Original Research Article

Study the Efficacy of *Rodhradiganavasti* in the Management of *Sthaulya* (Overweight)

Abstract:

Background: Obesity (*Sthaulya*) has been one of the primary diseases of the modern period, with its changing lifestyles,climate, and eating habits. Everyone has become a victim of many diseases caused by poor eating habits, and obesity is just one of them. Obesity is the privilege of the new era of robots and materialistic devices. In 2008, the WHO assessed that 1.5 billion individuals, were overweight and more than 200 million men and almost 300 million women were fat.**Objectives:**To evaluate the effect of *RodhradiganaVasti* in *Sthaulya*.**Study design**: This was an open-labelled single-arm interventional clinical study.**Methods:** 15 patients of *Sthaulya* were registered from *Panchakarma,* and *RodhradiganaVasti*was administered for 15 days.**Statistical Analysis:** The data were statistically analyzed using the Wilcoxon Signed Ranks Test for Subjective Parameter and paired t-test for Objective Parameter.**Results**: In this study, decreased weight, lipid profile and subjective parameters show positive finding after the intervention of *Vasti*.**Conclusion**: *RodhradiganaVasti*is one of the best remedies for relieving *Sthaulya.*

Keywords: *Sthaulya*, *RodhradiganaVasti*,Obesity, Overweight.

INTRODUCTION

Sthoulya(Obesity) has become a burning problem of the day caused by untraditional dietary habits. Obesity is considered a worldwide plague, expanding because of stationary ways of life and improved financial conditions [1].World Health Organization (2016) stated that there are around 2 billion adults overweight; of those, 650 million are seen as impacted by robustness (BMI>30 kg/m2). That compares to (39% of men and 40% of women) of adults developed 18 or over who were overweight, with 13 % fat. The general inescapability of strength fundamentally expanded some place in the scope of 1975 and 2016. It is evaluated since, by far, most of the all-out populace lives in countries where overweight and stoutness butchers a greater number of people than underweight[2].

Obesity is the closest therapeutic subject to *Sthaulya* in Ayurveda. Ayurveda defined eight varieties of *'Nindita Purusha*,' out of which one is *Atisthula*. *Atisthula* is morbid obesity which is considered 40-50 BMI, and Super Obesity,i.e.more significant than 50 BMI. Adipose tissue/fat deposition in the body sections, such as the heart, abdomen, gluteal or thigh area, is caused by excessive high-calorie intake.

The periodical *Shodhana* has also proved its effectiveness, and*NiruhaVasti* is among the most effective and widely used therapies with a wide variety of therapeutic acts.

*NiruhaVasti*eliminates *Dosha* (Humors) from the body and enhances the power of the body. And has *Achintya Shakti* (unpredictable effects).In this disorder, the excessive development of abnormal *Meda Dhatu* is clearly visualized. It has been shown that *Kapha* and *Meda* are the critical cause of the pathogenesis of *Medoroga*[3].However, the first line of treatment is considered to limit the excess development of *Kapha* and *Meda*. There is a lot of research and treatment for controlling this condition, but no ideal cure for this issue has been identified. Even using conventional medicine, adverse results and long-term complications are usually seen, but in Ayurveda, obese people minimize their weight without any side effects. *LekhanaVasti* is among the most crucial*Karma* listed by all the *Acharyas* for managing the *SthaulyaRoga*[4,5]. In the use of *Sthaulya,AcharyaSushruta* in *Sutrasthana* has been suggested*RodhradiGanaVasti*(*Rodhra, Palash, Kutannak, Ashoka, Phanji, Alwaluka, Jingani, Shallaki, Kadamb, Sala, Kadali*) these *Dravyas*have a negative effect on *Kaphavridhi* and *Medovridhi.*

Numerous treatment modalities are available in Ayurveda for obesity, such as *LekhanaBasti*. A lot of theoretical work has been done with *lekhana Basti* by a research scholar. But no study has been carried out to study the effectiveness of *RodhradhiganaVasti*. Hence, present study it was decided to select the *RodhradiganaVasti*[6].
To document and analyze this procedure for statistical interpretation, a present study entitled Effect of *RodhradiGanaVasti*on *Sthaulya*was undertaken.

Aim and Objectives

Aim- Study the effect of *RodhradiganaVasti*in *Sthaulya* (Overweight).

Objectives-

1. To study the effect of *RodhradiganaVasti*on Lipid profile.
2. To study the effect of *RodhradiganaVasti*on Weight
3. To study the effect of *RodhradiganaVasti*on BMI
4. To study the effect of *RodhradiganaVasti*onWaist to Hip ratio.
5. To study the effect of *RodhradiganaVasti*on subjective parameters.

Material and Methods:

Selection of Patient:

All the patient came from outdoor and indoor, which wasrecruited in the Panchakarma department. A total of 15 patients were registered in this study which is diagnosed with *Sthaulya.*According to their sign and symptoms. Informed consent was obtained from the patients before starting the intervention.

Diagnostic criteria:

*PratyatmaLakshana*of *Sthaulya*presenting with symptoms like *ChalaSphik Udara Stana, Kshudrashwasa, Dourbalya, Nidradikyata, Swedadikyata, Daurgandhyata, Atipipasa, Atikshudha*and *Alasya,* Value ofBMI.

i) Inclusion criteria

1. Primary obesity (E66.0 of ICD-10 criteria)
2. Patients with overweight where BMI > 25-30 kg/m2
3. Patients aged between 20 to 50 years**.**

ii) Exclusion criteria

1. Drug-induced obesity (E66.1 of ICD-10 criteria)
2. Extreme obesity with alveolar hypoventilation (E 66.2 of ICD-10 criteria)
3. Obesity due to any secondary causes.
4. Adipose genital dystrophy lipomatosis (E23.6 of ICD-10 criteria)
5. Dolorosa (E88.2 of ICD-10 criteria)
6. Prader-Will syndrome (E87.1 of ICD-10 criteria)
7. Other systemic diseases which intervene with the course of treatment.
8. Patients aged fewer than 20 and above 50 years.

Data Collection: Patients designated were completely analyzed by each subjective and objective parameter. A complete historywas taken, as well as a physical examination. Laboratory investigations was performed after following the inclusion and exclusion criteria.
Treatment:*RodhradiganaChurnavasti*was done along with *Pathya* for 15 days.
Study Duration: Initially, treatment lasted for 15 days and follow up period after one month. The total study duration was 45 days.

Table No. 1 Treatment Schedule

Day	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Vasti Schedule	**A**	**N**	**N**	**N**	**A**	**N**	**N**	**N**	**A**	**N**	**N**	**N**	**A**	**A**	**A**

A= Anuvasan, N= Niruhavasti

Table No. 2: *Vasti* composition

Sr. No.	***RodhradiGanaNiruhavasti***	**Quantity**
1.	*Rodhra, Palash, Kutannak, Ashoka, Phanji, Alwaluka, Jingani, Shallaki, Kadamb, Sala, Kadali*	800ml *qwath*
2.	*Madhu*	15 ml
3.	*Saidhava*	10 gm
4.	*Til tail*	30 ml
5.	*TriphalaChurna*	30 gm
For *AnuvasanVasti* We used tita tail 60 ml after food *anuvasan* was given		

Method of administration

Poorvakarma.

All the patients were asked to be in the hospital at or after 9 o'clock. Each patient advised mild*Abhyanga* and *Swedana*locally just before the introduction of *Vasti*. The *Abhyanga* was done with simple *TilaTaila,* and *Sweda* was done only to the area below the ribs to the foot.

Preparation of *Kwath*:

Ingredients:*RodhradiganaChoorna*- 100 gms, Water -1600 ml

Equipment: *Khalwa Yantra*, vessels, measuring glass, stirrer, stove, matchbox, sieve etc.

Materials for therapeutic intervention

For *NiruhaVasti* administration – Enema pot with soft rubber tubes at the end of the terminal.

For *AnuvasanaVasti*–Rubber Catheter and syringe was used.

Procedure: 100 grams of*RodhradiganaChoorna* added 1600ml ofwater in a vessel kept on the gas and reduced to 1/2,i.e. 800ml, and used for the *Vasti*.

Preparation of *RodhradiganaNiruhaVasti*:

The Different components of*RodhradiganaVasti*are combined as follows.
Firstly,*Madhu* and*SaindhavaLavana*were taken and mixed thoroughly with the aid of a wooden churner, and then*TilaTaila*was gradually added and well mixed. No crystals of*Lavana*were to be identified until*Taila*was introduced. The*RodhradiganaKwath*that is prepared both classically and freshly was added.
All ingredients are thoroughly combined, and special preparation is achieved without sediment deposition. It is performed by *Sukhoshna*, holding it over *Ushnajala* before the administration.*(Vasti* preparation was done as per *Niruhavasti)*.

***Pradhanakarma*:**

The patient was advised to lie on the *Panchakarmadroni* in *Vamaparshwa* (left lateral position) pot be fitted with a soft rubber tube (*NiruhaVasti*instrument) or a glycerin syringe with a rubber tube (*AnuvasanaVasti*instrument).

Extreme care has been taken to avoid all the *Vastivyapada.* The patients were told to move from the right to the left side and vice versa repeatedly for five minutes; in *Anuvasana*, *Mrudhutadana* was performed over *Kati*, Prushtha*Urupradesh.* The time of administration of *vasti*, the time of retention of *vasti*and any complications present were identified and recorded.

PaschatKarma: *VastiPratyagamana Kala* was registered, and then a detailed review of the patient was performed, re-recording all vital data. Patients were recommended to stay in *vastiPariharakala*[7] with all *Pathyapathya*.

Method of Assessment of treatment:

Both subjective and objective tests were conducted out before and after diagnosis in all cases. A separate rating has been provided for the subjective criteria of the evaluation, which include the following.

Table No. 3:- Assessment Criteria for Subjective parameters

Sr. No	Subjective Criteria	Grade-0	Grade-1	Grade-2	Grade-3	Grade-4

	Chalasphik Udara Stana	Absence of*Chalatva*	Little visible movement (in the areas) after fast movement	Little visible movement(in the area) even after moderated movement	Movement (in the areas) after mild movement	Movement (in the area) even after changing posture
	Alasya	No *alasya*(doing work satisfactorily with proper vigour in time)	Doing work satisfactorily with late initiation	Doing work unsatisfactory under mental pressure and takes time.	Not starting any work on his responsibilities and doing Little work very slowly	Does not take any initiation and not want to work even after pressure
	Dourbalya	Routine exercise can be performed	moderate activity without difficulty	only mild exercise	gentle exercise with very difficult	Can't do even gentle exercise
	Swedadikyata	Sweating after heavy workand fast movement or in the hot season	Profuse sweating after moderate work and movement	Sweating after little work and movement	Profuse sweating after little work and movement	**Nil**
	Daugandhyta	bad smell absent	bad smell Occasionally present;after bathing, it can remove.	Persistent bad smell limited to close areas difficulty to suppress with deodorants	Constant bad smell felt from long distance and is not suppressed by deodorant	Persistent bad smell felt from long distance even intolerable
	Kshudraswasa	Dyspnoea after heavy work but relived soon and up to tolerance	Dyspnoea after moderate work but reduce later and up to tolerance	Dyspnoea after little work but reduced later and up to tolerance	Dyspnoea after minor works but decrease after that and beyond tolerance	Dyspnoea in resting condition
	Atinidra	No day sleep can get up early, night sleep < 6 hrs.	Can avoid day sleep easily bit drowsy, night sleep	Can't prevent day sleep tired, day sleep 1-2 hrs and night	Constantlytired, sleepy day sleep 3-4 hrs and night sleep 9-10 hrs	Sleep while sitting itself, day sleep 5-6

			<7-8 hrs	sleep 8-9 hrs.		hrs and night sleep > 10 hrs
	Atipipasa	Normal thirst	Up to 1-litre excess intake of water	1 to 2 litres excess intake of water	2 to 3 litres excess intake of water	More than 3 litres excess intake of water

Table No. 4- Gradation for Subjective parameters

Grade	**0**	**1**	**2**	**3**	**4**	**5**
Ruchi	Unwilling for food	Unwilling for food, but could take the meal	Willing towards only most liking food, and not to other	Willing towards only one *Katu, Amla, Madhura* foodstuffs	Inclined towards some Specific *Aahara* or *rasaVishesha*	Equal willingness towards all the *Bhojyapadartha*
Abhyavaharana Shakti	The person not taking food at all.	The person taking food in less quantity once a day	The person taking food in less quantity	The person taking food in moderate quantity	The person taking food in regular quantity	Taking food in excessive quantity twice or thrice
According to the presence of *Jirnaaaharalakshana*n*Utsahaha, Laghuta, Udagarashuddhi, Kshudha, TrishnaPravrutti, Yathochitamalotsarga*						
Jarana Shakti	Presence of one symptom after 6 hours	Presence of two symptoms after 6 hours	Presence of three symptoms after 5 hours	Presence of four symptoms after 5 hours	Presence of all symptoms after 4 hours	Presence of all symptoms within 4 hours

Table No. 5: Gradationfor objective parameters

Grade	**0.**	**1.**	**2.**	**3.**
A. Weight	5kg and above	3-4kg.	1- 2kg.	no change (Basic)

B. BMI.	2.01- and above	1.01-2 kg/m2	0.01-1 kg/m2	no change (Basic)
C. In general body circumference chest, abdomen,waist, hip, waist and hip ratio	4 and above	2-3.99 cm	0.01-1.99 cms	no change (Basic)

Observations and result-
Table No. 6 Observation of Subjective criteria

GROUP B (Ranks) Wilcoxon Signed Ranks Test						
		N	Mean Rank	Sum of Ranks	Z	p-value
StanaUdaraSphikChalatva Before – After	Negative Ranks	15[a]	8.00	120.00	-3.472	0.001*
	Positive Ranks	0[b]	.00	.00		
	Ties	0[c]				
Kshudrashwasa Before – After	Negative Ranks	14[d]	8.32	116.50	-3.252	0.001*
	Positive Ranks	1[e]	3.50	3.50		
	Ties	0[f]				
Dourbalya Before – After	Negative Ranks	14[g]	7.75	108.50	-2.783	0.005*
	Positive Ranks	1[h]	11.50	11.50		
	Ties	0[i]				
Nidradikyata Before – After	Negative Ranks	14[j]	7.93	111.00	-2.976	0.003*
	Positive Ranks	1[k]	9.00	9.00		
	Ties	0[l]				
Swedadikyata Before – After	Negative Ranks	14[m]	8.50	119.00	-3.442	0.001*
	Positive Ranks	1[n]	1.00	1.00		
	Ties	0[o]				

Dourgandyata Before – After	Negative Ranks	11[p]	6.73	74.00	-2.812	0.005*
	Positive Ranks	1[q]	4.00	4.00		
	Ties	3[r]				
Atipipasa Before – After	Negative Ranks	14[s]	8.36	117.00	-3.277	0.001*
	Positive Ranks	1[t]	3.00	3.00		
	Ties	0[u]				
Atikshuda Before – After	Negative Ranks	12[v]	7.46	89.50	-3.306	0.001*
	Positive Ranks	1[w]	1.50	1.50		
	Ties	2[x]				

As per subjective parameters, patients had shown highly significant result in *stana*, *udara*, *spik*, *chalatva*, *kshudrashwasa*, *dourbalya*, *swedadhikyata*, *atipipasa*, *atishuda* and also a substantial reduction in remaining all symptoms of *sthaulya* with highly significant p-value ($p<0.001$).

Table no. 7: Observation of Objective criteria

Group B (Paired t test)							
		Mean	N	Std. Deviation	Std. Error Mean	T	p-value
WEIGHT	Before	81.6667	15	10.24463	2.64515	6.718	0.000*
	After	79.3333	15	10.32796	2.66667		
BMI	Before	34.3267	15	1.65031	0.42611	6.492	0.000*
	After	33.3200	15	1.72883	0.44638		
Waist to Hip Ratio	Before	0.9529	15	0.05759	0.01487	1.509	0.154
	After	0.9493	15	0.05625	0.01452		
Chest	Before	96.8000	15	6.33809	1.63649	-8.796	0.000*
	After	102.0000	15	5.98808	1.54612		
Abdomen	Before	99.4333	15	6.75031	1.74292	-12.232	0.000*
	After	180.2000	15	24.49548	6.32471		
Total Cholesterol	Before	180.2000	15	24.49548	6.32471	2.306	0.037*
	After	179.1333	15	23.67900	6.11389		
HDL	Before	35.7333	15	5.32470	1.37483	-1.606	0.131
	After	36.2000	15	5.69712	1.47099		
LDL	Before	116.8000	15	17.82935	4.60352	1.871	0.082
	After	115.8000	15	18.03251	4.65597		
Triglycerides	Before	126.9333	15	55.63076	14.36380	5.501	0.000*
	After	125.5333	15	55.60558	14.35730		

VLDL	Before	37.3333	15	31.30647	8.08330	1.048	0.312

As per Objective parameters like Weight, BMI, chest and abdomen circumference,total cholesterol, and Triglycerides had shown highly significant result. Therealso hadconsiderable variation in HDL, LDL and VLDL.

Discussion:

To contribute at least "squirrel service" to the medical field and, in turn, to the service of society, rational observation and useful discussion should be made for each research work. An attempt has been made to discuss the theories of both literary and clinical work.

Obesity is known as *'MedoRoga'* in Ayurveda[8] and is characterized as the condition one where excess fat is retained in the body. If the *Agni* (digestive fire) is vitiated, the *Ama* (toxic substances) is produced in the body, leading to obesity [9].

Obesity is a state of an overabundance of fat tissue mass. Overweight alludes to an abundance of body weight that incorporates muscle, bone, fat, and water [10]. Obesityis an extreme medical issue that can prompt an early passing. Different clinical problems, including hypertension, heart issues, diabetes, rest apnea, sadness, and joint inflammation, have been connected with overweight. A grown-up who is 30% heavier than their optimal weight (controlled by standard clinical and protection information) is thought to be stout [11].

Current treatment choices for obesity incorporate Fenfluramine, Dexfenfluramine, and Sibutramine, which go about as craving inhibitors that have hurtful impacts and couldn't be utilized for over a quarter of a year. Diuretic and laxative medications are likewise used to treat stoutness; nonetheless, the activity is for a more limited period, and patients are again weighted after suspension of treatment. Numerous gadgets, like vibrators, are utilized for neighbourhood lipolytic activity. Dietary blends (engineered wholesome mixtures) are expensive and have antagonistic impacts. In the present sense, Ayurveda provides a glimmer of hope in treatments such as *Vasti*.

Probable Mode of Action of *Vasti*:

Vasti has systemic action. The active principles of *Vasti* preparation (*Virya*) are absorbed by *Pakwashaya*(intestine) and distributed in different areas to channels of the body. It enters the lesion site and induces systemic effects, and reduces the pathogenesis of the disease, as has already been stated concerning*VastiKarmukata. Vasti* 's action can be observed at different levels of the body, such as *Dosha Dhatu* and *Malas*, etc. Like Palash, the ingredients of this particular Vasti under its Tikta and Katu Rasarelieve*Meda* and *Kapha*, the major etiological factors involved in disease pathogenesis. Under*KashayaRasa,* it reduces *SharirgataKleda*[12], facilitating the absorption of liquefied detoxified *Kapha* and *Meda*. *RukshaGuna*was developed by *Medo Shoshana* (absorption of vitiated fat)[13]. *Kadamba*and is being *TridoshaShamaka* by virtue of its *Tikta*, *Kashaya*Rasa,*KatuVipak* and *SheetVirya*[14]. *Rodhra* and *Kadali* due to its *Kashaya RasaKaphaghna*in nature [15], *Shala*is*Kashaya, Katu Rasa*, *Sheeta* and *RukshaGuna*, *Kaphaghna*in nature. *RukshaGuna* and *Kashaya Rasa Meda* are absorbed, and hence bark Powder is used in *Medoroga*[16]. *Ashoka* by virtue of its *Ttikta, Kashaya, Laghu*, *Ruksha, GunaKaphaghna* in nature[17]. Related studies on obesity and assessment were reviewed[18-20]. This *Dravya* displays *Karma* like *Lekhana*, *Rookshana,* and *Karshana*. It would aim to reduce

Meda, which is AtiupchitaMeda, accumulated in various sections of the body Vasti's interference in the ShakhagataDoshas, perhaps the *Margavarodha* caused by the *AtivriddhaMeda* is revived by the *SrotomargaVishodhanaKarma* of this *Vasti*. *Vasti's* role is focused on *Koshtagni*. *KoshtagataVatavruddhi triggered Koshtagni* in the case of *Sthaulya*. *Vasti* is reviving the vitiated *Vata.* The*Strotodushti*form of *Sanga is* changed, and the*Sampropti*of*Sthaulya*is reversed since *Vasti* is the primary treatmentfor*Vata.*

CONCLUSION:

The patients showed a marked difference in body circumferences, especially in abdominal girth and chest circumference. There was a relative improvement in subjective as well as objective criteria. It concluded that *RodhradiGanaVasti*hasa highly significant effect on subjective and objective parameters of *Sthaulya*. After completing the study, that environmental factors play an essential role in preventing the disease. A holistic approach required to tackle this multi-factorial disease.

REFERENCES:

1. Parwe S, Nisargandha M., Bhagwat P., Study the effect of *RodhradiGana Basti* and *Udvartana*in *Sthaulya*(Obesity): A Study Protocol, International Journal of Botany Studies, 2020 Oct. 5;5: 519-522.,www.botanyjournals.com
2. **https://www.worldobesity.org/about/about-obesity/prevalence-of-obesity dated 7-3-21.**
3. Hiware S, Parwe S. Role of Nitya Virechana in Medoroga--A case study. IAMJ. 2018;2:1085-9.
4. Naveen Kumar Saini, Clinical Trial Of *Gomutra*(Cow" s Urine) In Obesity Management International Journal of Ayurveda and Pharma Research, *Int. J. Ayur. Pharma Research, 2016;4 (10) :54-57.*
5. Lekshmi V, Prasanth D, Sharma A, A Conceptual Analysis On The Preparation And Administration Of Niruha Basti, *Ayurpharm Int J Ayur Alli Sci., Vol. 4, No. 12 (2015) Pages 226 – 235).*
6. Sharma A, editor. Sutrasthan, DravyasangrahaniyaAdhyaya. Verse 14,15. In Sushruta Samhita Varanasi, India ChaukhambaSurbharatiPrakashan 2015. Pg no. 296.
7. Patil V. Priciples and Practice of Panchakarma. A comprehensive Book for UG, PG, Research and Practioner. Delhi, India: Published by Chaukhmba Publication; 2018. Pg no. 447.
8. Parwe Shweta D. Effect of GomutraNiruha Basti on Sthaulya (obesity).
9. Pattonder R.K., ChandolaH.M.Clinical evaluation of trivrtyuktanavakaguggulu in obesity, Indian Journal of Ancient Medicine and Yoga Volume 4 Number 1, Jan - Mar 2011.
10. Gaurav Kumar et al, A Review OnSthaulya (Obesity) And Its Management In Ayurveda, Unique Journal Of Ayurvedic And Herbal Medicines, 02 (06), Nov-Dec 2014, Pg. No. 66-71.
11. Nisargandha MA, DeshpandeVK., ParveSD., SarafCA., Yogasana Training Improves Cardiovascular and Lipid Profile in Obese Subjects, J Datta Meghe Inst Med Sci Univ. 2012;7(4): 243-246.
12. Neelam KN, Ram B, Soni G. A study on Palash (Butea Monosperma Lam. Kuntz.) with special reference to its role in Madhumeha (Diabetes Mellitus Type 2). Journal of Medicinal Plants. 2017;5(2):204-6.

13. Murali Krishna C. Appraisal on Ayurvedic Herbs in the Management of Sthaulya (Obesity). International Journal of Ayurvedic Medicine. 2017;8(4):159-68.
14. Deshpande AP, Subhash R, editors. Textbook of Dravayguna Vigyan (English), Part-2, A.R. Nandurkar, Shaniwar Peth, India: Proficient Publishing House; 2007. p.787.
15. Deshpande AP, Subhash R, editors. Textbook of Dravayguna Vigyan (English), Part-2, A.R. Nandurkar, Shaniwar Peth, India: Proficient Publishing House; 2007. p.906.
16. Deshpande AP, Subhash R, editors. Textbook of Dravayguna Vigyan (English), Part-2, A.R. Nandurkar, Shaniwar Peth, India: Proficient Publishing House; 2007. p.295.
17. Deshpande AP, Subhash R, editors. Textbook of Dravayguna Vigyan (English), Part-2, A.R. Nandurkar, Shaniwar Peth, India: Proficient Publishing House; 2007. p.376.
18. Rasheed, Aamil, Sourya Acharya, Samarth Shukla, Sunil Kumar, Roopesh Yarappa, Yash Gupte, and Vidyashree Hulkoti. "High-Sensitivity C-Reactive Protein in Metabolic Healthy Obesity (MHO)." JOURNAL OF EVOLUTION OF MEDICAL AND DENTAL SCIENCES-JEMDS 9, no. 7 (February 17, 2020): 443–47. https://doi.org/10.14260/jemds/2020/100.
19. Garg, Mayank, and Sandip Mohale. "Prevalence of Metabolic Obesity Normal Weight (MONW) in Cardiovascular Disease Patients - A Hospital-Based Case Control Study." JOURNAL OF EVOLUTION OF MEDICAL AND DENTAL SCIENCES-JEMDS 9, no. 34 (August 24, 2020): 2427–31. https://doi.org/10.14260/jemds/2020/528.
20. Dr. Ali Say.(2019) The Impact of Medication Quality on Patient Rehospitalization Rate . International Journal of Respiratory Care, 15(1), 12–14.
21. Dr. Ahmed N.(2019) Public Health Outcome Framework Application on Obesity Patients. International Journal of Respiratory Care, 15(1), 15–18.
22. Hulkoti, Vidyashree S., Sourya Acharya, Samarth Shukla, Sree Karthik Partapa, and Yash Gupte. "In Search of an Ideal Obesity Assessment Tool : Is Body Mass Index Reliable Enough?" JOURNAL OF EVOLUTION OF MEDICAL AND DENTAL SCIENCES-JEMDS 9, no. 35 (August 31, 2020): 2556–60. https://doi.org/10.14260/jemds/2020/555.