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Preventive and curative effect of yoga in management of overweight and obesity.

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ABSTRACT

Obesity is emerged as the most prevalent sedentary lifestyle disorder in urban society. Today, *Yoga* has become more popular because of its potential to rejuvenate body-mind complex. The sedentary lifestyle of today's era leads to the non-communicable epidemic of overweight and *Sthaulya* (obesity). Regarding this, 2021 was a pivotal year for global obesity policy, following evidence showing that it is one of the leading risk factors for covid-19 death and disability.Covid-19 has brought to public attention that, the higher risk of ill health from infectious diseases associated with increased body weight. In many countries during 2020 and 2021 showed that "lockdown measures had a negative impact on the diets and lifestyles of children and adolescents, with a consequent increase in body weight and central fat accumulation." Excessive body weight is associated with various diseases. *Yoga* offers natural and effective lifestyle modification therapy without harmful side effects in overweight and obese persons through its some principals. In the present study, 90 patients with features of obesity were randomly divided into two groups. In experimental group patients were made to perform *Kapalbhati yogic shuddhikriya* daily at morning whereas in comparison for control group with *Sukshama vyayam techniques* (Loosening Exercises) and *Nadishodhana pranayama*. The study reveals that there was a remarkable decrease in subjective and objective parameters in both the groups, but *Kapalbhati* therapy is found more effective in every aspects of obesity. Average percentage of relief in experimental group is 39.68% and in control group is 28.74%. Hence to prevent this smoldering problem of present era the "Sciences of life" i.e.*Yoga* offers the lifestyle modifying, time effective, free of cost, objective therapy through its basic principles.

Keywords: *Sthaulya*,Obesity,*Yogic shuddhikriya, Kapalbhati, sukshama vyayam techniques,* and *nadishodhana Pranayama.*

INTRODUCTION

Ayurveda and *Yoga* are two inseparable sister sciences that stem from the *Vedas*. They together encompass healing disciplines in the body. On the one hand, *Ayurveda* rejuvenates the body; on the other, *Yoga* deals with the purification of body, mind and consciousness. Thus, together they both complement and embrace each other. Today, *Yoga* has become more popular because of its potential to rejuvenate body-mind complex, to maintain the healthy condition of body i.e. preventive aspect and acts as therapy in many diseases i.e. curative aspect as like Ayurveda.[1] The sedentary lifestyle of today‟s era leads tothe non-communicable epidemic of obesity. Ayurveda is one of such sciences that can always match up with the contemporary sciences. This unique quality of Ayurveda as a "Science of Life" eventually paved the way for free transaction between Ayurveda and other sciences of life that include Yoga, which in turn brings about eradication of diseases, prevents early aging, decreases mortality and promotes the health as quoted in *Shwetashwatar Upanishada.*[2]

"Sthaulya" (Obesity) is an increasing lifestyle related disorder now a day. Obesity and overweight together constitute as one of the top 10 global health problems as per the surveys conducted by World Health Organization.[3] Lack of physical activity, increase in convenience and frequent intake of food, industrialization, development in Artificial Intelligence technology, labor-saving devices, motorized transport, stress during work, more sedentary jobs, various types of junk food i.e. fast food, bakery items, increased amount of soft drink result into manifestation of obesity. It is estimated that most of the world's population lives in countries where overweight and obesity kills more people than underweight. By the year 2030 it is predicted that 1 in 5 women and 1 in 7 men will be living with obesity, equating to over 1 billion people globally. [4] Over the past three decades we have seen increasing numbers of overweight peoples, despite increasing knowledge of it. Regarding this, 2021 was a pivotal year for global obesity policy, following evidence showing that it is one of the leading risk factors for COVID-19 death and disability.COVID-19 has brought to public attention that, the higher risk of ill health from infectious diseases associated with increased body weight. Different studies have shown that the prevalence of overweight and obesity increased by 2% to 13% in different countries across the course of the pandemic.[5,6] Furthermore, the numbers of hours of physical activity declined significantly, while the proportion of children reporting screen time of more than five hours daily increased from 15% to 47% along with an increase in food insecurity.[7] Reviews across the medical literature confirm that people living with overweight, and especially obesity, are at a higher risk of developing infections of various types, and to develop serious complications following infection. Obesity was found to be highly correlated with covid-19 associated mortality; with death rates ten times higher in countries where over 50% of the population are living with overweight.[8]

The non-communicable epidemic of obesity is found to be the pioneer of Diabetes Mellitus (Type II), Heart diseases, depression, infertility, osteoarthritis, etc. The diseases are very hard to be treated and the treatments like angioplasty, knee transplantation, life- long anti-diabetic drugs etc. Happen to be highly expensive which is not affordable to common man.[9] Hence to prevent root cause namely "Obesity" is the easiest remedy to counter the consequences. This difficulty has drawn my attention towards prevention and control of obesity and preventing complications of obesity. Though, modern system of medicine has their own

therapeutic modalities in tackling obesity, but they are associated with many adverse effects. Considering this the global population is enthusiastically looking towards effective natural remedies. *Ayurveda* has considered Obesity as one of eight condemnable conditions (*Ashtounindit*).[10] Though etiology, symptoms, management of *Sthaulya* have been described in detail by ancient Ayurveda texts, no medicine is believed to be existent to get rid of *Sthaulya* as per *Acharya Vagbhata*.[11] Nevertheless, it is well known fact that, in *Ayurveda* management of disease is not all about merely taking the medicine. It is a collective operation of medicine, *Nidan-parivarjan (*avoid causative factor*)*, lifestyle modification regarding *Pathya-apathya (*wholesomet-unwholesome diet) and *vihara (*daily schedule*)*. Also to undertake the management of *Sthaulya* Yogic ways of lifestyle modification offers the objectless therapy (*Adravyabhoot chikitsa*) of "*Kapalbhati"* through *shat-shuddhikriyas* (purifying procedure) mentioned in *Hatha Yoga Pradipika* and *Gheranda samhita*.[12,13,14] So, to evaluate the preventive and curative effect of *yogic shuddhikriya (*purifying procedure*)*in *Sthaulya*, *Kapalbhati shuddhikriya* is chosen for present study for experimental group as a free of cost, viable, easy to do, time effective and lifestyle modification objectless therapy in comparison with a control therapy with *Sukshama vyayam techniques* (Loosening Exercises) and *nadishodhana pranayama.*

Material and Methods:-

Material - In the present study, on the basis of history and clinical examinations ninety patients with features of overweight and obese (sthaulya) as per ayurvedic classics [15] and body mass index equal to or more than 25 kg/m2 having age 25 to 55 years were selected. [16] The patients were selected irrespective of sex, religion, occupation, education, marital and economic status. These patients will be randomly divided into 2 groups namely experimental and control group containing forty-five subjects in each group. In experimental group, patients were made to perform *Kapalbhati shuddhikriya* daily at morning whereas in comparison with a control therapy of *Sukshama vyayam techniques* and *Nadishodhana pranayama.*

Methods:-

A] Experimental Group - In this group patients were made to perform *Kapalbhati* (yogic shuddhikriya) daily at morning and evening for three months, excluding ten days of initial study trial with empty stomach.

Method of performing *Kapalbhati*:-[17,18,]

1) Sit in comfortable asana (pose), preferably as *Padmasana* (lotus pose) or *Sukhasana* (comfort pose) with your spine erect and shoulders relaxed. Rest your hands on your knees in ***gyan mudra*** (thumb and index finger touching) or with palms facing upward. Take a deep, calming breath in through both nostrils to center you.

2) At the time of *rechaka* (expiration) give sudden jerk, do active forceful expiration, followed by passive effortless *puraka* (inspiration), counted as one *aavartane* (stroke)

3) Initially 3-4 repetitions of 10-20 strokes are to be performed in each setting, without holding breath, and then 20 to 30 strokes are gradually increased per day to reach the maximum strokes, sixty per one minute.

4) Then these maximum strokes are to be performed on empty stomach daily for ten times in a single setting for three months while taking one or two minute break between the strokes.

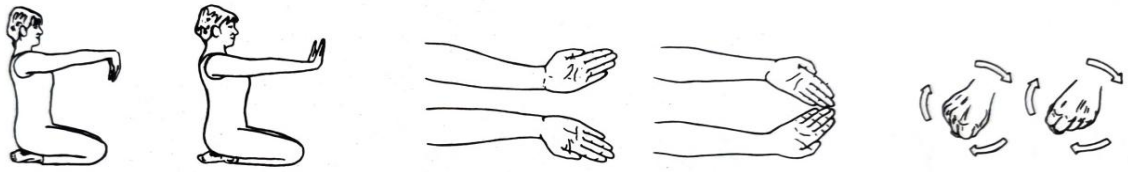
5) Perform these Kapalbhati practices at every morning and evening.

B] Control Group-

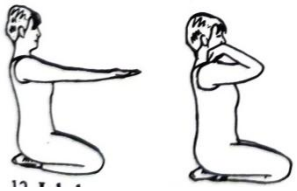
In this group forty-five patients were made to perform yogic *Sukshama vyayam techniques and Nadishodhan Pranayama* daily at morning and evening for three months, excluding ten days of initial study trial.

a)Method Of Performing Sukshama Vyayam Techniques (Warm up exercise; Loosening exercise) [19,20] -In sitting position

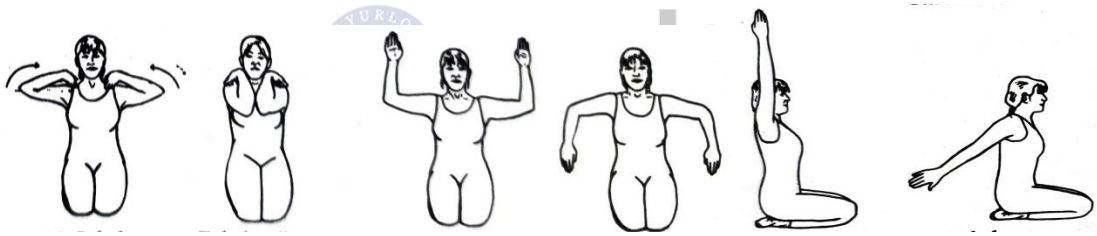
• Wrist joint movement (flexion-extension, radial-ulnar deviation, rotation)



• Elbow joint loosening exercise- (extension-flexion) –

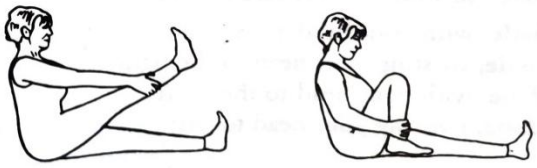


• Shoulder joint movement (flexion-extension, abduction-adduction, external and internal rotation)



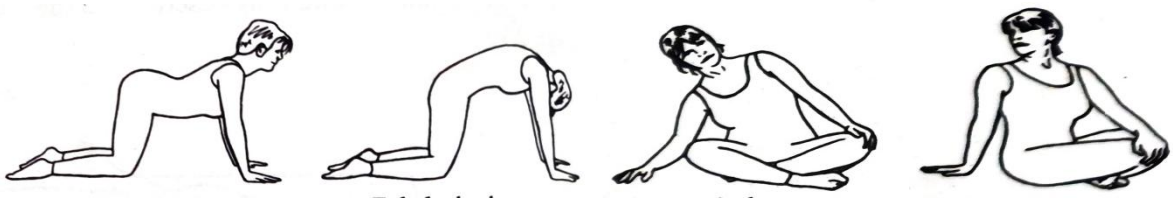
• Ankle joint movements (plantar flexion-dorsiflexion, eversion-inversion, rotation clock and anticlockwise.

• Knee joint movements, (flexion-extension,)



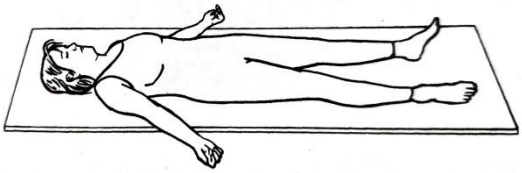
• Hip joint movement (extension-flexion, external and internal rotation, abduction- adduction.

• Spine (extension-flexion-backward and forward bend) ,spine –lateral flexion, rotation



• Neck movement - extension-flexion, lateral flexion, lateral rotation.

• Relaxation and corpse pose (shavasana)..



• Each warm up exercise performs daily on empty stomach.

Method of performing Sukshama vyayam techniques (Warm up exercise; Loosening exercise)-In standing position-

• Neck rotation clock and anti-clockwise

• Eyeball rotation clock and anti-clockwise

• Shoulder joint forward and backward rotation

• Wrist joint clock and anticlockwise rotation

• Chest twisting towards right and left side

• Hip joint rotation clock and anticlockwise

• Knee joint rotation clock and anticlockwise

• Ankle joint rotation clock and anticlockwise Each warm up exercise performs daily for four times in single setting on empty stomach.

b) *Nadishodhana (Anuloma-viloma) pranayama*- [21] **(Alternate nostril breathing)-**

Technique: Sit comfortably in a cross-legged position (*Sukhasana*) with your spine straight. Use your right hand in *Nasika Mudra* (fold index and middle fingers). Close the right nostril with the thumb, inhale through the left, close the left nostril, with your ring finger and exhale through the right. Then, inhale through the right and exhale through the left to complete one round. Practice *Nadishodhana pranayama* in the morning and evening for twenty cycles with empty stomach.

Diet and other advice:-The patient will be advised to avoid high fat diet and counseling for avoidance of factor leading to *Sthaulya (ie.nidanparivarjan*) will be done with every patient in both groups.

Importance of *Mitahara* (balanced diet) in *Yoga* and *Ayurveda*:

In classical texts, the importance of balanced diet is clearly mentioned. This is the

quantity sufficient to one's needs. Due to importance, *Mitahara* is described prior to starting yogic procedures in ancient yogic text.For proper digestion of food, it should be consumed in appropriate quantity as described in *Trividh kukshiya adhyaya* in *Ayurveda* and *Mitahara* in *Hath yoga Pradipika* and *Gherand Samhita*.[22,23,24]In Ayurveda, sages also describe wholesome and unwholesome diet in overweight person. In obesity one should avoid *guru ahara* (heavy food), *snigdha ahara* (unctuous food), *madhura ahara* (sweet food), *sheeta ahara* (cold food),*navanna* (fresh grains), *navamaddya* (fresh alcoholic preparation), *payavikara* (milk and milk preparation), *guda vikara* (jiggery preparation), *masha* (black gram), *godhuma*(wheat) etc. [25]

Duration of study:-Three months for both the groups with prior consent of each patient in both groups.

Selection criteria for both groups

1) All the patients diagnosed as overweight or obese irrespective of sex.
2) Body mass index (BMI) > or = 25 kg/m2
3) Waist:hip ratio (WHR) >1.0 in male, (WHR)>o.85 in female. [26]
4) Broca"s index [27] - Ideal body weight =height (in cm) minus 100.
6) Patients having symptoms described in ayurvedic and modern literature.
7) Co-operative, obedient patients willing to undergo the prescribed therapy.
8) Age between between 15 to 55 years.

Rejection criteria for both groups:-

1) Age less than 15 years and more than 55 years.
2) Any other systemic disorder and complications like hypertension, diabetes mellitus, coronary artery diseases, endocrinal disorders etc.
3) Patients having deviated nasal septum nasal polyps, appendicitis, pharyngitis, hepatomegaly, acute abdomen.
4) Having obesity as a secondary disorder to any other major disorder, consider on the basis of history taking and clinical examinations only, without any laboratory investigations.
5) Ante natal care and post natal care patients.

Assessment criteria:-

1) Subjective parameters
2) Objective parameters

All the subjective and objective parameters were noted in each patient of each group, before starting therapy, after forty-five days, and after sixty days of therapy.

1) Subjective parameters: - Subjective parameters have been graded as: 0, 1, 2, 3 on the basis of severity of ayurvedic symptomatology.[28]

a) Lack of karya-anutsaha (enthusiasm).
b) Daurbalya (weakness)
c) Swedadhikya (excessive sweating)
d) Kshudhadhikya (excessive appetite)
e) Trushnadhikya (excessive thirst)
f) Nidradhikya (excessive sleep)
g) Kshudrashvasa(tachypnoea)
h) Daurgandhya (body odour)

2) Objective parameters:-

1) Weight in kilograms
2) Height in meters
3) Body mass index (BMI) Quetlets Index-

Put above obtained value in following formula & calculate BMI,

$$\text{BMI} = \frac{\text{weight (kg)}}{Height\ (\text{m})2}$$

4) Broca's index for ideal body weight: - Brocas index = height (in cm) minus 100.
5) Waist: hip ratio (WHR)- [29]

Waist circumference is measured in horizontal plane with the subjects standing, at

midpoint between the lower border of the rib cage and the iliac crest, which is the level of abdominal girth at umbilicus. While hip circumference measured over the widest part of the buttocks. Both measurements were taken by measuring tape in centimeters. The ratio of the former to the later gives waist: hip ratio.

6) Abdominal girth - by using measuring tape abdominal girth will be taken at the level of umbilicus, 4 cm above and below the umbilicus in centimeters.

7) Mid arm circumference- it was measured with tape at midpoint between acromion and olecranon prominence of hand in centimeters.

8) Laboratory Investigation- Lipid Profile-

- Total cholesterol,
- Triglycerides,
- High density lipoprotein (HDL),
- Very-low-density lipoprotein (VLDL),
- Low density lipoprotein (LDL),

Results and discussion: -

Before treatment (BT) and after treatment (AT) all subjective parameters were evaluated statistically with help of "Wilcoxon signed rank test" for both the groups separately and afterwards, difference between BT score and AT score of both groups was compared by "Wilcoxon mann-whitney test".

Before treatment (BT) and after treatment (AT) all objective parameters were evaluated statistically with the help of "paired t-test" for both the groups separately and afterwards difference between BT and AT score of both groups was compared by "unpaired t- test".

Experimental group: -

In experimental group the symptoms were significantly relieved after treatment and p value was found out to be less than 0.05. Thus we can say that *Kapalbhati* therapy is beneficial in symptoms of overweight or obese *(Sthaulya).*

Control Group:-

In control group it was found that some symptoms relieved significantly at 5% level of significance, p value was < 0.05 except for symptoms Daurbalya, Swedadhikya, Trushnadhikya, Kshudrashvasa and Daurgandhya.

Comparison between two groups in subjective parameters:-

Difference between before treatment and after treatment score of both group was compared by Wilcoxon mann–whitney test. After comparison both groups is statistically highly significant in *karya-anutsaha* and *nidradhikya* while significant in remaining symptoms; therefore *kapalbhati shuddhikriya* in experimental group gives significant improvement in symptoms of *sthoulya* than *sukshama vyayam techniques* or loosening exercises in control group.

Paired T-test -: Objective parameters of experimental group:-

After applying paired t-test to the objective parameters of experimental group BT and AT, there was highly significant improvement in weight, body mass index, waist circumference, hip circumference, and waist: hip ratio and all abdominal girths. but there was no change in lipid profile, Broca's index, and mid-arm circumference.

Paired t-test -: objective parameters of control group:-

In control group after applying paired t-test to parameters BT and AT, there was highly significant improvement in weight, body mass index, waist circumference, and waist: hip ratio and abdominal girth at umbilicus. Significant improvement in hip circumference but, insignificant improvement in lipid profile, Broca's index, mid-arm circumference, abdominal girth 4 cm above and below the umbilicus.

Unpaired t-test between both groups of objective parameters:-

When unpaired t-test is applied to both groups for objective parameter, there

was highly significant improvement in all parameters except lipid profile, Broca's index and mid arm circumference. This shows that there is significant decrease in weight, body mass index, waist circumference, hip circumference and abdominal girth of patients in experimental group than patients in control group.

Percentage of relief in symptoms score:-

In experimental group, percentage of relief for *karya-anutsaha, daurbalya, swedadhikya, kshudhadhikya, trushnadhikya, nidradhikya, kshudrashvasa, daurgandhya* was 54.4%, 19.3%, 34.2%, 31.4%, 19.6%, 41.8%, 7.8%, 26.3% respectively. In control group, percentage of relief for the symptoms *karya anutsaha, daurbalya, swedadhikya, kshudhadhikya, trushnadhikya, nidradhikya, kshudrashvasa, daurgandhya* was 29.8%, 2%, 20.5%, 16.2%, 8.5%, 30.6%, 5.2%, 8.9% respectively.

Table.No.1-Showing Percentage Of Relief In Symptoms Of 90 Patients

Sr.No	Symptoms	% of relief	
		Experimental Group	Control Group
1	*Karya Anutsaha*	54.4	29.8
2	*Daurbalya*	19.3	2
3	*Swedadhikya*	34.2	20.5
4	*Kshudhadhikya*	31.4	16.2
5	*Trushnadhikya*	19.6	8.5
6	*Nidradhikya*	41.8	30.6
7	*Kshudrashvasa*	7.8	5.2
8	*Daurgandhya*	26.3	8.9

Total effect of therapy:-

In experimental group 3.3% patients show 50-75% of relief, 63.33%% patients show 25-50% of relief, and 33.33% patients show less than 25% of relief in symptoms of *Sthaulya.*
in control group 13.3% patients show 25-50% of relief, 86.67%% patients show less than 25% of relief, in symptoms of *Sthaulya.*

Table.no.2-showing overall effect of therapy in both groups

% of relief	experimental group		control group	
	no. of patients	percentage %	no. of patients	percentage %
less than 25%	17	37.78	29	64.45
25-50%	24	53.34	16	35.56
50-75%	4	8.9	0	0
more than 75%	0	0	0	0
Total	45	100	45	100

Overall effect of therapy:-

Average percentage of relief in experimental group is 39.68% and in control group is 28.74%. This shows that *Kapalbhati shuddhikriya* is more effective as compared to *Sukshama vyayam* techniques (warm up exercises/loosening exercise) and *Nadishodhana pranayama* in *Sthaulya* patients.

Table.No.3-Showing overall effect of therapy

Average % Relief	
Experimental Group	**Control Group**
39.68	28.74

Discussion-

In yogic science, *Shatkarma* ***(Shatkriya)*** refers to the six classical purification techniques which were designed to detoxify the body and balance the three *doshas* (*Vata*, *Pitta*, and *Kapha*). These practices are traditionally considered foundational and are ideally performed before progressing to *Asana* (postures) and *Pranayama* (breathing). *Kapalbhati* is one of these ***Shatkarma*** (purification technique) often called the "Skull Shining Breath".It is defined by rhythmic, forceful exhalations that act as a "bellows" to cleanse the respiratory and digestive systems. Kapalbhati means rapid breathing technique in which exhalations are active and forceful while inhalations are effortless and passive. It purifies the frontal area of the brain, improves metabolism, and reduces abdominal fat.

Yoga aims to decrease the "allostatic load" (the wear and tear on the body from chronic stress) by restoring autonomic balance through parasympathetic activation (vagal stimulation). Regular practice helps manage diseases by regulating the psychosomatic mechanisms, reducing cortisol, and increasing GABA levels, which improves autonomic function and decreases inflammation.Yogic practices of *sukshama vyayam techniques* (Loosening Exercises), *nadishodhana pranayama, Yogic shuddhikriya (cleansing process) i.e. Kapalbhati*, are used to remove blockages in the nadis, reduce the "fight or flight" response, and improve physical functioning, thus reducing the risk of lifestyle-related ailments.

Yogic *Shatkarma,* or six cleansing techniques, are essential purification practices in Hatha Yoga designed to detoxify the body (removing *ama*), balance the three doshas (*Vata, Pitta, Kapha), medasleshmahara* (remove excess fat and mucus from the body) and enhance physical and mental vitality. Specially *Kapalabhati* described as *kaphadosha vishoshi* **(absorb or dry out excess mucus,** phlegm). By cleansing the internal organs and removing gross impurities, they prepare the body and mind for deeper yoga practices like *Pranayama* and *meditation.*

Alternate breathing through the left and right nostrils is the procedure of *Nadishodhana pranayama.* It also removes *kapha dosa.* This procedure is useful for weight reduction. *Nadishodhana Pranayama* is a balancing and purifying breath technique that, primarily known for calming the mind, can assist in managing weight by reducing stress, improving metabolic function, and decreasing the urge for emotional or compulsive eating habits. *Nadi Shodhana* activates the parasympathetic nervous system, lowering stress and potential stress-induced overeating. It works by balancing the sympathetic and parasympathetic nervous systems, helping to eliminate excess *Kapha* (mucus/fat) and create a sense of lightness in the body, bringing the body and mind into balance. It enhances oxygenation and stimulates metabolic processes that help in weight management. The *Hatha Yoga Pradipika* stated that "leanness of the body" is a physical sign of purified *nadis*.

Conclusion:-

Overweight and obesity happens to be a disease of complex treatment. It poses a great threat to the general health of an individual. The available treatment is costly,

nonspecific and has not been proved to be reliable. In this context, the experimental therapy i.e. *Kapalbhati* serves the purpose. In comparison with the control therapy i.e. *Sukshama vyayam* techniques,and *Nadishodhana pranayama*. The *Kapalbhati* therapy is found out to be more effective in every aspect. According to *Ayurveda, Sthaulya* is about a group of various life-disrupting symptoms, *Kapalbhati* relives about all those symptoms either in a significant or highly significant manner. There are two aspects of cure; one is being cured and the other is feeling cured. *Kapalbhati* proves to be symptomatically effective on overweight and obesity on both the fronts.

It is observed that the overweight or obese patients are much more concerned about losing the inches than losing the unwanted weight. So, it was interesting to watch out for changes in anthropometric measurement of obese patients after availing *Kapalbhati* therapy. It is to mention that *Kapalbhati* has not brought about "inches loss" in mid-arm circumference. Having conceded this, one can never deny the overall efficacy of *Kapalbhati* on all other parameters. The study reveals that there was a remarkable decrease in abdominal girth, weight, body mass index, waist circumference, hip circumference, and waist hip ratio. Overall increase in enthusiasm is specially noted in the experimental group. In experimental group, highly significant results were obtained in other subjective parameters also.

Kapalbhati, being an objectless, non-pharmacological therapy, was very easy to adopt after a bit counseling irrespective of season and surrounding. Yoga is all about positive modification of lifestyle. So *Kapalbhati*, as a *shuddhikriya* (yogic cleansing procedure) is best suited for all sections of obese patients, be they prosperous or poor. Hence *Kapalbhati* is perfect choice for poor as well as middle income group as one has to spend not a single penny for practicing *Kapalbhati*. It is, therefore inferred that that *kapalbhati shuddhikriya* is more effective and highly recommended as compared to *Sukshama vyayam techniques* and Nadishodhana pranayama (warm up exercises/loosening exercise) in overweight or obese (*Sthaulya)* patients.

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