International Journal of Ayurveda and Pharma Research

Research Article

CLINICAL EVALUATION OF ANTI-OXIDANT ACTIVITY OF *MUSTA (CYPERUS ROTUNDUS LINN.)* WITH SPECIAL REFERENCE TO OBESITY (*STHAULYA*)

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ABSTRACT

Obesity is a health problem of affluence, of worldwide prevalence and is considered as the insidious creeping pandemic which is now engulfing the entire world. Obesity induces oxidative stress which is partly responsible for morbidities. The modern science fails to give a safe and effective remedy. Ayurveda can pave a way towards attaining the goal. In Ayurveda *Charaka* has mentioned *Musta* (*Cyperusrotundus* Linn.) in *Lekhaniyamahakashay* i.e. drugs acting as scraping agents. The rhizomes of *Musta (Cyperusrotundus Linn.)* contains flavonoids, ascorbic acid and polyphenol which are responsible for its anti oxidant activity. Open labelled study was done on 60 patients at Ayurved Mahavidyalaya Sion, Mumbai-22 for duration of 90 days. Out of 60 patients, 30 were advised to take *Mustachurna* 3 gm thrice a day with warm water along with diet and exercise while 30 patients were advised diet and exercise only. Monthly assessment was done on the basis of signs and symptoms like *Atitrushna* (excessive Thirst), *Atiksudha* (excessive hunger), *Atinidra* (excessive sleepiness), *Atisveda* (excessive sweating), *Daurgandhya* (excessive body odour), *Anutsaha* (laziness), *Daurbalya* (tiredness) and *Kshudraswasa* (breathlessness). Objective improvement was done on the basis of BMI**,** Waist: Hip ratio**,** and MDA (Malondialdehyde), GSH (glutathione peroxidase) enzyme study for oxidant activity at baseline and at the end of study (after 90 days). Subjective improvement is shown in percentage. Paired t test was applied to objective parameters which was highly significant at 1% level of significance i.e. $p<0.01$.in patients taking *Mustachurna* while in other group it was significant at 5% level of significance, concluding *Mustachurna* definitely has anti-obesity and anti-oxidant activity.

Key words: Obesity, oxidative stress, *Musta* (*Cyperusrotundus* Linn.), anti-oxidant, MDA, GSH.

INTRODUCTION

Obesity is emerging as an important health problem in India. Twenty two millions Indian are obese, especially abdominally obese.[1] The incidence of obesity is increasing day by day due to irregular eating habits and sedentary life style.[2] Obesity is chronic and increasingly common medical condition in which excess body fat has accumulated to the extent it may have a negative effect on health leading to reduced life expectancy and/ or increased health problems.[3] The signs and symptoms of obesity described in *Charakasamhita* are *Atitrushna* (Excessive Thirst), *Atiksudha* (Excessive Hunger), *Atinidra* (Excessive Sleepiness), *Atisveda* (Excessive Sweating), *Daurgandhya* (Excessive Body Odour), *Anutsaha* (Laziness), *Daurbalya* (Tiredness) and *Kshudraswasa* (Breathlessness).[4] Presently commonly used objective methods of estimating obesity are Body mass index and waist to hip ratio.[1] People are considered obese when their BMI a measurement obtained is equal to or more than 25 to 30[5] The desired waist to hip ratio in women is $\leq$0.8 and $\leq$1.0 in men. It is mostly primary, that is, no obvious cause exists other than an imbalance between energy intake and energy expenditure. Obesity has reached epidemic proportions in India in the 21st century with morbid obesity affecting 5% of the country's population[6]. It is a leading preventable cause of death worldwide, with increasing rates in adults and children.

Authorities view it as one of the most serious public health problems in 21st century. [7, 8]

In modern medical sciences, the classical treatment of obesity is only diet and exercise. If it doesn't work then anti obesity drugs are given which are least effective with drastic side effects[9]. Free radical-induced oxidative damage has been suggested to play a major role in the pathogenesis of obesity [10]. Ayurvedic drugs like *Shatavari, Guduchi, Gokshur, Ashwagandha, Pippali, Amalaki, Dadim, Tulsi, Haritaki* etc. also possess anti-oxidant properties [11]. *Musta* (*Cyperusrotundus* Linn.) is one such drug. It is a rich source of flavonoids, ascorbic acid andpolyphenol which are responsible for its anti-oxidantactivity.[12] *Charaka* has described *Musta* in *Lekhaniya Mahakashay*. The fat in the body is scraped digested and destroyed. Musta is a plant *having Katu, Tikta, Kashay rasa, Katuvipaka, Shitavirya and Laghuguna*. It has properties like *Lekhana* (scraping agent), *Dipana, Pachana* which plays major role in *Sthaulya* (obesity)[13]

MATERIALS AND METHODS

Selection of cases

There was random selection of patient from O.P.D. and I.P.D. of R.V. Ayurvedic hospital, Sion; Mumbai-22. Study was carried out as per Ethical Clearance Number – AMS /1354/11-12.

Type of study: Openlabeled study.
Total no of cases: 60
Duration of study-90 Days

Inclusive criteria

- Either sex
- Age between 18-60 years
- BMI: Between 25-40
- Informed consent signed

Exclusive criteria

- Age less than 18 years and more than 60 years
- Pregnant women and lactating mother.
- Patients with renal and hepatic dysfunction.
- Obesity due to hypothyroidism or Cushing's syndrome.
- Secondary obesity
- HIV-AIDS
- On drugs: Insulin dependent, anti depressant, or steroid dependent patients.
- BMI more than 40

Drug source: Rhizomes of *Musta* (*Cyperusrotundus* Linn.)
Formulation: *Churna* (powder) of *Musta* (*Cyperusrotundus* Linn.)
Mode of administration: Oral.
Dose: 3 gm TDS
Anupan*: Koshnodak* (Warm water)
Follow up: Clinical follow-up was advised every 30 days in duration of 90 days.

Statistical test

Statistical analysis was done by applying Paired t-test to objective parameters: at baseline and at the end of study (after 90 days). Subjective improvement has been shown in percentage[14]

Assessment of efficacy

Subjective improvement

Monthly assessment was done with the help of reduction in following symptoms.

- *Atitrushna* (Excessive Thirst)
- *Atiksudha* (Excessive Hunger)
- *Atinidra* (Excessive Sleepiness)
- *Atisveda* (Excessive Sweating)
- *Daurgandhya* (Excessive Body Odour)
- *Anutsaha* (Laziness)
- *Daurbalya* (Tiredness)
- *Kshudraswasa* (Breathlessness)

Objective improvement

- BMI
- Waist: Hip ratio
- For antioxidant Study: MDA, GSH enzyme study

Gradation of symptoms [15]

(1) *Atitrushna* (Excessive Thirst)

0- thirst can be controlled

1-thirst can be controlled for some time

2-thirst is unbearable

3-thirst is unbearable with dryness in throat and mouth

(2) *Atishudha* (Excessive Hunger)

0-Severe Hunger during meal times

1-Severe hunger between two meal times

2-Having hunger pangs frequently between meals

3- Hunger pangs immediately after meals

(3) *Atinidra* (Excessive sleepiness)

0- 8 hours sleep

1- 10 hours sleep

2-More than 12 hours of sleep

3- More than above

(4) *Atisveda* (Excessive Sweating)

0- Sweating after running

1- Sweating after walking 500 meters

2- Sweating after walking 100 meters

3- Sweating even when stationary

(5) *Daurgandhya*(Excessive Body Odour)

0- Realized by patient only

1-Realized by others around him

2- Realized by others at a radius of 1 meter

3-Realized by others at a radius greater than 1 meter

(6) *Anutsaha* (Laziness)

0- feels like working and works

1-Does not feel like working but may work

2-Does not feel like working

3-Does notwork at all

(7) *Daurbalya* (Weakness)

0-Tiredness after climbing 30 stairs

1- Tiredness after climbing 20 stairs

2- Tiredness after climbing 10 stairs

3- Tiredness after walking small distance

(8) *Kshudrashwasa* (Breathlessness)

0- Breathlessness after climbing 30 stairs

1- Breathlessness after climbing 20 stairs

2- Breathlessness after climbing 10 stairs

3-Breathlessness after walking small distance

RESULTS

Table 1: Chart Showing % Improvement In Symptoms

Symptoms	Group A	Group B
Excessive thirst	69.23%	33.33%
Excessive hunger	85.19%	34.48%
Excessive sleep	60.87%	33.33%
Excessive sweat	33.33%	50.00%
Body odour	46.67%	38.89%
Laziness	100.00%	31.25%
Tiredness	100.00%	29.63%
Breathlessness	96.30%	17.86%

Table 2: BMI Analysis

	Decreased	No change	Increased
Group A	86.67%	3.33%	10.00%
Group B	73.33%	20.00%	6.67%

Table 3: Statistical analysis for BMI

	Mean	SD	SE	t value
Group A	1.64	1.49	0.27	6.06
Group B	0.67	1.27	0.23	2.88

Table 4: Analysis of Waist: hip

	Decreased	No change	Increased
Group A	80.00%	13.33%	6.67%
Group B	66.67%	6.67%	26.67%

Table 5: Statistical analysis of Waist: hip

	Mean	SD	SE	t value
Group A	0.03	0.004	1.45	7.21
Group B	0.01	0.09	0.00	1.46

Table 6: MDA analysis

	Decreased	No change	Increased
Group A	96.67%	3.45%	0.00%
Group B	60.00%	0.00%	40.00%

Table 7: Statistical analysis of MDA

	MEAN	SD	SE	t value
Group A	1.86	1.16	0.21	8.80
Group B	0.13	0.48	0.09	1.42

Table 8: GSH analysis

	Decreased	No change	Increased
Group A	96.67%	0.00%	3.33%
Group B	60.00%	0.00%	40.00%

Table 9: Statistical analysis of GSH

	Mean	SD	SE	t value
Group A	13.22	7.28	1.33	9.95
Group B	3.28	6.49	1.18	2.77

DISCUSSION

Out of 60 patients 7 [11.67%] were males and 53 [88.33%] were females. Age wise categorisation showed that 31.67% were between 18-30 years of age, 23.33% between 31-40 years of age, 16.67% between 41-50 years of age and 28.33% between 51-60 years of age. According to physical activity: Heavy worker: 11.67 %, Moderate worker: 46.67%, Sedentary worker: 41.67%. Diet wise distribution shows that 38.33% 0f subjects have a vegetarian diet and 61.67% have mixed diet.

Subjective evaluation showed all the 30 patients of group A showed reduction in

Breathlessness, laziness and tiredness. 69.23% showed decrease in excessive thirst, 85.19% showed decrease in excessive hunger, 60.87% showed decrease in excessive sleepiness, 33.33% showed decrease in excessive sweat and 46.67% showed decrease in body odour. While in Group B out of 30 patients 33.33% subjects showed decrease in excessive thirst and sleep, 34.48% showed decrease in excessive hunger, 50% showed decrease in excessive sweat, 38.89% showed decrease in body odour, 31.25% showed decrease in laziness, only 29.63% showed decrease in tiredness, and only 17.86% showed decrease in breathlessness. Thus patients Group A showed more symptomatic relief than patients Group B. In objective evaluation the BMI of Group A patients was reduced significantly, t value = 6.06 at 1 % level of significance i.e. $p<0.01$.While BMI of Group B patients was reduced less as compared to Group A, t value= 2.88 at 5 % level of significance i.e. $p<0.05$.

Waist: Hip ratio of Group A patients was reduced significantly, t value = 7.21 at 1% level of significance i.e. $p< 0.01$.WhileWaist: Hip ratio of Group B patients was reduced less as compared to Group A patients, t value=1.46 at 5% level of significance i.e. $p< 0.05$.Out of 30 patients in group A 96.67% showed decrease in MDA value, 3.45% showed no change and not a single subject showed increase in MDA. While in Group B Out of 30 patients 60% showed decrease in MDA value and 40% showed increase in MDA value The statistical test is found to be highly significant for Group A at $p<0.01$ while the statistical test for Group B was not significant.

In Ayurveda many drugs are described as *Lekhaniya* and *Medoghna* like *Haridra, Daruharidra, Haritki* etc. *Musta* is a one of the drug which show S*lekhaniya* and anti-oxidant activity. *Musta* has *Tikta, Katu rasa, Katuvipaka, Shitavirya* and *Laghu, Rukshaguna*. It alleviates *Kapha* and *Pitta dosas* and aggravates *Vatadosha*. The rhizomes of *Musta* contains flavonoids, ascorbic acid and polyphenol which shows anti-oxidant properties. Due to *Tikta* and *Katu rasa* it repairs altered *Jatharagni* and *Medodhatvagni*. *Laghu, Ruksha* guna absorbs all the water content from *Meda* and *Kapha*. Also due to *Katu rasa* it digests *Meda* and *Kapha*. All these properties vitiate *Vatadosha*. To avoid that *Musta* is given with warm water. Flavonoids, ascorbic acid and polyphenol present in *Musta* scavenge free radicals from the body and reduce oxidative stress. From the above case studies of 60 patients the anti-oxidant activity of *Musta* can be proved. It definitely reduces the signs and symptoms of oxidative stress induced obesity. There were no major adverse events noted with *Musta.* There were some minor problems encountered by the patients taking *Musta*. It was noted that a few patients experienced nauseating sensation while ingesting *Musta* for first 3-4 days. Some could not tolerate its smell. But all these symptoms abated after 3-4 days. Further research needs to be done to make *Musta* more palatable.

CONCLUSION

After studying 60 patients for 90days following points were concluded.

1. Patients taking *Musta churna* have shown considerable decrease in subjective (signs and symptoms) and objective parameters (BMI and Hip waist ratio) as compared to other group. *Musta* having *Tikta, Katu rasa*, *Katuvipaka and Laghu Ruksha guna* burns and metabolizes fat, improves process of fat metabolism, chelates already present fat and removes it out of the body. Thus *Musta* definitely has anti-obesity activity.
2. *Musta* reduces oxidative stress by scavenging free radicals and terminating chain reaction. There was considerable decrease in MDA values and good increase in GSH values in patients taking *Mustachurna*. Polyphenols and ascorbic acid present in *Musta* may be responsible for this.
3. The drug does not showed any toxic effects.
4. Thus *Musta* definitely has positive effect in reducing signs and symptoms of oxidative stress induced obesity.

ACKNOWLEDGEMENT

It is great pleasure for me to express my gratitude with profound respect to Shree Dhootpapeshwar Ltd. Mumbai for Standardization & Phytochemical Analysis of *Musta churna* samples. I am also grateful to Anchrom Lab. Mulund, Mumbai for HPTLC of *Mustachurna* sample. I express my thankfulness to Blatter Herbarium, Dept. of Botany in St. Xavier's College, Mumbai. Last but not least I am very thankful to Sheth R.V. Ayurved Rugnalaya, Sion, Mumbai-22

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Cite this article as:
Ramteke Ashok D, Gandhi Sonali P, Jivan Thombre B, Snehal Saurkar. Clinical Evaluation of Anti-oxidant activity of Musta (cyperus rotundus linn.) With special reference to Obesity (Sthaulya). Int. J. Ayur. Pharma Research. 2014; 2 (2): 83-87.
Source of support: Nil, Conflict of interest: None Declared

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