A Comparative Study on *Vidangadi Churna* and *Amrutadya Guggul* in the Management of *Sthoulya* with special reference to Obesity

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ABSTRACT:

Background: *Sthoulya* is a disorder dominated by *medadhatu* due to abnormal accumulation of *meda in Gatra pradesha* specifically in *Sphik, Udara, Stana* and *Gala*. It is caused by morbid *kapha dosha* initially and later pitta and *Vaata* involved in its pathogenesis. This vitiated Dosha or Doshas afflict. The *medadhatu* involving *medovaha srotas* produces the related symptom of its own *srotas*. Further in later stage due abnormal accumulation of *Abadha apachita meda* in other respective *srotas* exhibits *lakshanas* like *Javoparodha, Ayusohrasa,* and *Swedabadha* etc. as its complication. The mode of onset is usually gradual depending upon the *Nidana"s* like *Atisampurna aahara, Avyaayama, Manasika bhava"s, Beejadoshaja* and by *Nidanarthakara karana"s.* The involvement of pitta and *vaata dosha"s along kapha dosha* in the pathogenesis of *Sthoulya* can be well appreciated by their symptoms like *Swedadhikya, Atikshudha, Ati Pipasa, Dourgandhya, Javoparodha, Dourbalya,* and *Utshahani* etc

Aim: To assess the clinical efficacy of *Vidangadi churna and Amrutadya guggul* in the management of *Sthoulya* (obesity).

Materials and Methods: The clinical studies were conducted by the Randomized Comparative Clinical Study method; this method compared the clinical efficacy of *Vidangadi churna and Amrutadya guggul* in the management of *Sthoulya* (obesity).

Result: In Group A, 2 patients (10%) were shown marked improvement, 16 patients (80%) were shown moderate improvement and 2 patients (10%) were shown mild improvement. In Group B, 3 patients (15%) were shown marked improvement, 15 patients (75%) were shown moderate improvement and 2 patients (10%) were shown mild improvement.

Conclusion- There is no much difference in the results of the both the treatment. Both the drug significantly effective.

Key words- *Sthoulya,* obesity, *Vidangadi churna*, *Amrutadya guggul*

INTRODUCTION

In recent decades, there has been a significant increase in overweight and obesity prevalence rates in many countries around the world. According to the WHO, 'Excess body weight poses one of the most serious public health challenges of the 21st century.[1] A change in life styles creates several different types of health problems including physical, mental, economic and social.[2] Obesity is the final

common pathway of a complex array of genetic, physiological, nutritional, psychological and cultural influences.[3] Among these social and cultural factors are perhaps the most ubiquitous, social and psychological consequences of obesity include stigmatization and discrimination, down word social mobility, decreased work capacity and dramatic economic losses.[4] According to WHO obesity is measured by the Body Mass Index (BMI), state as a BMI greater than or equal to 25 is overweight and a BMI greater than or equal to 30 is obesity.[5] Ayurvedic classics give sufficient focus on obesity (*Sthoulya or Medoroga*) and serves as a guideline to advise diet, *Shodana karma*, drugs etc. present or to control the disease.[6] Present work research entitled 'A comparative study on *Vidangadi churna and Amrutadya guggul* in the management of *Sthoulya* with special reference to obesity' was conducted at SDM Trust's Ayurvedic Medical College, Terdal to for prevention and management of *Sthoulya.*

MATERIALS AND METHODS

Source Of Data :
Literary Source: All the Ayurvedic, Modern literature, Journals, websites about the disease and the Medicine was reviewed and documented for the planned study.
Sample Source: The patients were selected from OPD and IPD of SDM Trust's Ayurvedic Medical College, Padma hospital and Research centre, Terdal. Drug Source: Raw drugs required were collected from the GMP approved pharmacy. *Vidangadi churna and Amrutadya guggul* were prepared at SDMT AMC in the dept. of Rasashastra and Bhaishajya kalpana in according to classical reference.
Methods Of Collection of Data: Evaluation of the patient was done after detailed examination and the data was recorded in a specially prepared proforma.

Study design:
1. A Randomized Comparative Clinical Study.
2. 40 patients irrespective of sex, socio-economic status, place, suffering from *Sthoulya* were selected for the study. Selected patients were randomly placed under 2 groups A and B with minimum 20 patients in each group.
3. A separate case sheet was prepared with a complete history, physical signs and symptoms, necessary lab investigations. The parameters of signs and symptoms were scored on basis of standard methods and was analysed statistically.

Criteria for selection of patient –
Inclusion Criteria
1. Patient presenting classical symptoms of *sthoulya.*
2. Age group – 18 to 50 yrs.
3. BMI more than 25 and less than 40
4. Patients were selected irrespective of gender, occupation and socioeconomic status.

Exclusion Criteria
1. BMI more than 40.
2. Pregnant women.
3. Patients suffering from life threatening disease.
4. Patient who daily go aerobics

Withdrawal Criteria: Patients with improper follow up and showing any adverse effect were withdrawn from study.
Diagnostic Criteria: Diagnosis would be done on the bases of signs & symptoms of *sthoulya* as explained in the classical text. (Diagnosis will also be done according to subjective & objective parameters)

Methodology: Evaluation of the patient will be done after detailed examination and the data will be recorded in a specially prepared proforma i.e. A separate case sheet will be prepared with a complete history, physical signs and symptoms before treatment and at the time of every follow up.

Duration: Duration of Treatment – *Shamanoushadha* was given for 30 days in both groups
Group A- *Vidangadi churna* – 30 days. Follow up - 15th and 30th day
Group B - *Amrutadya guggul* -30 days Follow up- 15thand 30th day

ASSESSMENT CRITERIA:
These criteria to be followed before, during & after the treatment.
Subjective Parameters: 1- *Ati-kshudha* 2- *Ati-pipasa* 3- *Ati-nidra* 4-*Ati-sweda* – 5- *Ayatopacha utsaha*
Objective Parameter - 1. Body weight 2. BMI 3. Chest circumference 4. Waist circumference 5. Mid arm circumference 6. Mid -high circumference

Interventions –

Group-A : Patients under this group were treated by *Vidangadi Churna* - 1 karsha12 (12 grams) 4grams tid - after food with *sukhoshna jala anupapan* for 30 days.

Group-B: Patients under this group were treated by *Amrutadya Guggul vati* 500 mg 2 tid [General dose of GUGGUL is 1-3 Maasha13 =1-3 gm] with *sukhoshna jal anupan* 30 days.

Assessment criteria for Subjective Parameters (Table 1-Table 6)

OBSERVATIONS AND RESULTS

The patients who were registered for the study were assessed according to a standard proforma and clinical studies of 40 patients of *Sthoulya* were selected for the study, the observations and results are described in Table 7 to Table 30

In Group A, marked improvement was observed in 2 patients, moderate improvement wasobserved in 16 patients and mild improvement was observed in 2 patients. In Group B, marked improvement was observed in 3 patients, moderate improvement was observed in 15 patients and mild improvement was observed in 2 patients.(Graph 1)

DISCUSSION

Sthoulya is a *Dushya* dominant *Vyadhi* (disease). There is an involvement of all the three Doshas in *Sthoulya* but the vitiation of *Kapha-Vata* and *Meda* of prime importance. Etiological factor mainly vitiates *Kapha - Meda*.[6] This vitiated *Meda* obstructs the path of *Vata* and causes its *Avarana* which results in to provocation of *Vata*. Thus remaining in the *Koshta Vata* causes *Atikshudha,* this increases gravity of the disease and makes the *Sthoulya Krichhrasadhya* (very difficult to treat). Due to obstruction by *Meda* (Fat), *Vyana Vayu* cannot transport nutrients to other Dhatus (tissues). So *Medadhatu* (fat tissue) is increased and *Uttaradhatus* (Further Tissues) are decreased. So, treatment modality should be planned considering vitiated *Meda, Kapha* and *Vata. Lekhana Basti* and *Vamana Karma* are amongst them.[7] Sedentary life, lack of exercise, faulty food habits and urbanization precipitate the disease. Genetic predisposition, *Kapha* predominant Prakriti increases the prevalence of *Sthoulya*. Females are more prone to Obesity due to feminine factor like menopause and aggravating factors like delivery,

I.U.C.D., oral contraceptive pills and miscarriage**.** Present work research entitled A comparative study on *Vidangadi churna* and *Amrutadya guggul* in the management of *Sthoulya* with special reference to obesity was conducted at SDM Trust's Ayurvedic Medical College, Terdal to for prevention and management of *Sthaulya*. In modern science, a similar condition is named as obesity. It specially refers to an excess amount of body fat. This illness is named so because of its complexity in symptoms as well as etiological factors. BMI using Quetelet"s Index, Age specific weight for height table, skin fold measurements, body girth measurement, densitometry, computed tomography, are several laboratory methods for measuring body fats even imaging techniques are used to confirm the diagnosis and to assess the severity of obesity. Over weight, obese, morbid obesity are the different levels of obesity helps in adopting better management.

➢ **Discussion about clinical study:**
The study was carried out on 40 patients who were divided into two groups.
Group A: *Vidangadi churna* for 20 patients.
Group B: *Amrutadya guggul* Orally for 20 patients. Total of 40 patients complaining of *Sthoulya* were registered in the study and completed the treatment.

➢ **Discussion on demographic data**
- **Age:** In Group A, maximum patients (65%) belong to age group 31-40 years. In Group B, maximum patients (70%) belong to age group 31-40 years. According to Ayurveda, it is believed that Madhyama Vaya leading to *Paripurnata* of *Shareera dhatu"s.* In modern texts obesity is more prevalent in adolescent. But it's not possible to conclude the fact with our study because of age-restricted criteria.
- **Gender:** In Group A, 9 were male and 11 were females. In Group B, 7 were male and 13 were females. because have a tendency to develop fatty mass. Moreover, there are 3 important phases in female's life when they undergo enamours hormonal changes, they are menarche, pregnancy and menopause. These changes also contribute to weight gain. Females are also more conscious about their appearance; hence they approach the hospitals more for cosmetic reason as compared to males.
- **Marital Status**: In Group A, all 20 patients were married. In Group B, 19 were married and 1 was unmarried. Moreover, married females were found obese in comparison to unmarried, owing to hormonal changes occurring after marriage during pregnancy.

- **Occupation:** In Group A, 2 were businessman, 8 were housewives, 4 were labours, 5 were doing service and 1 was student. In Group B, 3 were businessman, 6 were housewives, 6 were labours, 3 were doing service and 2 were students. Thus, it can be said that now a days housewife's are making use of electronic machines and gadgets for most of household works due to which the physical activity is minimized. Similar in the case of doing jobs, teachers they were related with light nature of work and they were mentally more active than physically. So, their energy expenditure is less than energy intake which may leads to become obese.

- **Diet:** In Group A, 14 were having mixed diet and 6 were having veg diet. In Group B, 12 were having mixed diet and 8 were having veg diet. Which are responsible for *medo dosha vriddhi, kapha and adhyasana* types of dietetic habit produces ama in the body and makes *medodhatvagni mandya* which leads to *Sthoulya.* Non-vegetarian diet has high calorific value which contributes to the increase in weight, but it cannot be conclude that only mixed diet is cause of obesity because the expenditure of calories by exercise is proportionally required to maintain the energy balance. A vegetarian who is physically inactive is equally prone for gaining weight as physically active non-vegetarian.

- **Prakruti:** In Group A, 8 were having *Pitta Kapha Prakruti,* 2 were having *Vata Kapha Prakruti* and 10 were having *Vatapitta Prakruti.* In Group A, 6 were having *Pitta Kapha Prakruti*, 3 were having *VataKapha Prakruti* and 11 were having *Vatapitta Prakruti.* In general, the persons having *dwandwaja prakruti* are considered to be prone of being diseased as compared to these with *Ek-doshaja or sama-prakruti.*

- **Koshta:** In Group A, 2 were having *krur koshtha*, 16 were having *madhyam koshtha*, 2 were having *mrudu kostha*. In Group B, 4 were having *krur koshtha*, 15 were having *madhyam koshtha,* 1 was having *mrudu kostha.*

- **Agni:** In Group A, 10 were having *mand agni*, 4 were having *teekshna* and 6 were having *visham agni*. In Group B, 8 were having *mand agni*, 5 were having *teekshna,* 2 were having *sama agni* and 5 were having *visham agni*

- **Mala:** In Group A, 6 were having *samyak mala pravruti*, 14 were having *vibandha* mala. In Group B, 7 were having *samyak mala pravruti*, 13 were having *vibandha mala.*

- **Discussion about the relief in the symptoms:**

- *Ati-Kshudha and Ati-Pipasa:* In *Ati-Kshudha* , effect observed in Group A is 60.42% and effect observed in Group B is 60.71%. In *Ati- Pipasa* effect observed in Group A is 63.27% and effect observed in Group B is 67.92%. It is due to vitiation of *vata* by obstruction of *meda ati-kshudha* and *ati Pipasa* are prominent features. *Ati kshudha* indicates the *annavaha strotas* and *ati pipasa* indicates the *udakvaha strotas*. The drugs of *Vidangadi churna* and *Amrutadya guggul has tridoshgna, ama pachan , lekhaniya , Chhedaniya* properties. They remove the *aavran of vayu in koshta* and corrects the *agni vaigunatva.* Moreover, it corrects the *medodhatvagni.* Therefore, the formation of *uttardhatu* is increased while the formation of *medodhatu* is decreased. Thus *ati-kshudha* and *ati-pipasa* get subsides.

- *Ati-Nidra :* In *Ati- Nidra* , effect observed in Group A is 64.58% and effect observed in Group B is 68.09%. Reduction in *ati nidra* was highly significant. In group A and B, it has modality to eliminate *tridosha* and *meda.* Thus, *atinidra* gets subsides.

- *Ati-Sweda :* In *Ati- Sweada*, effect observed in Group A is 62.50% and effect observed in Group B is 67.44%. In group A *vidangadi churna* helps by its *ushna, tikshna gunas .Amrutadya guggul* internally which helps by its *ushna ,sukshma guna ,katu, tikta ,kashay* properties. expels out the vitiated *doshas* , also removes the *kleda* by which it clears the obstruction in *swedavaha strotas.*

- *Ayatopacha Utsaha* : In *Ayatopacha Utsaha,* effect observed in Group A is 60.87% and effect observed in Group B is 67.39%. It is due to *kaphavruddhi* and obstruction of *strotas*. In group A drugs of *Vidangadi churna* and In group B drugs of *Amrutadya guggul* helps in removing the vitiated *kapha dosha* and obstruction of *strotas* . *Vidangadi churna* and *Amrutadya guggul* given internally having *tikta, katu, kashay rasa,ushna virya, kaphahara , lekhaniya and medorogahara* properties which corrects the obstructions of *strotas and medodhatvagnimandya* then the deposition of *meda* is stopped, formation of *uttardhatu* is increased *aalasya , Ayatopacha Utsaha* is subsides.

- **Body weight:** In Body weight, effect observed in Group A is 3.75% and effect observed in Group B is 4.08%.

- **BMI:** In BMI effect observed in Group A is 3.77% and effect observed in Group B is 4.12%.

CONCLUSION

In the present study the patients have responded with improvement in their symptoms rather than objective

features. In Group A, 2 patients (10%) were shown marked improvement, 16 patients (80%) were shown moderate improvement and 2 patients (10%) were shown mild improvement. In Group B, 3 patients (15%) were shown marked improvement, 15 patients (75%) were shown moderate improvement and 2 patients (10%) were shown mild improvement. There is no much difference in the results of the both the treatment. Both the drug significantly effective. So, we can conclude that the results were almost same in both groups.

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Table No. 1 *Ati – Kshudha*

Normal 2 times meals / day.	0
Excess appetite 3 times daily	1
3-4 meals/ day.	2
4-5 meals / day.	3

Table No. 2 *Ati – Pipasa*

Normal Thrist 1.5 - 2.0 litre/ 24 hr.	0
Upto 1 lit excess intake of water	1
Upto 2 lit excess intake of water	2
More than 3 lit intake of water	3

Table No. 3 *Ati – Nidra*

Normal sleep 6 – 7 hrs./ day	0
Sleep up to 8 hrs. / day.	1
Sleep up to 10 hrs. / day	2
Sleep up to 10 hrs. / day	3

Table No. 4   *Ati – Sweda*

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

Table No. 5 *Ayatopacha utsaha*

No Aalasya (doing work satisfactorily with proper vigor in time)	0
Doing wok satisfactorily with late intiation	1
Not starting any work in his own responsibility	2
Does not take any initiation and not want to work even after pressure.	3

Table No. 6 Body Mass Index (BMI)

BMI	Value	Grade
Normal	18.5 - 24.9	0
Overweight	25.0 - 29.9	1
Obese class I	30.0 - 34.9	2
Obese class II	35.0 - 39.9	3

Table No. 7: Distribution of patients according to Age

Age Group	Group A		Group B		Total	
	N	%	N	%	N	%
18-20 Years	0	0.00	2	10.00	2	5
21-30 Years	5	25.00	3	15.00	8	20
31-40 Years	13	65.00	15	75.00	28	70
41-50 Years	2	10.00	0	0.00	2	5
TOTAL	**20**	**100.00**	**20**	**100.00**	**40**	**100**

Table No. 8 :Distribution of patients according to Gender

Gender	Group A		Group B		Total	
	N	%	N	%	N	%
Male	9	45.00	7	35.00	16	40
Female	11	55.00	13	65.00	24	60
TOTAL	**20**	**100.00**	**20**	**100.00**	**40**	**100**

Table No. 9 : Distribution of patients according to Marital Status

Marital Status	Group A		Group B		Total	
	N	%	N	%	N	%
Married	20	100.00	19	95.00	39	97.5
Unmarried	0	0.00	1	5.00	1	2.5
TOTAL	**20**	**100.00**	**20**	**100.00**	**40**	**100**

Table No. 10 : Distribution of patients according to Occupation

Occupation	Group A		Group B		Total	
	N	%	N	%	N	%
Business	2	10.00	3	15.00	5	12.5
Housewife	8	40.00	6	30.00	14	35
Labour	4	20.00	6	30.00	10	25
Service	5	25.00	3	15.00	8	20
Student	1	5.00	2	10.00	3	7.5
TOTAL	**20**	**100.00**	**20**	**100.00**	**40**	**100**

Table No. 11: Distribution of patients according to Diet

Diet	Group A		Group B		Total	
	N	%	N	%	N	%
Mixed	14	70.00	12	60.00	26	65
Veg	6	30.00	8	40.00	14	35
TOTAL	**20**	**100.00**	**20**	**100.00**	**40**	**100**

Table No. 12 : Distribution of patients according to *Prakruti*

Prakruti	Group A		Group B		Total	
	N	%	N	%	N	%
PK	8	40.00	6	30.00	14	35
VK	2	10.00	3	15.00	5	12.5
VP	10	50.00	11	55.00	21	52.5
TOTAL	**20**	**100.00**	**20**	**100.00**	**40**	**100**

Table No.13 : Distribution of patients according to Mala

Mala	Group A		Group B		Total	
	N	%	N	%	N	%
Samyak	6	30.00	7	35.00	13	32.5
Vibandha	14	70.00	13	65.00	27	67.5
TOTAL	**20**	**100.00**	**20**	**100.00**	**40**	**100**

Table No. 14 : Distribution of patients according to *Koshta*

Koshtha	Group A		Group B		Total	
	N	%	N	%	N	%
Krur	2	10.00	4	20.00	6	15
Madhyam	16	80.00	15	75.00	31	77.5
Mrudu	2	10.00	1	5.00	3	7.5
TOTAL	**20**	**100.00**	**20**	**100.00**	**40**	**100**

Table No. 15 : Distribution of patients according to Agni

Agni	Group A		Group B		Total	
	N	%	N	%	N	%
Manda	10	50.00	8	40.00	18	45
Teekshna	4	20.00	5	25.00	9	22.5
Sama	0	0.00	2	10.00	2	5
Visham	6	30.00	5	25.00	11	27.5
TOTAL	**20**	**100.00**	**20**	**100.00**	**40**	**100**

Table No. 16: Distribution of patients according to *Vyayam*

Vyayam	Group A		Group B		Total	
	N	%	N	%	N	%
Irregular	4	20.00	5	25.00	9	22.5
Less	14	70.00	15	75.00	29	72.5
Proper	2	10.00	0	0.00	2	5
TOTAL	**20**	**100.00**	**20**	**100.00**	**40**	**100**

Table No. 17: Effect treatment on *Ati- kshudha*

Ati- kshudha		Mean	Median	SD	SE	Wilcoxon W	P-Value	% Effect	Result
Group A	BT	2.40	2.50	0.68	0.15	-3.938[a]	0.0000821	60.42	Significant
	AT	0.95	1.00	0.51	0.11				
Group B	BT	1.40	1.00	0.60	0.13	-3.314[a]	0.0009196	60.71	Significant

Table No. 18 : Effect treatment on *Ati – Pipasa*

Ati-pipasa		Mean	Median	SD	SE	Wilcoxon W	P-Value	% Effect	Result
Group A	BT	2.45	2.50	0.60	0.14	-4.041[a]	0.0000531	63.27	Significant
	AT	0.90	1.00	0.45	0.10				
Group B	BT	2.65	3.00	0.59	0.13	-4.179[a]	0.0000293	67.92	Significant

Table No. 19 : Effect treatment on *Ati- Nidra*

Ati-nidra		Mean	Median	SD	SE	Wilcoxon W	P-Value	% Effect	Result
Group A	BT	2.40	2.00	0.50	0.11	-4.041[a]	0.0000531	64.58	Significant
	AT	0.85	1.00	0.49	0.11				
Group B	BT	2.35	2.00	0.49	0.11	-4.053[a]	0.0000506	68.09	Significant
	AT	0.75	1.00	0.44	0.10				

Table No. 20 : Effect treatment on *Ati- Sweda*

Ati-sweda		Mean	Median	SD	SE	Wilcoxon W	P-Value	% Effect	Result
Group A	BT	2.00	2.00	0.65	0.15	-3.987[a]	0.0000668	62.50	Significant
	AT	0.75	1.00	0.44	0.10				
Group B	BT	2.15	2.00	0.75	0.17	-3.938[a]	0.0000821	67.44	Significant
	AT	0.70	1.00	0.57	0.13				

Table No. 21: Effect treatment on *Ayatopacha Utsaha*

Ayatopacha Utsaha		Mean	Median	SD	SE	Wilcoxon W	P-Value	% Effect	Result
Group A	BT	2.30	2.50	0.80	0.18	-3.938[a]	0.0000821	60.87	Significant
	AT	0.90	1.00	0.45	0.10				
Group B	BT	2.30	2.00	0.47	0.11	-4.041[a]	0.0000531	67.39	Significant
	AT	0.75	1.00	0.44	0.10				

Table No. 22: Comparison Between Group A and Group B (Subjective)

	Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	P-Value
Ati-kshudha	Group A	20	24.85	497.00	113.000	0.011
	Group B	20	16.15	323.00		
	Total	40				
Ati-Pipasa	Group A	20	18.00	360.00	150.000	0.096
	Group B	20	23.00	460.00		
	Total	40				
Ati-Nidra	Group A	20	20.00	400.00	190.000	0.752
	Group B	20	21.00	420.00		
	Total	40				
Ati-Sweda	Group A	20	18.60	372.00	162.000	0.241
	Group B	20	22.40	448.00		
	Total	40				
Ayatopacha Utsaha	Group A	20	19.28	385.50	175.500	0.450
	Group B	20	21.73	434.50		
	Total	40				

Table No. 23 : Effect treatment on Body Weight

Body Weight		Mean	N	SD	SE	t-Value	P-Value	% Effect	Result
Group A	BT	80.05	20	5.10	1.14	19.142	0.000	3.75	Significant
	AT	77.05	20	5.40	1.21				
Group B	BT	75.90	20	3.92	0.88	20.385	0.000	4.08	Significant
	AT	72.80	20	3.97	0.89				

Table No. 24 : Effect treatment on BMI

BMI		Mean	N	SD	SE	t-Value	P-Value	% Effect	Result
Group A	BT	30.40	20	1.72	0.38	9.784	0.000	3.77	Significant
	AT	29.26	20	1.87	0.42				
Group B	BT	28.74	20	1.33	0.30	14.660	0.000	4.12	Significant
	AT	27.55	20	1.33	0.30				

Table No. 25: Effect treatment on Chest Circumference

Chest Circumference		Mean	N	SD	SE	t-Value	P-Value	% Effect	Result
Group A	BT	40.27	20	1.44	0.32	8.834	0.000	1.42	Significant
	AT	39.70	20	1.47	0.33				
Group B	BT	40.50	20	1.53	0.34	9.379	0.000	1.54	Significant
	AT	39.88	20	1.51	0.34				

Table No. 26: Effect treatment on Waist Circumference

Waist Circumference		Mean	N	SD	SE	t-Value	P-Value	% Effect	Result
Group A	BT	38.83	20	1.52	0.34	8.916	0.000	1.56	Significant
	AT	38.22	20	1.62	0.36				
Group B	BT	38.35	20	0.93	0.21	12.337	0.000	1.76	Significant
	AT	37.68	20	1.00	0.22				

Table No. 27: Effect treatment on Mid Arm Circumference

Mid Arm Circumference		Mean	N	SD	SE	t-Value	P-Value	% Effect	Result
Group A	BT	30.03	20	1.13	0.25	11.461	0.000	2.58	Significant
	AT	29.25	20	1.14	0.26				
Group B	BT	30.05	20	0.79	0.18	11.000	0.000	2.75	Significant
	AT	29.23	20	0.72	0.16				

Table No. 28 : Effect treatment on Mid Thigh Circumference

Mid Thigh Circumference		Mean	N	SD	SE	t-Value	P-Value	% Effect	Result
Group A	BT	59.48	20	1.49	0.33	10.376	0.000	1.43	Significant
	AT	58.63	20	1.44	0.32				
Group B	BT	58.40	20	1.03	0.23	19.615	0.000	1.54	Significant
	AT	57.50	20	1.01	0.23				

Table no 29: Comparison Between Group A and Group B (Objective)

	Group	N	Mean Diff	SD	SE	t-Value	P-Value
Body weight	Group A	20	3.00	1.04	0.24	-0.607	0.547
	Group B	20	3.10	1.07	0.23		
BMI	Group A	20	1.14	1.12	0.26	-1.604	0.117
	Group B	20	1.19	0.98	0.21		
Chest Circumference	Group A	20	0.57	0.29	0.06	-0.593	0.557
	Group B	20	0.63	0.30	0.07		
Waist circumference	Group A	20	0.61	0.30	0.07	-0.803	0.427
	Group B	20	0.68	0.24	0.05		
Mid Arm circumference	Group A	20	0.78	0.30	0.07	-0.495	0.623
	Group B	20	0.83	0.34	0.08		
Mid-thigh circumference	Group A	20	0.85	0.37	0.08	-0.533	0.597
	Group B	20	0.90	0.21	0.05		

Table No. 30: Overall Effect after Treatment

Overall Effect	Group A		Group B	
	N	%	N	%
Marked Improvement	2	10.00	3	15.00
Moderate Improvement	16	80.00	15	75.00
Mild Improvement	2	10.00	2	10.00
No change	0	0.00	0	0.00
TOTAL	**20**	**100.00**	**20**	**100.00**

GRAPH 1