (kg/m^2)	28.39±0.667	27.76±0.611	2.21	0.62± 0.144**
BMR(kcal)	1525.6±30.118	1509.1± 29.788	1.08	16.52± 3.437**
BF%	31.85±1.170	29.44±1.169	7.58	2.41± 0.304**
VF	12.40±0.860	11.28±0.792	9.03	1.12± 0.226**
Waist (cm)	95.58±0.870	93.64±0.797	2.02	1.94± 0.353**
Hip(cm)	102.38±1.099	100.96±1.011	1.38	1.42± 0.383*
WHR	0.93±0.007	0.92±0.0058	1.02	0.009± 0.004*
SKFT(mm)	51.60±2.230	48.48±2.148	6.04	3.12± 0.413**

Effect of Trial Drug *Yava* on Anthropometric Parameters: Values are expressed as Mean ± SEM; n=25, *P<0.05, **P<0.01 significant difference before and after treatment by paired t test. Effect of *Yava* on Anthropometric Parameters shows that there was a statistically extremely significant improvement in BMI, BMR, Body weight, Body Fat, Visceral Fat, Waist and Skin Fold Thickness (p<0.0001**) but a very significant improvement Hip (0.0011*) and Waist Hip Ratio status (0.0308*) (Table no.3)

Table 4: Effect of Oat on Anthropometric Parameters (N=23) in Group B

Measurement	Mean± SEM		Percentage Decrease	Difference (Mean± SEM)
	Before Treatment	After Treatment		
Body wt (kg)	84.55±2.103	83.35±2.091	1.41	1.2±0.162*
BMI (kg/m^2)	30.74±0.823	30.38±0.801	1.17	0.36±0.115*
BMR(kcal)	1518.5±30.567	1505.0±30.098	0.88	13.47± 2.167**
BF%	33.12±1.315	31.04±1.231	6.26	2.07±0.232**
VF	15.91±1.274	14.69±1.230	7.65	1.21±0.217**
Waist (cm)	95.67±2.630	94.43±2.623	1.29	1.23±0.198**
Hip(cm)	103.00±2.929	102.07±2.920	0.90	0.93±0.269*
WHR	0.93±0.008	0.92±0.007	0.88	0.008±0.003*
SKFT(mm)	53±2.014	50.82±2.012	4.10	2.17±0.156**

Effect of Trial Drug *Jai* on Anthropometric Parameters: Values are expressed as Mean ± SEM; n=23, *P<0.05, **P<0.01 significant difference before and after treatment by paired t test. Effect of *Jai* on Anthropometric Parameters shows that there was a statistically significant improvement in BMI (0.0048*), Hip (0.0022*) and Waist Hip Ratio (0.0434*) but a extremely significant improvement (p<0.0001**) in Body weight, Body fat % status, Visceral Fat, BMR and Skin Fold Thickness. (Table no.4)

Table 5: Effect of Barley on Haematological & Biochemical Parameters in Group A

Measurement	Mean± SEM		% Decrease	Difference (Mean± SEM)
	Before Treatment	After Treatment		
FBS mg/dl	96.42±4.869	88.93±4.482	7.77	7.49±1.998**
Cholesterol mg/dl	184.10±7.616	171.45±6.565	6.87	12.65±5.341*
TG mg/dl	152±7.996	138±6.227	8.64	13.14±5.419*
HDL mg/dl	63.94±4.222	57.48±2.909	10.10	6.46±2.517*
LDL mg/dl	111.90±6.911	100.15±6.504	10.49	11.74±1.832**
VLDL mg/dl	38.24±2.309	33.00±2.072	13.71	5.24±1.0825**

Effect of Trial Drug Barley on Laboratory Parameters: Values are expressed as Mean ± SEM ; n=25, *P<0.05, **P<0.01 significant difference before and after treatment by paired t test. Effect of Barley on Laboratory Parameters shows that FBS (p=0.001**), LDL (p<0.0001**) and VLDL (<0.0001**) was statistically extremely significant. There was a statistically highly significant in the Cholesterol (p=0.0262*), TG (p=0.232*), HDL (p=0.0169*). (Table No.5)

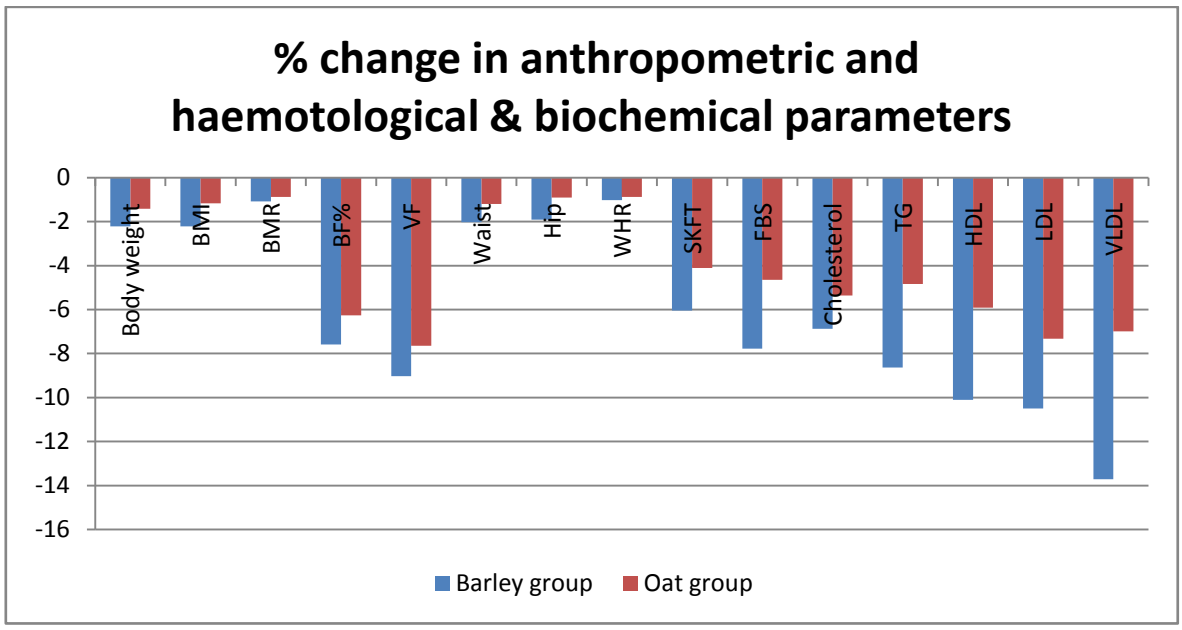
Table 6: Effect of Oat on Haematological & Biochemical Parameters in Group B

Measurement	Mean± SEM		% Decrease	Difference (Mean± SEM)
	Before Treatment	After Treatment		
FBS mg/dl	100.60±3.575	95.913±3.435	4.6549	4.683±1.314*
Cholesterol mg/dl	193.07±11.160	182.71±10.251	5.3664	10.361±2.932*
TG mg/dl	148.76±6.967	141.57±7.665	4.8312	7.187±1.387**
HDL mg/dl	60.104±2.313	56.552±1.936	5.910	3.552±1.221*
LDL mg/dl	99.970±8.145	92.635±7.784	7.337	7.335±1.480**
VLDL mg/dl	33.148±2.263	30.830±1.683	6.9911	2.317±1.103*

Effect of Trial Drug *Yava* on Laboratory Parameters: Values are expressed as Mean ± SEM; n=23, *P<0.05, **P<0.01 significant difference before and after treatment by paired t test. Effect of Jai on Laboratory Parameters shows that TG and LDL was statistically extremely significant (p 0.0001**). FBS (0.0018*); Cholesterol (0.0019*), HDL (0.0082*), VLDL (0.0476*) was statistically significant improvement. (Table No.6)

Table 7: Comparison of both Physical and Haematological Parameters in Group I and Group II

Parameters	% Decrease	
	Barley (*Yava*)	Oat (Jai)
BW	2.2225	1.4192
BMI	2.2119	1.1736
BMR	1.0829	0.8876
BF%	7.5841	6.2615
VF	9.0323	7.6503
Waist	2.0297	1.295
Hip	1.387	0.9076
WHR	1.0243	0.8845
SKFT	6.0465	4.1017
FBS	7.7714	4.6549
Cholesterol	6.8744	5.3664
TG	8.6451	4.8312
HDL	10.108	5.910
LDL	10.498	7.337
VLDL	13.711	6.9911



By comparing these results we can say that flour of barley and Oat were an effective anti obesity drug. During this study, there was not any allergic condition or side effects reported by volunteers.

Table 8: Comparative Effect of Barley and Oat on Subjective Parameters (*Pratyatma Laksana* Parameters) (N=23) (Wilcoxon Matched-Pairs Signed-Ranks Test)

SYMPTOMS	% Decrease	
	Barley (*Yava*)	Oat(*Jai*)
Cala Sphika	19.04	8.69
Cala Udara	25.00	18.75
Cala sthana	7.69	6.66
Alasya	57.14*	40.00*
KsudrasvAsa	20.83	21.73
Daurbalya	53.33*	52.38*
NidrAdhikya	33.33	25.00
SwedAdhikya	37.50	33.33
Daurgandhya	25.00	18.18
Snigdhagatrata	31.81	22.72
Gaurava	54.16**	46.15
Ati Pipasa	50.00	20.00
Ruchi	22.22	33.33
Abhyavaranasakti	42.85	40.00
Jaranasakti	38.46	36.36
Krcha Vyavayata	50.00	25.00
Gatra Sada	41.66	20.00

Effect of trial drug barley on subjective parameters (*Pratyatma lakshana*) shows that there was a statistically significant improvement in *Alasya* (p=0.0078) and *Daurbalya* (p=0.0078) and there is extremely significant changes in *Gaurava* (p= 0.0002). Effect of jai on *Pratyatma Laksana* parameters shows that there was a statistically significant improvement in *Daurbalya* (p=0.001) and *Alasya* (p=0.0313). The other *Pratyatma laksana* such as *Chala sphika* etc also showed a consistent improvement but the level of statistical significance was not quite significant in both groups.

DISCUSSION

In this study, our aim was to evaluate the anti obesity effect of the flour of Barley and Oat on body composition in overweight men and women. The group receiving the chapatti of barley flour tended to have greater weight loss, significant reductions in abdomen, waist, hip and skin fold thickness circumference are also found significant in reduction in serum cholesterol, serum triglycerides, VLDL and LDL. Although chapatti from Oat flour also showed significant result but Barley is found to be much better than Oat.

Table 1 was showing causative factors as per classics. *Adhyasana* and *Visamasana* (unusual fooding habits) habit was observed in the patients before the manifestation of disease as per history given, which incorporates meals followed by episodes of binge eating. As Acharya Sushruta states "*Rasa Nimittam Eva Sthlaulyam Karsyam Cha"* this undigested *Ahara Rasa* produced by *Adhyasana* converts into *Ama* and further intake of *Madhura, Snigdha, Guru, Sita dravya* diet aggravates the formation of *Ama.* This produced *Ama* further causing excessive production of *Medo dhatu* in the body. This is before manifestation but after manifestation alleviated *Vata Dosha* from *Kostha* becomes the cause for increased appetite and leads to *Adhyasana*. This observation supports the previous studies and references mentioned in classics. Generally the *Dugdha* (milk) and its products have the similar properties like *Kapha* like *Sita, Mridu, Snigdha, Bahala, Slaksna* and *guru Guna*. So the continuous intake of these products aggravates the *Kapha* and *Meda* due to their heaviness viscousness and dullness qualities. *Navanna* is considered to be *Abhisayandi*, if it is taken continuously then it produces obstruction in channels (*Shrotorodha*) by aggravating *Kapha*, ultimately *Medovrddhi* occurred. *Pistanna ati sevana* are considered as *guru* and there are more chances of production of *Ama* by affecting the *Pachaka agni* as a result the *Dhatwagni* especially *Medo dhatwagni* becomes *"Manda"* and there is accumulation of *Ama* in *Medodhatu. Anupa mamsa* like pig, cow, buffalo, dear etc which are *Guru, Snigdha, Madhura* and aphrodisiac, if the person eats these *Mamsa* excessively. It is elevator of *vata* and aggravates *Kapha* and *Pitta*, it promotes strength and flabbiness. Due to their properties,

it vitiates the *Medovaha srotas* through affecting the *Medovriddhi*. In *Sthaulya, Medo dhatu* obstructs the normal path of *Vatadosha,* this *Vata dosha (Samana Vayu)* stimulates the *Pachaka Pitta* in the *Kostha* which leads to symptom like *Atiksudha* and having *Atibhojana* tendency. Urbanization has leaded the people towards junk food like bread and fast food. it is responsible for *Ama* production. The intake of Tea/Coffee with sugar increase calorie intake. *Asya Sukha, Diwaswapna, Achinta* and *Nityaharsha* are practiced daily then it obstructs channels by increasing the *Kapha*, its effect the *Medo dhatu*, which produce *Medovriddhi*. One desirous of reducing over corpulence (*Sthaulya*) should indulge gradually more and more in vigil, sexual act, physical and mental exercises. Due to lack of these activities the *Sukra dhatu* increases and it may produce *Srotorodha*. Because of weight, people feel *Avyavaya. Aharatmaka* Nidanas were found in maximum number of patients as evidenced in classics. All these Nidanas were having *Kapha Medovriddhikar* properties and owing to these properties they increase *Kapha* and *Meda* in the body. The combined effect of all these *Nidanas* is reduction in energy expenditure and increase in energy gain, which ultimately disturbs the balance and leads to *Sthaulya.*

Probable mode of action

Most of the *Acarya* considered Barley is having *Madhura - Kasaya rasa, Guru, Ruksha, Pichila* and *Sara guna, Sita virya*, and *Katu vipaka*; mainly *Kapha-pittahara* and *Vata vardhaka* action. The *Vayu* is responsible for clarity among channels, *Soshana* of *Dosa* and stimulation of *Agni. Katu vipaka dravya* are generally said to be *Lekhaniya* because of having *Vayu, agni* and *Akasha mahabhuta* dominance. After the *Dhatvagni* and *Bhutagni paka* they reduce the *Kapha* and homologues *Dhatu*. Having these properties *Yava* helps to stabalise the *Agni* in *Kostha*, clears the channels obstructed by *Meda. Pichhala guna* is providing some sliminess in tract. *Yava* has *Guru guna*, means it will take much time for digestion and remain for long time in intestinal tract because of which person feel fullness for a long duration. Although Oat is also having the same properties but it is found to having more *Kasaya rasa* and *Ruksha guna* than barley. So it vitiates *Vata dosa.* It is advisable to take Oat with some *Snighda guna dravya* like milk and ghee to subside its *Ruksha* nature, so that *Vata dosha* remain in normal limit. Even many modern text also describes that it should not be used as the sole article of diet for a long time even with the addition of milk, on account of its tendency to produce skin eruptions due to the irritating qualities of "avenin" one of its ingredients[15]. So it is advisable not to use oat for a long time.

CONCLUSION

Therefore we can say that barley is effective for inhibition, amelioration or prevention of various diseases caused by uncontrolled adipogenesis and lipolysis thereof, for example, obesity, overweight, lipid storage disease, hyperlipidemia, atherosclerosis, thrombosis and hypercholesterolemia. It is also mentioned as wholesomeness (*Pathya*) in many *Ayurvedic* texts. It is a time to reintroduce the barley and Oat again in main diet as both possesses high nutritional value and having *Lekhana* property and can be good substitute of protein, fibres and minerals in diet. In tradition most of the preparations of Yava is used with water as dough for *Roti, dalia* or *Sattu*. Oat is already introduced in the market as anti obesity diet now a days. There should some dietary and lifestyle modifications and therefore modifying these factors may be helpful in curtailing this unhealthy trend and can control obesity to some extent. This study proves the indication of *Yava* (barley) over *Jai* (oat) as mentioned in many *Ayurvedic* texts.

REFERENCES

1. India facing obesity epidemic: experts". The Hindu.[cited 2007 july 12] Available from http://hindu.com./2007/10/12/stories/2007101260940600.htm.
2. Joshi SR, Joshi SS. Obesity therapeutics – the Indian Consensus. Gupta SB, (ed). API Medicine Update 2002, Association of Physicians of India, 2002; 12: 492-504.
3. Joshi SR, Management of Obese Indian patient, Ind. Jour. Obes., Vol.1.1, Jan- Mar 2005
4. World Health Organization. Physical Status: The Use and Interpretation of Anthropometry. Geneva: World Health Organization; 1995.
5. Deurenberg P, Deurenberg- Yap M, Guricci S. Asians' are different from Caucasians and from each other in their body mass index/body fat percent relationship. Obes Rev 2002; 3:141- 146
6. Eckel RH, Grundy SM, Zimmet PZ. The metabolic syndrome. The Lancet 2005; 365: 1415-28.

7. Gaur KC Sharma, Sharangdhar samhita, Navalkishore publication, Lucknow, Forth Edition 1994, (Pratam khand chap-4; shlok 10); 46
8. Tripathi Brhamananda, Charaka Samhita (edited with Charakachandrika hindi commentry) by Tripathi Brhamananda, Chaukhambha Subharti Prakashana, Varanasi, 2001, C.S.Su 21/4; 399
9. Shastri Ambikadutta, Susurta Samhita (edited with Ayurveda-tattva -sandika hindi commentary) Chaukhambha Sanskrit Sansthan, Varanasi, 2005, S.S.Su 15/37; 62
10. Adult Treatment Panel III. Third report of the national cholesterol education program (NCEP) expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (adult treatment panel III) final report. Circulation 2002; 106: 3143–421
11. Allian CC, Pool LS, Chan CSG, Richmand W, Fu P. Enzymatic determination of total serum cholesterol. Clin chem1974; 20: 470-475.
12. Schettler G., Nussele E. Maßnahmen zur Prävention der Arteriosklerose. Arb Med Soz Med Prav med 1975; 10: 25-29.
13. Trinder, P. Determination of Glucose in Blood Using Glucose Oxidase with an Alternative Oxygen Acceptor. Ann Clin Biochem 1969; 6: 24-25.
14. Friedewald WT, Levy RI, Fredrickson DS. Estimation of the concentration of low-density lipoprotein cholesterol in plasma, without use of the preparative ultracentrifuge. Clin Chem 1972; 18: 499–502
15. Singh M P; Medicinal Herbs and their Formulation, Vol 1, Daya publishing house, Delhi; 2005, 145.

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