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Evaluation Of The Effect Of *RukshaBasti* Along With *Suryanamasakar* And *Nadishodhan Pranayama* In The Management Of *Sthaulya* (Obesity)

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ABSTRACT

The aim of present study was evaluation of the effect of *rukshabasti* along with *suryanamasakar* and *nadishodhan pranayama* in the management of *sthaulya* (obesity).*Sthaulya* (Obesity) is one among the major disease of modern era with continuous changing life style, environment and diet habits. *Atisthaulya* (obesity) is considered as one of the *Astanindita purush* as described by *Acharya Charak*. Obesity has reached epidemic proportions in India in the 21st century, with morbid obesity affecting 5% of the country's population. Though, many theory and medicament put toward us for the management of the obesity but till now perfect remedy for this problem is not found in modern science. In *Ayurvedic* classics various treatment modality given for the management of obesity like *Udvartan, Basti, Vyayam, Langhana etc.* Keeping of this view this study were selected *Suryanamaskar, Nadishodhana Pranayama* and *Ruksha Basti* both are having great potential to control and cure the obesity. In this study 60 patient were selected and divided into 30 for each group according to inclusion criteria. In Group A Patients were advised *Ruksha Basti, Suryanamskar* and *Nadishodhan Pranayama* and in Group B Patients were advised only *Yoga* procedure *Suryanamskar* and *Nadishodhan Pranayama*. After the completion of treatment statistical analysis revealed that according mean difference and percentage relief all subjective and objective parameter Group "A" Showed better result than Group "B".

Key Worlds- *Sthaulya*, Obesity, *Ruksha Basti, Suryanamaskara, Nadishodhan Pranayama*

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INTRODUCTION

An excess accumulation of energy in the form of body fat >25% in males and >30% in females is considered as obesity which is becoming a global health problem.[1] Due to its negative impact on health, it is now considered as one of the important risk factor which could reduce the life expectancy. It is proved that obesity is responsible for the development of certain dangerous co morbidities such as metabolic syndrome, Diabetes Mellitus type 2, High Blood Pressure, Dislipidemia and Heart Disease. Cardio vascular disorders continue to be the major cause of mortality representing about 30% of all deaths worldwide. [2]

Obesity is the reason for about 80% of type 2 diabetes, about 70% of cardiovascular disease and 42% of breast & colon cancers. [3] In 2014 WHO estimate that, more than 1.9 billion adults, 18 years and older, were overweight. Of these over 600 million were obese. Overall, about 13% of the world's adult population (11% of men and 15% of women) were obese in 2014.[4] India, with 1.2 billion people is the second most populous country in the world. [5]

Obesity occurs when a person consumes more calories from food than he or she burns. Obesity is caused by various series of factors like genetic factors carried by genes such as Leptin, LepR, POMC, MC4R and PC-1 and environmental factors such as life style, behaviour, diet, physical activity, social factors like poverty and a lower level of education. Diseases like Hypothyroidism, Cushing syndrome, Polycystic ovarian syndrome and Drugs like steroids, antidepressant can make a person obese. [6]

Ayurvedic classics considered both exogenous (*Ahara* and *Vihara*) and endogenous (*Bijadosha*) factors for its development also the detail etiopathogenesis, prognosis and management described scientifically in classics. In the pathogenesis of *Sthaulya*, it is considered that all the three *Doshas* are vitiated, especially *Kledaka Kapha*, *Pachaka Pitta*, *Samana* and *Vyana Vayu*. *Aama Annarasa* travelling in the body channels gets obstructed in the *Medovaha Srotas* and combines with *Kapha* and *Meda*, decreasing the *Medo Dhatvagni* which in turn gives rise to augmentation of *Meda*. Vitiated *Vyana Vayu* propels this augmented *Meda Dhatu* to its sites viz. *Udara*, *Sphika*, *Stana* etc. resulting in *Sthaulya* or *Ati Sthula*.[7] *Atisthaulya* (Obesity) is considered as one of the *Astanindita purush* also *Shleshma Nanatmaja vyadhi* as described by *Acharya Charaka*.. *Guru and*

Aptarpana Chikitsa for the management of *Sthaulya is* advised by *Acharya Charaka* because *Sthaulya* is considered as a *Santarpana Janya Vyadhi* . *Acharya Vagbhatta* also said *Medovriddhi Janyaroga* should be treated with *Apatarpan Chikitsa (As. H. Su. 11/31).*[8]

Acharya Charaka specifically described *Ruksha, Ushna Tiksna Basti, Guru Aptarpana Chikitsa.* Also *Aacharya Sushruta* stated that there is no other measure such as *Vyayama* (exercise) for the reduction of the fat. *Acharya Vagbhatta* advised *Nitya langhana* therapy for *Sthaulya* patients. Therefore, keeping in view of all these points, present study entitled with "Evaluation of the effect of *Ruksha Basti* along with *Surya Namaskar* & *Nadisodhan Pranayama* in the management of *Sthaulya* [Obesity].

AIM AND OBJECTIVES:

- Evaluation of the effect of *Ruksha* ***B****asti* along with *Suryanamaskar* and *Nadishodhan Pranayama* in the management of *Sthaulya* (Obesity).
- Evaluation of the effect of *Suryanamaskar* and *Nadishodhan Pranayama* alone in the management *Sthaulya* (Obesity).
- To observe the effect of these therapies on haematological, BMI and other parameters on *Sthaulya* (obesity) patient.

MATERIALS AND METHOD:

The study was randomised clinical trial on 60 patients. After the sign the informed consent form these patients were randomly allotted in both the groups Group "A" and in Group "B".

Inclusion Criteria:

- Both sex included in the study.
- Patient's age above 15 years and below 45 years were selected.
- Patients were having clinical sign and symptom of *Sthaulya* (Obesity)
- Patients having BMI [body mass index] between 25 -35 were included in the study.
- Patients those were fit for *Basti karm*.

Exclusion Criteria:

- Patients were having history of serious systemic disease like cardiac disorders, renal and hepatic impairment, Hypertension, Cancer patients, DM 1st and 2nd.
- Pregnant women and lactating mother.
- Patients who are having hypothyroidism and other kind of hormonal imbalance.
- Patients with PCOD and other gynecological complaints.
- Patients with long term steroid treatment.

Investigations: Biochemical test – Lipid profile, Blood sugar

Ethical committee Registration :- The study is approved by institutional ethical committee vide letter number Ref,/Swasthavritta/2017 dated 13/06/2015

CTRI Registration :- As the study is conducted in the year 2015-2017, so no CTRI is needed.

STUDY DESIGN:

Randomly selected patients were divided in to two groups (30 patients in each group) after that a detailed proforma prepared which was especially consisting of the chief complaints mentioned in different *Ayurvedic* classics with detailed history of patients.

Group A: (*Ruksha Basti* along with *Suryanamskar* and *Nadishodhan Pranayama* group**)**

Patients of this group were advised *Ruksha Basti* for 1 month along with Yoga Procedure as per the efficiency of the patients 11-21 cycles of *Suryanamskar* and *Nadishodhan Pranayama* (15 minutes) were advised for 2 month and follow up after 1 month .

Ruksha Basti: All patients of this group were taken sign the consent form and also carried out various investigations before starting *Basti* Therapy.

Dose of *Ruksha Basti* - 200 ml/ patients

Duration of *Basti* therapy - 30 day

Drug use in *Basti karma* : (*Vaishwanar Churna)***

The ingredients of the *Vaishvanar Churna* have been purchased from the Vindhya herbal (Minor forest produce processing & research centre) Pharmacy, Bhopal (M.P.) and drug was prepared in the college pharmacy of Pt. K.L.S. Govt. Ayurvedic College, Bhopal (M.P.). The pharmacy supplied a crude coarse (*Yavakut*) powder of drugs for *Kwatha.*

Ingredients of *Vaishvanara Churna* [9]

Name	Botanical name	Ratio
1) Haritaki	*Terminala chebula*	12
2) Sunthi	*Zingiber officinale*	5
3) Ajmoda	*Carum roxburghianum*	3
4) Yavani	*Trachyspermum ammi*	2
5) Saindhavlavan	Sodium chloride	2

Preparation of *Basti Dravya:*

Per day 30 gram of *Vaishvanara churna* have been taken for preparation of *Basti Dravya* in each patient. 30 gm of *Vaishwanar churna* 300 ml of water was added then boil till 200 ml remaining, then sieved this material. After cooling this *Basti dravya* it was administrate to the patients according to classical procedure.

Group B: (*Suryanamskar* and *Nadishodhan Pranayama* group)

Patients of this group were advised yoga procedure as per the efficiency of the patients 11 -21 cycles of *Suryanamskar* and *Nadishodhan Pranayama* (15 minutes) daily in early morning for 2 month and follow up after 1 month .

And all the patients both of the group were advised to restrict high caloric diet, cheese, cold drinks, fatty food & junk food.

ASSESSMENT CRITERIA:

The efficacy of the therapy was assessed on the basis of the following subjective as well as objective criteria.

Subjective criteria: The patients were assessed twice by giving a score before and after the therapy according to the severity of the symptoms. Statistical analysis was carried out to obtain the efficacy of the therapy. The details of the scoring pattern adopted for the main signs and symptoms in the present study were as follows.

Grade of Complaints:

0 No complaint
1 Presence of mild complaint
2 Presence of moderate complaint
3 Presence of severe complain

Objective criteria:

It was assessed on Skin fold thickness, Body circumferences, BMI, Body fat percentage, waist hip ratio, Biochemical investigation before starting the treatment and after completion of treatment.

Assessment on Basis of complaints:

- Complete relief (100 %)
- Marked relief (> 75 - <100 %)
- Moderate relief (> 50 - <75 %)
- Mild relief (<50 - > 25 %)
- No relief (< 25 %)

STATISTICAL ANALYSIS:

- Statistical analysis of objective parameter Paired t test within the group and unpaired t test between the groups have been used.
- Statistical analysis of Subjective parameter Wilcoxon matched- pairs signed-ranks test for within the group and Mann Whitney test for between the groups have been used. The results were interpreted as,

p>0.05	Insignificant
P<0.05	Significant improvement
p<0.005	Very significant improvement
P<0.0001	Highly significant improvement

OBSERVATIONS AND RESULTS:

Total 60 patients were registered in this study in which 47 patients (22 patients in group A & 25 in group B) were completed the treatment and 13 patients were drop out from the study.

Demographic observation-

1. Age wise distribution shows that 41.67 % patients were in the age group of 16-25 years, 23.33 % patients were in the age group of 26-35 and 35 % patients were in the age group of 36-45 years.

2- Sex wise distribution of patients showed that in this study maximum 65 % of patients were female whereas 35 % patients were male.

3- Occupation wise distribution indicates that 43.33 % patients were doing deskwork, 10 % patients were doing field work with intellectual and 38.33 % patients were student.

4- 53.33 % patients were from middle class, while 30 % from lower middle, 11.67 % were Upper class and 5 % were poor.

5- About 51.67 % patients were found doing *Adhyashana* followed by 28.33 %, 15 % patients were found doing *Vishamashana* and *Samashana* respectively .

6- Dominant *Guna* in diet wise distribution indicates that 41.67 % patients were taking *Guru* predominant diet, 33.33 % patients were taking *Snigdha* dominant *Guna* diet, 15 % patients were taking *Shita* predominant diet.

7- Dominant *Rasa* in diet wise distribution indicates that *Madhura Rasa* dominance was found in diet of about 45 % of the patients followed by 26.67 %, 23.33 % and 5 % of the patients which were found to have *Amla*, *Lavana*, *Katu Rasa* dominance in the diet respectively.

8- Fast food wise distribution indicated that 81.67 % patients were taking fast food and 18.33 % patients were not taking fast food.

9- 51.67 % patients were not doing any exercise, 35 % patients were doing exercise regularly and 13.33 % patients were doing exercise irregularly

10- The study shows that majority of the patients 65 % belonged to *Kapha-Vata Prakruti*, 30 % Patients were *Pitta-kapha* and 5 % patients were belong to *Vata-pitta prakruti*.

11- Emotional make-up wise distribution indicates that 20 % were having continuous jolly emotional make-up, 28.33 % patients were having stress, 16.67 % were having anxiety and 5 % were having depression emotional make-up.

Clinical observation-

1. Effect on BMI

BMI	**Mean**		**M.D.**	**% Relief**	**S.D.**	**S.E.**	**Paired t test & P value**	**Re mark**
	BT	**AT**						
Group A	31.189	28.554	2.635	8.44	0.5250	0.1119	t = 23.544 p< 0.0001	HS
Group B	29.702	27.980	1.721	5.79	0.4091	0.0818	t = 21.034 p< 0.0001	HS
Unpaired t test p<0.0001 , t= 6.698 (HS)								

Note – HS (Highly Significant)

2. Effect on body fat %:

Body Fat %	Mean		M.D.	% Relief	S.D.	S.E.	Paired t test & p value	Remark
	BT	AT						
Group A	37.017	34.792	2.225	6.01	0.6442	0.1374	t = 16.203 p< 0.0001	HS
Group B	31.929	30.072	1.859	5.82	0.7120	0.1424	t=13.054 p<0.0001	HS
Unpaired t test p= 0.0727, t = 1.838, (p> 0.05) (NS)								

Note – HS (Highly Significant), NS- (Not Significant)

3. Effect on Skin fold thickness:

Skinfold Thickness		Mean		M.D.	% Relief	S.D.	S.E.	Paired t test & P value	Remark
	Group	BT	AT						
Bicep	A	14.636	10.636	4.000	27.32	1.826	0.3892	t = 10.276 p< 0.0001	HS
	B	12.960	10.400	2.56	19.75	0.820	0.1641	t = 15.599 p< 0.0001	HS
	Unpaired t test- p<0.0001 , t = 3.560 (HS)								
Tricep	A	29.364	24.636	4.727	16.09	0.984	0.2099	t = 22.517 p< 0.0001	HS
	B	27.040	22.840	4.200	15.53	2.236	0.4472	t = 9.391 p< 0.0001	HS
	Unpaired t test- p=0.3128 , t = 1.021 , (p>0.05) (NS)								
Subscapular	A	22.409	17.864	4.545	20.28	1.711	0.3647	t=12.463 p< 0.0001	HS
	B	23.640	20.480	3.160	13.36	2.035	0.4069	t = 7.765 p< 0.0001	HS
	Unpaired t test- p=0.0159, t = 2.506 , p<0.05 (S)								
Superior iliac	A	30.909	25.955	4.955	16.03	2.516	0.5365	t = 9.236 p< 0.0001	HS
	B	30.160	26.400	3.760	12.46	1.921	0.3842	t = 9.787 p< 0.0001	HS
	Unpaired t test- p=0.0720, t = 1.843 , p>0.05 (NS)								

Note – HS (Highly Significant), NS- (Not Significant), S- (Significant)

4. Effect on measurement:

Measurement		Mean		M.D.	% Relief	S.D.	S.E.	Paired t test & P value	Remark
Rt mid arm	**Group**	BT	**AT**						
	A	33.023	30.318	2.705	8.19	1.333	0.2843	t = 9.515 p< 0.0001	HS
	B	31.584	28.980	2.604	8.24	0.879	0.1759	t=14.802 p< 0.0001	HS
	Unpaired t test- p=0.7580, t = 0.3100 , p>0.05, (NS)								
Chest	A	101.68	98.182	3.500	3.44	0.8452	0.1802	t=19.424 p< 0.0001	HS
	B	99.912	96.960	2.952	2.95	0.9959	0.1992	t=14.821 p< 0.0001	HS
	Unpaired t test- p=0.0495, t = 2.019 , p<0.05 (S)								
Abdomen	A	107.59	98.682	8.909	8.28	6.314	1.346	t = 6.618 p< 0.0001	HS
	B	100.22	94.920	5.300	5.28	1.506	0.3013	t=17.592 p< 0.0001	HS
	Unpaired t test- p=0.008, t = 2.774 , p<0.005 (VS)								
Mid Thigh	A	57.955	53.000	4.955	8.54	2.011	0.4288	t=11.554 p< 0.0001	HS
	B	55.892	53.120	2.772	4.95	1.427	0.2854	t = 9.713 p< 0.0001	HS
	Unpaired t test- p<0.0001, t = 4.331 (HS)								
Waist	A	94.227	90.455	3.773	4.00	1.378	0.2937	t=12.844 p< 0.0001	HS
	B	90.820	87.640	3.180	3.50	1.383	0.2766	t=11.495 p< 0.0001	HS
	Unpaired t test- p=0.1487, t = 1.469 , p>0.05 (NS)								
Hip	A	111.82	108.77	3.045	2.72	0.962	0.2052	t=14.841 p< 0.0001	HS
	B	103.62	101.12	2.504	2.41	1.196	0.2393	t=10.465 p< 0.0001	HS
	Unpaired t test- p=0.0974, t = 1.693, p>0.05 (NS)								

Note – HS (Highly Significant), NS- (Not Significant), S- (Significant)

5. Effect on waist hip ratio:

W/H ratio	Mean		M.D.	% Relief	S.D.	S.E.	Paired t test & P value	Re Mark
	BT	AT						
Group A	0.8473	0.8186	0.02864	3.38	0.02949	0.006287	t=4.455 p<0.0001	HS
Group B	0.8788	0.8656	0.01320	1.5	0.01314	0.002628	t=5.023 P<0.0001	HS
Unpaired t test p=0.0223, t = 2.367, p< 0.05 (S)								

Note – HS (Highly Significant), S- (Significant)

6. Effect on HDL:

HDL	Mean		M.D.	% Relief	S.D.	S.E.	Paired t test & P value	Re mark
	BT	AT						
Group A	45.273	48.227	2.955	6.52	4.134	0.8815	t = 3.352 p<0.0001	HS
Group B	46.280	48.920	2.640	5.70	2.079	0.4159	t = 6.348 p<0.0001	HS
Unpaired t test - p=0.7384, t = 0.3361 , p>0.05 (NS)								

Note – HS (Highly Significant), NS- (Not Significant)

7. Effect on LDL:

LDL	Mean		M.D.	% Relief	S.D.	S.E.	Paired t test & P value	Re mark
	BT	AT						
Group A	143.20	129.32	13.885	9.69	10.405	2.218	t = 6.259 p<0.0001	HS
Group B	121.54	108.85	12.685	10.43	15.994	3.199	t = 3.965 p<0.0001	HS
Unpaired t test p=0.7654, t = 0.3002 , p>0.05 (NS)								

Note – HS (Highly Significant), NS- (Not Significant),

8. Effect on VLDL:

VLDL	Mean		M.D.	% Relief	S.D.	S.E.	Paired t test & p value	Re mark
	BT	AT						
Group A	24.881	20.684	4.197	16.86	3.059	0.6521	t = 6.436 p< 0.0001	HS
Group B	25.955	22.498	3.457	13.31	3.410	0.6820	t = 5.068 p< 0.0001	HS
Unpaired t test p=0.4402, t = 0.7787, p>0.05 (NS)								

Significant), **Note –** HS (Highly Significant), NS- (Not Significant)

9. Effect on Cholesterol:

Cholest Erol	Mean		M.D.	% Relief	S.D.	S.E.	Paired t test & P value	Re mark
	BT	AT						
Group A	209.48	190.30	19.179	9.15	8.426	1.796	t = 10.676 p< 0.0001	HS
Group B	186.16	170.99	15.164	8.14	9.039	1.808	t = 8.388 p< 0.0001	HS
Unpaired t test p=0.1238, t = 1.568 , p>0.05 (NS)								

Note – HS (Highly Significant), NS- (Not Significant)

10. Effect on Triglyceride:

Trigly Ceride	Mean		M.D.	% Relief	S.D.	S.E.	Paired t test & P value	Re Mark
	BT	AT						
Group A	123.65	107.24	16.416	13.27	16.118	3.436	t = 4.777 p<0.0001	HS
Group B	132.32	114.84	17.478	13.20	23.022	4.604	t = 3.796 p<0.0001	HS
Unpaired t test - p=0.8227, t = 0.2254 , p>0.05 (NS)								

Note – HS (Highly Significant), NS- (Not Significant)

11. Effect on fasting blood sugar in prediabetic patients:

FBS	Mean		M.D.	% Relief	S.D.	S.E.	Paired t test & P value	Re Mark
	BT	AT						
Group A	89.212	79.886	9.325	10.45	5.504	1.173	t = 7.947 p<0.0001	HS
Group B	96.236	88.005	8.230	8.55	5.462	1.092	t = 7.535 p<0.0001	HS
Unpaired t test - p=0.4979 , t = 0.6833, p>0.05 (NS)								

Note – HS (Highly Significant), NS- (Not Significant)

Statistical analysis of Sign and Symptom- Wilcoxon matched- pairs signed-ranks test for within the group and Mann Whitney test for between the group have been used –

1. Effect of therapy on *Kshudadhikya* (Polyphagia):

Kshuda Dhikya	Mean		M.D.	% Relief	S.D.	S.E.	W, N & P value	Re Mark
	BT	AT						
Group A	1.727	0.8182	0.9091	52.64	0.2942	0.06273	W=210.00 (N=20) p<0.0001	HS
Group B	1.640	0.8800	0.7600	46.34	0.4359	0.08718	W=190.00 (N=19) p<0.0001	HS
Mann Whitney test - U=234.00 , p=0.3686, p>0.05, (NS)								

Note – HS (Highly Significant), NS- (Not Significant)

2. Effect on *Atipipasaa* (Polydipsia):

Atipipasa	Mean		M.D.	% Relief	S.D.	S.E.	W, N & P value	Re Mark
	BT	AT						
Group A	1.909	0.5000	1.409	73.80	0.5903	0.1259	W= 253.00 (N= 22) p<0.0001	HS
Group B	1.840	0.9200	0.9200	50	0.2769	0.05538	W= 276.00 (N=23) p<0.0001	HS
Mann Whitney test - U=161.00, p=0.0118 , p<0.005 (VS)								

Note – HS (Highly Significant), VS- (very Significant)

3. Effect of Therapy on *Daurbalyata*(General debility):

Daurbal yata	Mean		M.D.	% Relief	S.D.	S.E.	W, N & P value	Re Mark
	BT	AT						
Group A	1.773	0.8182	0.9545	53.83	0.2132	0.04545	W=231.00 (N=21) p<0.0001	HS
Group B	1.720	0.9200	0.8000	46.51	0.4082	0.08165	W=220.00 (N=20) p<0.0001	HS
Mann Whitney test - U=232.50, p=0.3481 , p>0.05, (NS)								

Note – HS (Highly Significant), NS- (Not Significant)

4. Effect of Therapy On *Swedadhikya* (Perspiration) *:*

Sweda dhikya	**Mean**		**M.D.**	**% Relief**	**S.D.**	**S.E.**	**W, N & P value**	**Re Mark**
	BT	**AT**						
Group A	1.909	0.8636	1.045	54.74	0.2132	0.04545	W =253.00 (N=22) p<0.0001	HS
Group B	1.840	0.9600	0.8800	47.82	0.3317	0.06633	W=253.00 (N=22) p<0.0001	HS
Mann Whitney test - U=241.50, p=0.4542 , p>0.05 (NS)								

Note – HS (Highly Significant), NS- (Not Significant)

5. Effect of therapy on *kriccha vyavaya (Dificulty in Maithuna)* :

kriccha vyavaya	**Mean**		**M.D.**	**% Relief**	**S.D.**	**S.E.**	**W, N & P value**	**Re Mark**
	BT	**AT**						
Group A	0.5000	0.1364	0.3636	72.72	0.5811	0.1239	W=26.00 (N=7), p<0.05	S
Group B	0.6800	0.3600	0.3200	47.05	0.4761	0.0952	W=36.00 (N=8), p<0.005	S
Mann Whitney test - U=271.50 , p=0.9475, p>0.05 (NS)								

Note –S (Significant), NS- (Not Significant)

6. Effect of therapy on *Daurgandhata* (foul smell).

Daurg Andhata	**Mean**		**M.D.**	**% Relief**	**S.D.**	**S.E.**	**W, N & P value**	**Re Mark**
	BT	**AT**						
Group A	1.864	0.7727	1.091	58.53	0.2942	0.06273	W=253.00 (N=22) p<0.0001	HS
Group B	1.760	0.9600	0.800	45.45	0.4082	0.08165	W=210.00 (N=20) p<0.0001	HS
Mann Whitney test - U =200.00, p=0.0969, p>0.05 (NS)								

Note – HS (Highly Significant), NS- (Not Significant)

7. Effect of therapy on *Kshudra Shwasa* (Dysponea during slight exertion):

Kshudra Shwasa	**Mean**		**M.D.**	**% Relief**	**S.D.**	**S.E.**	**W, N & P value**	**Re Mark**
	BT	**AT**						
Group A	1.682	0.7727	0.9091	54.04	0.2942	0.06273	W=210.00 (N=20) p<0.0001	HS
Group B	1.360	0.6800	0.6800	50	0.4761	0.09522	W=153.00 (N=17) p<0.0001	HS
Mann Whitney test - U =199.50, p=0.0981, p>0.05, (NS)								

Note – HS (Highly Significant), NS- (Not Significant)

8. Table No.72 - Effect of therapy on *Chal sphik* (Pendulous movement of buttock):

Chal sphik	**Mean**		**M.D.**	**% Relief**	**S.D.**	**S.E.**	**W, N & P value**	**Re mark**
	BT	**AT**						
Group A	1.682	0.5455	1.136	67.53	0.3513	0.07489	W=253.00 (N=22) p<0.0001	HS
Group B	1.480	0.5200	0.9600	64.86	0.2000	0.04000	W=300.00 (N=24) p<0.0001	HS
Mann Whitney test - U=228.00, p>0.05, p=0.2922 (NS)								

Note – HS (Highly Significant), NS- (Not Significant)

9. Effect of therapy on *Chal Udara* (Pendulous movement of Abdomen):

Chal udara	**Mean**		**M.D.**	**% Relief**	**S.D.**	**S.E.**	**W, N & P value**	**Re mark**
	BT	**AT**						
Group A	1.727	0.4545	1.273	73.71	0.4558	0.09719	W=253.00 (N=22) p<0.0001	HS
Group B	1.348	0.5217	0.8261	61.28	0.3876	0.08081	W=190.00 (N=19) p<0.0001	HS
Mann Whitney test - U =168.00, p=0.0177 , p<0.05 (S)								

Note – HS (Highly Significant), S- (Significant)

10. Effect of therapy on *Chal Stana* (Pendulous movement of breast):

Chal Stana	**Mean**		**M.D.**	**% Relief**	**S.D.**	**S.E.**	**W, N & P value**	**Re mark**
	BT	**AT**						
Group A	1.773	0.6818	1.091	61.53	0.2942	0.06273	W=253.00 (N=22) p<0.0001	HS
Group B	1.440	0.6800	0.7600	52.77	0.4359	0.08718	W=190.00 (N=19) p<0.0001	HS
Mann Whitney test - U =190.00, p>0.05, p=0.0608 (NS)								

Note – HS (Highly Significant), NS- (Not Significant)

11. Effect of therapy on *Javoprodha* (Utsah hani):

Javop Rodha	**Mean**		**M.D.**	**% Relief**	**S.D.**	**S.E.**	**W, N & P value**	**Re mark**
	BT	**AT**						
Group A	2.227	0.7273	1.500	67.35	0.5118	0.1091	W=253.00 (N=22) p<0.0001	HS
Group B	1.640	0.6400	1.000	60.97	0.4082	0.08165	W=276.00 (N=23) p<0.0001	HS
Mann Whitney test - U=148.00, p<0.005, p=0.0058 (V S)								

Note – HS (Highly Significant), VS- (Very Significant)

DISCUSSION

According mean difference and percentage relief Group "A" found more effective than Group "B". *Ruksha Basti, SuryaNamaskar* and *Nadishodhana Pranayama* group provided better result in improvement of sign and symptoms, *Dosha Dushti Lakshna, Sroto Dushti Lakshna* and in objective parameters i.e. Weight, B.M.I, body Circumference and Skin fold thickness as compared to *Suryanamaskara* and *Nadishodhan Pranayama* group. Moreover, *Ruksha Basti ,Suryanamaskar* and *Nadishodhana* group (Group A) showed better result in overall effect of therapy than *Surya Namaskara* and *Nadishodhana Pranayama* group (Group B). It may be because *Panchakarma* technique in the form of *Ruksha Basti* by virtue of its *Ushna Tikshna* and *Ruksha* property open the obstructed channels, eliminates the *Doshas* (breakdown the *Sthaulya* pathology) reduces *Kapha* and *Meda* and simultaneously, *Surya Namaskara* and

Nadishodhana Pranayama by balancing the autonomic nervous system corrects the hormonal imbalances, increases metabolic rate thus by correcting the *Agni* (*Jatharagni* & *Dhatwagni*) which is the key factor of this disease reduces obesity.

Demographic discussion:

Age: The patients in the present study were selected between the age of 15 and 45. Maximum number of obese patients 41.67 % found in 15-25 year of age group .It reveals that this age group person was leading sedentary lifestyle than other age group patients.

Sex: In this study 65 % were female and 35 % were male. This observation supports that females are more prone to obesity than male. Also in this study, maximum female patients were student and desk worker which were leading sedentary life.

Occupation: Maximum 43.33 % patients were desk worker followed by 38.33 % patients were student. This study showed that student and desk worker spend more time in sitting position as well as increased stress and strain that leads to obesity.

Socio-economic status: Majority of patients 53.33 % patients were in middle class followed by 30 % and 11.67 % in lower middle class and upper class respectively. This finding reflects that this disease not only affects the upper class but it is more predominant in middle class also due to the change in life style.

Dietary Habit: 51.67 % patients were doing *Adhyashana*, 28.33 % patients were doing *Vishmashana* and 15 % patients were doing *Samashana*. *Adhyashana*, *Vishmashana* and *Samashana* are considered as causative factor for obesity.45 % patients were taking *Madhura* Rasa dominant *Ahara*, 26.67 % patients were taking *Amla* Rasa, and 23.33 % patients were taking *Lavana* Rasa dominant *Ahara*. 41.67 % were taking *Guru Ahara*, 15 % were taking *Sheet guna* dominant *Ahara*. Excessive use of *Madhur Rasa* is a causative factor for *Sthaulya* (Ch.Su.21/4) because due to its *Snigdha*, *Sheeta* and *Guru Guna* it increases the *Kapha Dosha* and all the *Dhatu* including *Meda* (Ch.Su.26/42).Excessive use of *Amla Rasa* causes *Kleda* in body which enhances *Sthaulya* (A.S.Su.18/10). 33.33 % were taking *Snigdha Ahara*, its excessive consumption is directly increases *Kapha Dosha* and *Medo Dhatu*. (Ch.Su.1/44)

Fast food: In this study maximum 81.67 % patients were taking fast food. Fast food having high calories and considered as a *Atisnigdha* and *Guru Ahara* which develop the "*Ama*" in the body due to *Agnimandya* thus, help to etiopathogenasis of *Sthaulya*.

Emotional Make-up: 20 % were having jolly emotional make-up, 28.33 % patients were having stress, 16.67 % were having anxiety, and 5 % were having depression. *Aacharya Charaka* has stated that *Harshanityatva* is one of the important causative factor for *Sthaulya*. (Ch.Su.21/4) and stress and anxiety also play important role in pathogenesis of *Sthaulya*.

Exercise: 51.67 % patients were not doing any exercise and 35 % patients were doing mild exercise regularly and 13.33 % patients were doing exercise

irregularly. This study reveals that dominance of sedentary life which is the most common etiological factor of *Sthaulya*.

Prakruti: In this study maximum 65 % of the patients belonged to *Kapha-Vata Prakruti* and 30 % *Kapha Pitta Prakrati* which reveals that maximum of the patients were *Kapha* predominant *Prakruti*, related with either *Vata* or *Pitta*. *Acharya Charaka* also indicated that *Sthaulya* is a *Sleshma Nanatmaja Vyadhi* .(Ch.Su.20/17)

Clinical Discussion:

BMI : In group A patients 8.44 % decrease in BMI and in Group B 5.79 % decrease of BMI were reported with highly significant statistically ($p<0.0001$). On the basis of mean difference Group A found more effective than Group B on BMI.

Body fat %: In Group A Body fat % reduced by 6.01 % while in Group B it reduced by 5.82 % with highly significance ($p<0.0001$).On inter group comparison on the basis of mean difference both groups were found equally effective.

Effect on Skin fold thickness: Effect of the treatment on various skin fold thickness found highly significant in both Group A & B. But in inter group comparison on the basis of mean difference Group A found more effective than Group B in skin fold thickness of biceps, sub scapular while in skin fold thickness of triceps and superior iliac both groups were equally effective.

Effect on measurement of different body parts: In Group A decrease of measurement found in Abdomen 8.28 %, Waist 4 %, Hip 2.72 % while in Group B decrease of measurement found in Abdomen 5.28 %, Waist 3.50 %, Hip 2.41 % with statistically highly significance ($p<0.0001$). On inter group comparison on the basis of mean difference in the reduction of abdominal girth Group A found more effective than Group B while in Waist and Hip measurement both groups were equally effective.

Effect on waist hip ratio: In Group A reduction in W/H Ratio found 3.38 % and in Group B 1.5 % with highly significance ($p<0.0001$). On inter group comparison Group A found more effective than Group B.

Effect on lipid profile:

In Group A patients increase in HDL found 6.52 %, decrease in LDL 9.69 %, VLDL 16.86 %, cholesterol 9.15 %, triglyceride 13.27 % while in Group B increase in HDL found 5.70 %, decrease in LDL 10.43 %, VLDL 13.31 %, Cholesterol 8.14 %, triglyceride 13.20 % with statistically highly significance ($p<0.0001$). On inter group comparison on the basis of mean difference both groups found equally effective.

Effect on Fasting blood sugar in Prediabetic patients:

In Group A patients decrease in fasting blood sugar in Prediabetic patients found 10.45% while in group B patients decrease in fasting blood sugar in Prediabetic patients found 8.55% with statistically highly significance ($p<0.0001$). On inter group comparison on the basis of mean difference both groups found equally effective.

Effect on Symptoms of Sthaulya:

On inter group comparison on the basis of mean difference in the symptoms like *Kshudadhikya, Daurbalyata, Swedadhikya, Kricchavyavaya, Kshudraswasha* and *Chal Sphik ,Chal Stana,Daurgandhya* both groups found equally effective. And on the basis of percentage relief in *Kshudadhikya* 52.64 % relief found in group A and 46.34 % in group B. In *Daurbalyata* 53.83 % relief found in group A and 46.51 % in group B. In *Swedadhikya* 54.74 % relief found in group A and 47.82 % in group B. In *Kricchavyavaya* 72.72 % relief found in group A and 47.05 % in group B. In *Kshudraswasha* 54.04 % relief found in group A and 50 % in group B. In *Chal Sphik* 67.53 % relief found in group A and 64.86 % in group B. In *Chal Stana* 61.53 % relief found in group A and 52.77 % in group B. In *Daurgandhya* 58.53 % relief found in group A and 45.45 % in group B.

On inter group comparison on the basis of mean difference in the symptoms like *Atipipasa, Chal Udar, Javoprodha* Group A found more effective than group B. And on the basis of percentage relief in *Atipipasa* 73.80 % relief found in group A and 50 % in group B, in *Chal Udar* 73.71 % relief found in group A and 61.28 % in group B, in *Javoprodha* 67.35 % relief found in group A and 60.97 % in group B.

Overall effect of therapy:

- **Complete relief:** No patients were assessed as a complete relief in both groups.
-
- **Marked Improvement:** Group A 9.09 % patients were assessed as marked improved, while in Group B none of the patients were assessed under this grade.
- **Moderate Improvement:** Group A 13.64 % patients were assessed as moderate improved, while in group B none of patients were observed under this grade.
- **Mild Improvement:** Group A 68.18 % patients were assessed as mild improved, while in group B 68 % patients were observed under this grade.
- **No Improvement:** Group A 9.09 % patients were assessed as no improved, while in group B 32 % patients were observed under this grade.

Probable mode of action of *Ruksha basti* on *Sthaulya* (Obesity):

Due to obstruction of the *Srotas* by *Meda Dhatu, Vata (Samana Vata)* gets obstructed in *Koshta* and plays an important role in the development of obesity by doing quick digestion and absorption of ingested food. Thus, the person tends to take more and more food in short duration. which leads the person to *Adhyashana* and to take *Guru Snigdha Ahara*. This again formed Vitiated *Meda* and *Ama*. This cycle repeated again and again in obese person so it becomes very difficult to manage this disease. Thus, treatment procedure which could eliminate this obstructed *Vata Dosha* and simultaneously reduces the *Meda* should be needed.

In *Ayurvedic* classics it is considered that most of the *Vata Dosha* predominant diseases can be easily treated by *Basti Karma* hence *Basti* procedure are

consider to be the best choice to control the vitiated *Vata Dosha*. *Vata* is playing an important role in *Samprapti* of *Sthaulya* also. Therefore, in the effective management of *Sthaulya Acharya Charaka* recommended *Basti* procedure for the elimination of the vitiated *Doshas* and to break the disease pathology.

It was recommended by *Acharya Charaka* that *Basti* prepared by *Ruksha, Ushna and Tikshna* property drugs can provide better result because of its *Kaphagna* and *Medohara* properties. Therefore, *Vaishwanar Churna* have been selected as ingredient for *Basti Karma* in this study. The ingredients of *Vaishwanar Churna* had dominant in *Katu, Tikta, Kashaya Rasa, Laghu, Tikshna, Shukshma, Ruksha in Guna , Ushna Virya* and *Katu* in *Vipaka*.

Thus, Action of the *Ruksha Basti* used in this study may be understood by the dominant *Gunas* of its ingredients. Because of the *Ruksha Guna* of *Vaishwanar Churna's* ingredients *Basti* was able to reduce the *Kaphadosha and Meda Dhatu.* And due to *Ushnaveerya* of *Basti Dravyas* it was able to do *Deepana-Pachana* and enhanced the *Agni* at all levels thus reduced the *Ama*. Because of the *Sukshma Guna* of *Vishwanar Churna,* which is dominant in *Akasha, Vayu* and *Agni Mahabhuta* this *Basti* drugs were reach at cellular level. Simultaneously *Tikshna Guna* of *Basti* drugs which is dominant in *Agni Mahabhuta* were helped to open the microchanels (Srotas) and then were break the *Dosha Sanghata* in *Srotas*. So, that the *Vyana Vayu* was able to transport the nutrients to its related *Dhatu* and then the formation of *Uttrotar Dhatu* were take place properly. Hence the process of *Medovriddhi* were checked.

By virtue of these properties this *Ruksha Basti* was able to reduced *Meda* and correct the *Medo Dhatvagni* at the same time it removed *Avarana* of *Meda* on *Vatadosha* hence were brings *Jatharagni* to its normal by its *lekhan, Shodhan, Amapachan, Srotoshodhan* properties and provided good result in all signs and symptoms.

Probable mode of action of *Suryanamaskara & Nadishodhan pranayama* on obesity:

In Group B (*Suryanamaskara* and *Nadishodhana Pranayama* Group) BMI reduced by 5.79 % with highly significance ($p<0.0001$), waist hip ratio reduced by 1.5 % with highly significance ($p<0.0001$) and abdominal girth reduced by 5.28 % with highly significance ($p<0.0001$), Body fat % reduced by 5.82 % with highly significance ($p<0.0001$), effect on lipid profile were also Reported statistically highly significance ($p<0.0001$) and in percentage increase in HDL 5.70 %, decrease in LDL 10.43 %, VLDL 13.31 %,Cholesterol 8.14 %, triglyceride 13.20 % were recorded. In Pre-diabetic patients serum blood sugar were decreased by 8.55 %.These findings indicating that *Surya Namaskar* along with *Nadishodhan Pranayama* definitely reducing the body weight significantly.

Decrease in abdominal skin fold thickness, abdominal girth showed decrease in visceral adiposity. Various research findings indicating that proinflammatory cytokines such as tumor necrosis factor-alpha (TNF-a) and Interleukins-1 and -6, etc.

are produced by visceral adipose cells in good quantity. These proinflammatory cytokines disrupt normal insulin action in fat and muscle cells, and may cause the whole-body insulin resistance. Insulin resistance is often associated with abnormalities in lipids particularly high blood triglycerides low high density lipoprotein and high level of blood sugar.

In the present study decrease in triglycerides and increases in HDL indicating that *Suryanamaskara* and *Nadishodhana Pranayama* had definitely improved Insulin resistance. And the increase in HDL level also indicating that HDL particles were able to do their normal functions like removing of fats and cholesterol from cells and transport it back to the liver for excretion or re-utilization.

Present study's findings on lipid profile and decrease in blood sugar level in Pre-diabetes patients also indicating that by practicing *Surya Namaskar* along with *Nadishodhan Pranayama* worked on obesity related secondary associated problems like Diabetes Mellitus, Dyslipidemia and insulin resistance. These finding supports the other research findings that the performance of asana led to increased sensitivity of the B cells of the pancreas to the glucose signal [10].and regular practice of *Asanas* significantly decreases the oxidative stress of the body which plays a key role in insulin resistance and obesity.[11]

Significant reduction in BMI in the present study also indicating that *Suryanamaskar* and *Nadishodhan Pranayama* increases the mobilization and utilization of fatty acid. It may be because adrenal medulla during exercise releases epinephrine and norepinephrine. These two hormones directly activate hormone-sensitive triglyceride lipase that is present in abundance in the fat cell, and this causes rapid breakdown of triglyceride and mobilization of fatty acids.[12] That means practicing *Suryanamaskar* and *Nadishodhan Pranayama* definitely increases the metabolic rate, it not only enhances *Jatharagni* but also corrects the *Dhatuagni* (*Medodhatwagni*) thus increases the energy expenditure and help to encourage energy imbalances by enhancing metabolic rate thus reduces obesity.

The decrease in BMI, skin fold thickness, body fat %, and improvement in sign & symptom indicating that *Suryanamaskara* and *Nadishodhana Pranayama* was defiantly breakdown the *Samprapti* of *Sthaulya* therefore significant effect in various subjective and objective parameters found in Group "B" patients.

Effect of therapy:

In Group "A" and Group "B" patients decrease in BMI, Body fat %, skin fold thickness, measurement in different part of body, W/H Ratio, LDL, VLDL, cholesterol ,triglyceride and decrease in fasting blood sugar in prediabetic patients were found. Also, the increase in HDL were also reported with the statistically highly significance ($p<0.0001$). Reduction in most of the symptoms were also reported with the statistically highly significance ($p<0.0001$) in both Groups.

In inter group comparison Group "A" found more effective on BMI, Skin fold thickness of biceps with statistically highly significance ($p< 0.0001$) and measurement of abdomen, in the symptoms like *Javoprodha* Group "A" found more effective with very significance ($p<0.005$) and in skin fold thickness

of sub scapular, measurement of Chest, W/H Ratio, in symptoms like *Atipipasaa, Chal Udara* Group "A" found more effective with significance ($p<0.05$).

Thus, Group "A" (*Ruksha Basti , Suryanamaskar* and *Nadishodhana Pranayama* group) showed better result in overall effect of therapy than Group "B" (*Surya Namaskara* and *Nadishodhana Pranayama* group) in the management of obesity *(Sthaulya).*

CONCLUSION:

On the basis of Observations made, Results achieved and thorough discussion in present study following conclusion can be drawn.

1. In the present study in the management of *Sthaulya* according mean difference and percentage relief Group "A" showed better result than Group "B" because in Group "A" *Ruksha Basti* given along with *Suryanamaskar* and *Nadishodhana Pranayama* were advised. *Basti* showed better result in almost all the parameters because it eliminates *Doshas* from the body and simultaneously absorbed drugs of *Basti* were performed their action on *Samprapti Vighatana* at cellular level. And it was the plus point that any hazardous effects were not found during this study also.

2. Results of this study are very encouraging. Hence, this study suggested that for the management of obesity (*Sthaulya*) *Ruksha Basti* along with *Suryanamaskara* and *Nadishodhana Pranayama* can be adopted as therapeutic measures for obesity (*Sthaulya).*Which will provide the great benefit to the patients and also provide the global acceptance of *Ayurveda*.

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