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Clinical Study on *Dashanga Guggulu* and *Surya Namaskar* in the Management of *Sthaulya* (Obesity) In Children

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Abstract

Introduction: One of the oldest medicinal sciences in the world is Ayurveda. It describes the conceptual analysis of various diseases using its own principles and methodologies. Distinct Acharya has given different descriptions of "Sthoulya" in Ayurveda. In Ayurveda terms, Sthoulya is used as overweight and obesity. Obesity is defined as an overabundance of adipose tissue-fat depot in the body. This study has undertaken the management of Sthoulya by assessing the comparative efficacy of Dashanga Guggulu and Surya Namaskar in the management of Sthoulya (childhood obesity). The available data is based on clinical findings.

Aims & objectives: To assess the comparative efficacy of Dashanga Guggulu and Suryanamaskar in the management of Sthoulya (childhood obesity).

Materials: Patients were OPD and IPD of Balroga Department of Sanjeevani Ayurveda Hospital of Post graduate Institute of Ayurved, Dr. S.R. Rajasthan Ayurved University, Jodhpur, Rajasthan & randomly divided into three groups equally i.e. 20 in each group viz- Group A – This group of 20 children was given Dashanga Guggulu. Group B – This group of 20 children was given Surya Namaskar (Sun Salutation) and Group C – This group of 20 children was given Dashanga Guggulu along with Surya Namaskar (Sun Salutation). The dose of Dashanga Guggulu was calculated according to the age of patients calculated by Young's formula. The duration of treatment was 45 days.

Result: Group C administered with trial drug Dashanga Guggulu and Surya Namaskar has shown highly significant results in reducing the symptomatology of Sthoulya in comparison to groups A and B.

Keywords: Childhood Obesity, *Sthoulya, Suryanamaskar, Dashanaga Guggulu*

Introduction

Health in ancient classics is defined as the person having proportionate musculature, thickness of the body no doubt possesses very strong sensory and motor organs, and as such, they are not overcome by the onslaught of diseases [1]. A healthy individual can tolerate hunger, thirst, the heat of the sun, cold and physical exercise. They can digest and assimilate in adequate manner while World Health Organization (WHO) defines heath, as it is a state of mental, physical, and social wellbeing in which disease and infirmity are absent [2]. Childhood obesity is a major pediatric health problem in the recent era. Obesity prevalence among children and adolescents is still too high. For children and adolescents aged 2-19 years the prevalence of obesity was 18.5% and affected about 13.7 million children and adolescents. Obesity prevalence was 13.9% among 2- to 5-year-old, 18.4% among 6- to 11-year-old, and 20.6% among 12 to 19-year-old [3]. the factors influencing childhood obesity start in fetal programming and continue into adulthood with lifestyle. Obesity can occur due to many reasons including diet habit, sedentary lifestyle, genetic factors, and use of certain medication. Obesity is excess accumulation of fat in body. Childhood is a period of growth and development. In this period if child is significantly overweight for his/her age and height, he or she suffers from childhood obesity. Weight is ear-

liest parameter used for definition of obesity; weight corrected for height defined as body mass index (BMI) [4]. Obesity is very well described in *Ayurveda* Classics as *Sthaulya*. It is defined under *Santarapanajanya Vikara* [5] (an over nutritional disorder) and *Raspradoshaja Vikara [6]* (a disorder of lymph or plasma). It is also considered as *Medoroga* (a disorder of *Meda Dhatu*) [7].*Acharya Kashyapa* considered *Sthaulya* as one of the *Aprashast Sharira [8]* while explaining the anthropology. *Acharya Sushruta* considered this disease as *Darun Vyadhi [6]*. *Acharya Bhela* described *Sthaulya* as *Medovyapattijanya Roga*. *Acharya Charaka* described this *Sthaulya Roga* among *Astanindita Purusha*, *Kapha Nanatmaja diseases* and *Samsodhana Yogya Vyadhi*. According to *Ayurveda* the root causes *of Sthaulya* are excessive intake of *Madhura, Sheeta, Snigdha, Guru Ahaara, Avyayama, Diwvaswapna, Beeja Dosha [9].* Due to *Sthaulya* – there is excessive increase of fat and musculature over the abdomen, buttock and breast. Because of excessive deposition of fat abdomen of *Sthaulya Rogi* become pendulous in shape [10]. Their strength becomes disproportionately reduced to his physical growth.

Need of Study

Childhood obesity can lead to complications for child's physical, social, and emotional wellbeing. Obesity in childhood and adolescence is associated with risks of metabolic disorders like insulin resistance, respiratory disorders like asthma, musculoskeletal disorders, endocrinal disturbances like early puberty in girls, dermatological disorders like skin tags etc. As long-term risks associated with childhood obesity is obese, children are more likely to become obese adults, so there is a higher risk of chronic non-communicable diseases like hypertension, and type-2 diabetes etc. Therefore, childhood obesity is a serious medical condition. In the allopathic system of medicine, treatment for obesity is available but has limitation and not so effective but expensive and may occur some serious side effects. *Ayurveda* explains two main therapies for the treatment of *Sthaulya* viz: *Shamshodhana* & *Samshamana. Shamshodhana* includes *Panchkarma* therapy & *Samshamana* includes some medication like *Amrutadi Guggulu, Navak Guggulu,* and *Dashanga Guggulu* etc. Clinical study of childhood obesity is the need of era for protection from various health hazards caused by the obesity. In present time occurrence of obesity is increasing trend among children and parents preferring *Ayurveda* management instead of modern chemical drugs because of no side effects.

Aims & Objectives

i. To evaluate the efficacy of *Dashanga Guggulu* in the management of Childhood Obesity.

ii. To evaluate the efficacy of *Surya Namaskar* in management of Childhood Obesity.

iii. To compare the efficacy of *Dashanga Guggulu* and *Surya Namaskar* in management of Childhood Obesity.

Methodology

IEC APPROVAL

Institutional ethics committee's approval was taken for the randomized controlled group clinical study.

IEC order no. DSRRAU/UCA/IEC/19-20/314 dated 08/07/2020

CTRI REGISTRATION -Prior to the start of trial, the study was applied for registration in CTRI with reference number REF/2021/04/043184 AU and in 01-jun- 2021 trial was registered to CTRI with registration No. CTRI/2021/09/036357

STUDY DESIGN

Study type: Interventional

Interventional model: Three group assignment

Allocation: Randomized with lottery method

Masking: opaque envelop

Purpose: Treatment

Timing: 45 days

End point: Efficacy

Protocol of Research

Consent of children after making her aware about trail

Fulfilment of inclusion criteria.

Registration of obese and overweight children.

Investigation mentioned were advised to patients before after treatment.

Source of Patients

All affected children for present study were screened out from OPD & IPD of- P.G. department of *Kaumarbhritya*, Dr. S. R. Rajasthan *Ayurveda* University Jodhpur, Kanniram Salgram Satellite *Ayurveda* Hospital, Magara Punjala, Jodhpur and Medical camps.

Age group

Children between 5 to 16 years of both sexes were included in the study.

Number of Children

70 children were screened out from above source; out of which 60 children were registered. 10 children were discontinued the treatment during the course.

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Grouping of patients

Selected patients were randomly divided into three groups keeping in mind that all the three groups had 20 children from various grades, schools & socioeconomic status (Table 1).

Table 1: Showing Grouping and Posology.

Group	Group A	Group B	Group C
Name of drug	*Dashanga Guggulu*	Surya Namaskar	*Dashanga* Guggulu & Surya Namaskar
Dose	As per Young's formula		As per Young's formula
No. of patients	20	20	20
Types of study	Open level	Open level	Open level
Duration of drug	45days	45days	45days
Duration Twice daily	Duration Twice daily	One time	*Dashanga* guggulu vati-Twice daily
			Surya Namaskar-one
			Time
***Anupan* (Vehicle)**	*Ushan Jal* (lukewarm water)		*Ushan Jal* (lukewarm water)
Randomization	Simple random sampling	Simple random sampling	Simple random sampling
Route	Oral		Oral

Diagnostic Criteria

1. Children age group from 5-16 years of both sexes having clinical signs & symptoms of childhood obesity were selected for present study.

2. Patients' shows cardinal features of childhood obesity (Ayurveda Classics & Modern) were selected.

3. Children with a BMI more than 85th percentile was included in the present study

Exclusion criteria

1. Children aged below 5years & above 16 years of age.

2. Patients receiving drugs like steroids and anti-depressants etc.

3. Childhood obesity occurs due to endocrinal disorders like Cushing syndrome, hypothyroidism, Prader Willi Syndrome etc. were excluded from study.

4. Children having BMI below 85th percentile were excluded from study.

Discontinuation Criteria

Any acute illness for which requires emergency treatment. Parents/Guardian/Children not willing to continue treatment.

ADR Evaluation Criteria

A preformed was developed to record adverse drug reaction due to *Dashanga Guggulu* but in the entire study no adverse effect was observed.

Trail Drug

Selection of Drug

For present study a *Dashanga Guggulu* [11] described in *Bhavprakash Madhyam Khanda* under *Sthaulyarogaadhikar* was selected. These drugs contain nine herbs (Table 2).

Table 2: Showing the contents of *Dashanga* guggulu[5].

S.N.	Ingredients	Latin name	Part used	Ratio
1.	*Guggulu*	*Commiphora Mukul Engl*	*Niryas*	8 parts
2.	*Sunthi*	*Zinziber officinale Rosc*	*Rizome*	1 part
3.	*Marich*	*Piper nigrum Linn.*	Fruit	1 part
4.	*Pippli*	*Piper longum Linn.*	Root	1 part
5.	*Nagarmotha*	*Cyperus rotendus Linn.*	Rizome	1 part
6.	*Amalaki*	*Emblica officinale Gaertn.*	Fruit	1 part
7.	*Bibhitaki*	*Terminelia bellirica Roxb.*	Fruit	1 part
8.	*Haritaki*	*Terminellia chebula Retz.*	Fruit	1 part
9.	*Vidang*	*Embelia ribes Burm.*	Fruit	1 part

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Preparation of Trial Drug

All dried parts were collected, dry and processed in the pharmacy of Post Graduate Institute of Ayurved (P.G.I.A.) formally known as University Post Graduate Institute of *Ayurveda* Studies & Research / University College of Ayurveda and transformed into tablet form to increase palatability of administration in the paediatric age.

Dose & Duration

The dose of drug administration was calculated based on young formula. In this formula adult dose was 1gm as mentioned in *Bhaisjya Ratana Vali [1]* (Tables 2 & 3).

Table 3: Showing Dose of *Dashanga Guggulu* as per young formula.

Drug	*Dashanga Guggulu*			
Age of the child	5-6year	7-9year	10-12year	13-16year
Drug Dose	155mgBD	200mgBD	250mgBD	275mgBD
Duration of Drug	45 Days			

$$\text{Young Formula} = \frac{(\text{Adult dose X Age in year})}{(\text{Age in year}+12)}$$

Basic Features of Surya Namaskar

Surya Namaskar consists of five essential aspects i.e. physical posture, breathing, mantras, awareness and relaxation.

Physical Postures

There are 12 steps involved in one cycle *Surya Namaskar*. These twelve steps were *Pranamasana, Hasta Uttanasana, Pada hastsana, Ashwa sanchalasana, Parvatasana, Astang Namaskar, Bhujangasana, Parvatasana, Ashwa sanchalasana, Pada hastsana, Hasta Uttanasana* & *Pranamasana.* It was suggested that everyone should complete at least 10 cycles twice a day. There is definite, scientific, medicinal view behind uttering each hymn, which contains certain words that give specific stimulation and exercise to our vital organs and systems.

Assessment Criteria

All *Sthaulya* patients were assessed on subjective parameters, objective parameters, and laboratory investigations.

Subjective Criteria

Following symptoms were subjectively assessed-

i. *Alasya/Utsahhani/Javoparodha (lethargy)*

ii. *Atiksudha (excessive hunger)*

iii. *Gatrasad(*fatigue*)*

iv. *Atipipasa (excessive thirst)*

v. *Angagaurav (heaviness in body)*

vi. To assess the effect of therapy, a scoring pattern was adopted. According to this grading of all signs and symptoms of *Sthaulya* were divided into four grades based on their severity (Table 4).

Table 4: Showing four-point scale to assess the efficacy of therapy on subjective parameters.

1. *Alasya/Utsah Hani/Javoparodha(lethargy)*	
No utsahhani (doing satisfactory work with proper vigor in time)	G_0
Doing satisfactory work/late	G_1
Doing unsatisfactory work	G_2
Don't want to do work	G_3
2. Atiksudha (excessive hunger)	
Morning breakfast with lunch and dinner	G_0
Supplementary food One time with above mentioned	G_1
Supplementary food Two time with above mentioned	G_2
Supplementary food Three time with above mentioned	G_3
3. *Gatrasad(fatigue)*	
No fatigue	G_0

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Fatigue at the time of moderate work	G_1
Fatigue after light work	G_2
Fatigue after routine work	G_3
4. *Atipipasa (excessive thirst)*	
Feeling of thirst(6-8hours) and relieved by drinking water	G_0
Feeling of thirst(>8-10hours) and relieved by drinking water	G_1
Feeling of thirst(>10-12hours) and relieved by drinking water	G_2
Feeling of thirst(>12hours) and relieved by drinking water	G_3
5. Angagaurav (heaviness in body)	
No feeling of heaviness	G_0
Occasionally present	G_1
Most of the time present feeling of heaviness	G_2
Always present feeling of heaviness	G_3

Objective Criteria

i. Assessments of the therapy were also carried out by comparing before and after treatment, on following objective –

ii. Body mass index (BMI)- The girth measurement of different regions was measured by measuring tape.

iii. Chest –in normal expansion at the level of nipple

iv. Abdomen – at the level of umbilicus

v. Mid arm – mid of the arm at triceps

vi. Mid-thigh- mid of thigh at biceps femoris

vii. Waist Circumference

viii. Hip Circumference

ix. Serum lipid profile

x. Fat analysis with fat caliber (skin fold thickness)

Anthropometric Assessment

Body mass index (BMI) [6,7]

BMI- Body Mass Index of the child was assessed before and after the treatment by the formula as:

$$\text{BMI} = \frac{\text{Actual weight in kg.}}{(\text{Height in meter})^2}.$$

BMI-Weight (kg)/Height (m) CDC growth charts were used to know age sex specific BMI

Classification of BMI (KG/M2) (Table 5)

Table 5: Showing Classification of BMI.

Weight status category	Percentile range
Under weight	Less than the 5th percentile
Normal or healthy weight	5th percentile to less than the 85th percentile
Overweight	85th to less than the 95th percentile
Obese	95th percentile or greater

Statistical Analysis

GraphPad Instat 3.0 was used to calculate all the results.

Intra Group Comparison

For Nonparametric Data Wilcoxon Matched pairs signed ranks test was used while for Parametric Data Paired't' Test was used and results were calculated.

Inter Group Comparison

For Nonparametric variables and parametric data ANNOVA Test was used and results were calculated.

Observations

Total 60 children were registered in this trial study. Among them 20 children had been included in group A and group B and

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other 20 children were registered in group C.

Age

It shows that number of patients group A, group B and group C were 21.66% in 13-16 years age group, group A and group B, group C 40% no. of patients belongs to age group 10-12 years. Group A, Group B and Group C 33.33% in7-9 age. Group A, Group B and Group C were 15% in 5-6 years. It means that youngsters in their adolescent years are more likely to become obese. It is *Madhyama Kala*, according to *Ayurveda*, and it leads to "*Paripurnata*" in all *Sharir Dhatu s.* Obesity is more common in adolescents, according to recent sources.

Gender

Sex wise Distribution of the patients of Childhood Obesity male 50% and female 50% patients were female. The cause behind this result may be due to the presence of gender inequality in family culture. Which is justified by previous study in 9-15 years children suggest that overall prevalence of overweight and obesity is higher in boys as compared to girls. According to WHO study- In 2016, 39 percent of adults aged 18 and up were overweight (39 percent of men and 40 percent of women).

Religion

Religion Majority of the population i.e., 93.33% patients were Hindu in groups followed by Muslim community 6.66% group A group B group C. This may be the representation of the total community distribution in Jodhpur city and surrounding areas from where most of the patients came.

Socioeconomic Status

The socioeconomic status study included the maximum children were from upper middle status and minimum no. of patients was from lower middle status. Obesity is thought to be more widespread among the rich segment of society due to lifestyles, less physical activity, and less mental labor. In the middle classes of society indicated their lack of knowledge about food choices and consumption. This could possibly be attributed to regional eating habits, which favor fatty and fried foods in all grades.

Habitat

The study included maximum children, from urban area 90 % in group A, group B and group C and Minimum children 10 % Rural habitat were in group A group B and group C.

Dietary Habits

Mixed dietaries were found to be more i.e., 40% individuals and individuals of patients have vegetarians' diet was 60%. Due to the total community (Hindu) distribution in Jodhpur city and surrounding from where most of the patients came.

Satva, Satmaya

Satva was *Avara* type in 53.33% while it was *Madhyama* type in 46.66% and *Pravara* type in 0.00% in groups. 56.66% of patients had *Avara Satmaya*; 43.33% patients had *Pravara Satmaya.* Persons having different *Satva* have different control over food choices resulting in weight gain while 56% patients were having *Avara Satmya* and 43.33% patients were having *Ekrasa Satmya. Shadrasa Yukt Bhojana* has been mentioned as the more nutritious and balanced food in dietary habits. So, the person consuming all proportions of food i.e., carbohydrates, fats, proteins etc. in excess quantity will be more prone towards obesity being *Sthaulya* as *Santarpanjanya Vyadhi*.

Abhyavarana Shakti, Jarana Shakti

Abhyavarana Shakti11.66% patients had *Madhyam Ahar Shakti* and 81.66% patients had *Pravara Ahar Shakti*. 6.66% of patients had *Hina Ahar Shakti. Jarana Shakti* 0% patients had *Avara Jarna Shakti*, 50% patients had *Madhyam Jarna Shakti* and 50 % patients had *Pravara Jarna Shakti*. In *Sthaulya*, *Sandhukshna* of *Agni* due to the *Avarana* of *Vayu* leads to excessive hunger causing the desire to eat more frequently. *Acharya* has mentioned that, in *Sthaulya* due to *Avarana* of *Vayu* there will be excessive hunger causing the desire to eat more frequently. *Charaka* has mentioned that *Sthaulya* patients have good appetite, and they take food in large quantity to satisfy their hunger but due to pathology of disease, only the *Medo Dhatu* gets nourished and other *Dhatu s* undergo diminution. Due to *Agni Sandhukshna by Vata*, voracious *Agni* makes food easily digestible and craves for next intake of food. This makes the vicious cycle continue to accumulate more *Meda* in body. This kind of behaviour may lead to *mandagni* and *Medo Dhatu vriddhi*.

Vyayam Shakti

Vyayam Shakti 30% patients had *Alpa Vyayam* 31.66% patients had *Hina Vyayam* and 38.32% patients had *Madhyam Vyayam*. It shows how etiological factors, such as *Avyayam*, have a role in the occurrence of *Sthaulya*. Obesity is mostly caused by a lack of physical activity. This assertion is validated by both ancient and modern medical knowledge.

Desha

10% patients had *Aanoop Desha* and 90% patients had *Jangal Desha*. Due to the total community distribution in Jodhpur city and surrounding areas from where most of the patients came.

Agni

16.66% of patients had *Samagni* and 35% patients had *Tikshna Agni*. 48.33% of patients had *Vishamagni*. *Samagni* get converted into *Vishamagni* due to influence of the *Vata* usually causes irregular eating at frequent intervals, which is one of the *Nidana* of

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obesity. In obesity there will be excessive appetite as mentioned in the pathology. This has been supported by the reference of *Charaka Samhita* which states that, in *Sthaulya* due to *Avarana* of *Vayu* there will be excessive hunger causing a desire to eat more frequently.

Koshtha

15% patients had *Krura Kostha*, 81.66% patients had *Madhyama Kostha* and 3.33% patients had *Mradu Kosth*. Dominance of *vata* and *Kapha* in *koshtha* results in disturbed digestion and bowel habits.

Nidra

15% of patients had *atinidra*, 85 % patients had *samayak nidra*. Excess sleep is one of the main reasons of obesity, as it produces *Kapha Prakopa* and increases the *Meda Dhatu*, therefore acting as an etiological factor. *Divaswapana* also causes vitiation in all three *Doshas* and an excessive rise in the *Meda Dhatu* due to the *Snigdha-Abhishyandi* property's blockage. *Divaswapana* is strongly prohibited in *Medasvi, Kapha Prakriti,* and *Kapha Rogi* patients.

Samhanan

65% of patients had *Avara samhanan*, 33.33% patients had *Madhyam Samhanan*. 1.66% of patients had *Pravara Samhanan*. *Samhanana* of overweight/obese children hugely falls in *Avara* category due delicacy of *Dhatu s* in *Balyavastha*. In obese people, quality of *Meda Dhatu* has been compromised with its increase quantity, resulting in decline of *Samhanana*. Unwanted accumulation of cholesterol in the body is termed as *Abadda Medas* in *Ayurveda*. Similar observation has been found in the present study.

Sharirik Prakriti

13.33% patients had *Pitta Kapha*, 55% patients had *Kapha Pitta*, 16.66% patients had *Kapha Vata*, 5% patients had *Pitta Vata*, and 5% patients had *Vata Kapha* and 5% *Vata pitta*. *Sthaulya* has been considered in *Sleshma Nanatmaja Vyadhi*. *Kapha Prakriti* patients are more prone to develop obesity due to its similarities with properties of causative factors as well as *Ashraya-Ashrayi Bhava* of *Meda* which is the main *Dushya. Vataja Prakriti* is known for its irregularity and over activity. *Kapha Vtaja Prakriti* patients were predominantly found in the present study which could be explained in relation to pathology of *Sthaulya*.

Manasika Prakriti

25% of patients had *Satvika Rajsika Prakrati*, 30% patients had *Satvika Tamsika Prakrati*, and 45% patients had *Rajsika Tamsika Prakrati*.

Result (Tables 6-10) (Figure 1)

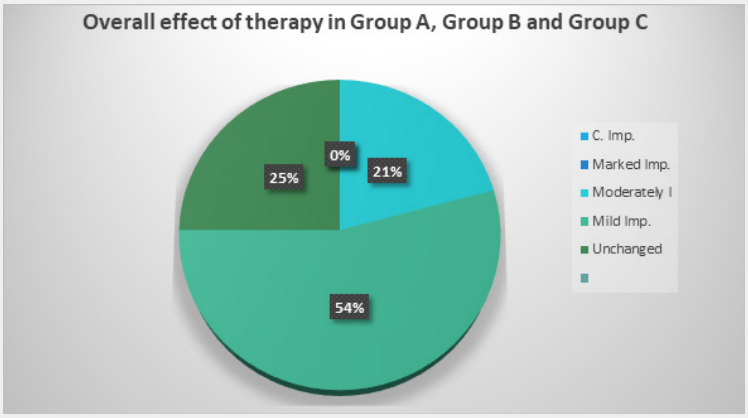

Figure 1.

Table 6: Showing the effect of therapy on Subjective parameter (Intra Group Study) of Group A, B and C (Wilcoxon Matched Pairs Signed Rank Test).

Sign and symptoms	Gr	Mean score		Difference	% Relief	SD ±	SE ±	P value	S
		BT	AT						
Alasya/ utsah hani/ Javoparodha(lethargy)	**A**	2.3	1.4	0.9	39.13	0.3078	0.06882	<0.0001	ES

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	B	2.45	1.4	1.05	42.85	0.2236	0.05	0.0001	ES
	C	2.3	0.95	1.35	58.69	0.5871	0.1313	<0.0001	ES
Atikshudha (Excessive hunger)	**A**	2.35	1.45	0.9	39.13	0.4472	0.1	<0.0001	ES
	B	2.3	1.25	1.05	45.65	0.394	0.08811	<0.0001	ES
	C	2.5	1.35	1.15	46	0.7452	0.1666	<0.0001	ES
Atipipasa(excessive thirst)	**A**	2.15	1.4	0.75	34.88	0.6387	0.1428	<0.0001	ES
	B	2.2	1.15	1.05	47.72	0.2236	0.05	<0.0001	ES
	C	2.25	1.05	1.2	53.33	0.6156	0.1376	<0.0001	ES
Anga Gaurav (Heaviness in body)	**A**	2	1.35	0.65	32.5	0.4894	0.1094	<0.0001	ES
	B	2.15	1.45	0.7	32.55	0.5712	0.127	<0.0001	ES
	C	2.35	1.45	0.9	38.29	0.3078	0.068	<0.0001	ES
Gatrasada (fatigue)	**A**	1.95	1.45	0.5	25.64	0.513	0.1147	<0.0001	ES
	B	2.15	1.35	0.8	37.2	0.5231	0.117	<0.0001	ES
	C	2.2	1.2	1	45.45	0.3244	0.072	<0.0001	ES

Table 7: Showing the effect of therapy on Subjective parameter (Inter Group Study) of Group A, B and C (Kruskal–Wallis test).

Parameter	P value	Significance	Kruskal wallis static	K.W. test
Alasya/utsah hani/Javoparodha	0.0034	VS	11.372	A Vs B NS A Vs C VS B Vs C NS
Atikshudha	0.4123	NS	1.772	A Vs B NS A Vs C NS B Vs C NS
Trishna	0.0314	S	6.923	A Vs B NS A Vs C NS B Vs C NS
Anga Gaurav	0.184	NS	3.386	A Vs B NS A Vs C NS B Vs C NS
Gatrasada	0.0068	VS	9.972	A Vs B VS B Vs B NS B Vs C NS

Table 8: Showing the effect of therapy on Objective parameter (Intra Group Study) of Group A, B and C (Paired t Test).

Variable	Group	Mean score		Mean Difference	% Relief	SD ±	SE±	P value	T	S
		BT	AT						Value	
Weight	A	44.325	42.29	2.035	4.59	0.7562	0.1691	<0.0001	12.03	ES
	B	47.52	45.25	2.275	4.99	0.6382	0.1427	<0.0001	15.943	ES
	C	45.25	42.05	3.2	7.071	0.7678	0.1717	<0.0001	18.639	ES
Height	A	139.4	139.64	0.235	0.168	0.6839	0.1529	0.0704	1.537	S
	B	145.23	145.3	0.075	0.0516	0.186	0.0416	0.0436	1.803	S
	C	143.25	143.37	0.115	0.08	0.239	0.0534	0.0445	2.152	S

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BMI	A	93.65	90.7	2.95	3.15	2.235	0.4999	<0.0001	5.9	ES
	B	92.6	86.1	6.5	7.019	6.493	1.452	0.0001	4.477	ES
	C	91.4	84.2	7.2	7.87	4.047	0.905	<0.0001	7.956	ES
Waist circumfe-rence	A	55.95	54.3	1.65	2.94	0.6708	0.15	<0.0001	11	ES
	B	73.7	71.65	2.05	2.78	0.5104	0.1141	<0.0001	17.96	ES
	C	59.5	57.05	2.45	4.11	0.6863	0.1535	<0.0001	15.96	ES
Hip circumfe-rence	A	55.95	54.55	1.4	2.5	0.9403	0.2103	<0.0001	6.58	ES
	B	68.95	67.2	1.75	2.53	0.7164	0.1602	<0.0001	10.92	ES
	C	60.25	57.6	2.65	4.39	0.8751	0.195	<0.0001	13.543	ES
Chest circumfe-rence	A	38.65	37.2	1.45	3.75	0.5104	0.1141	<0.0001	12.7	ES
	B	54.9	53.2	1.7	3.096	1.081	0.2417	<0.0001	7.033	ES
	C	41.75	39.45	2.3	5.5	0.8645	0.1933	<0.0001	11.89	ES
Mid arm circumfe-rence	A	30.15	28.6	1.55	5.14	0.759	0.1698	<0.0001	10.51	ES
	B	29.5	27.65	1.85	6.27	0.4894	0.1094	<0.0001	16.9	ES
	C	30.15	27.75	2.4	7.96	0.8208	0.1835	<0.0001	13.07	ES
Mid-thigh circumfe-rence	A	29.5	28.35	1.15	3.89	0.489	0.1094	<0.0001	10.51	ES
	B	30.65	29	1.65	5.38	0.5871	0.1313	<0.0001	12.56	ES
	C	31.55	29.4	2.15	6.81	0.8127	0.1817	<0.0001	11.83	ES
S.f.t. biceps	A	4.05	3.515	0.53	13	0.33	0.76	<0.0001	7.08	ES
	B	4.12	3.51	0.61	14	0.277	0.061	<0.0001	9.84	ES
	C	4.22	3.51	0.71	16	0.36	0.082	<0.0001	8.58	ES
S.F.T. triceps	A	7.38	6.84	0.54	7.3	0.37	0.082	<0.0001	6.57	ES
	B	7.47	6.81	0.66	8.8	0.412	0.092	<0.0001	7.61	ES
	C	7.45	6.73	0.74	9.9	0.39	0.088	<0.0001	8.34	ES
S.F.T. supra iliac	A	1.95	1.55	0.4	20.5	0.52	0.11	0.001	3.55	VS
	B	2.05	1.35	0.71	8.29	0.47	0.1	<0.0001	6.65	ES
	C	2.05	1.25	0.79	38	0.36	0.082	<0.0001	9.66	ES
Serum cholesterol	A	136.36	134.29	2.065	1.51	1.319	0.294	<0.0001	7.003	ES
	B	149.4	147.11	2.29	1.53	1.03	0.231	<0.0001	9.874	ES
	C	139.04	135.99	3.05	2.19	1.36	0.305	<0.0001	9.994	ES
S. Triglyce-ride	A	135.75	134.12	1.63	1.2	1.3	0.29	<0.0001	5.601	ES
	B	146	143.81	2.19	1.5	0.983	0.219	<0.0001	9.983	ES
	C	136.65	134.41	2.24	1.64	1.034	0.2312	<0.0001	9.69	ES
S. HDL	A	51.98	52.8	0.82	1.6	2.78	0.621	0.2028	4.934	NS
	B	53.15	54.26	1.11	2.08	2.76	0.619	0.088	1.319	NS
	C	37.75	41.44	3.68	9.94	3.34	0.74	<0.0001	1.793	ES
S. LDL	A	96.32	102.99	6.66	6.9	26	5.81	0.2663	1.145	NS
	B	111.96	99	12.95	11.66	27.7	6.19	0.0502	2.091	NS
	C	112.59	112.58	0.005	0.004	28.123	6.288	0.999	4.48	NS

Table 9: Showing effect of therapeutic trial on Objective parameters (inter group comparison) (ANOVA- Tukey Kramer multiple comparison test).

Parameter	P value	Significance	Tukey- Kramer test
Weight	0.0001	ES	A Vs B NS A Vs C P<0.001 B Vs C P<0.001

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BMI	0.0108	S	A Vs B P<0.05 A Vs C P<0.05 B Vs C P>0.05
Waist circumference	0.0008	ES	A Vs B NS A Vs C P<0.001 B Vs C NS
Hip circumference	<0.0001	ES	A Vs B NS A Vs C P<0.001 B Vs C P<0.01
Chest circumference	0.008	VS	A Vs B NS A Vs C P<0.01 B Vs C P>0.05
Mid arm circumference	0.0013	VS	A Vs B NS A Vs C P <0.001 B Vs C P<0.05
Mid-thigh circumference	<0.0001	ES	A Vs B P<0.05 A Vs C P<0.001 B Vs C P<0.05
Serum cholesterol	0.0397	S	A Vs B NS A Vs C P <0.05 B Vs C NS
S. Triglyceride	0.0397	S	A Vs B NS A Vs C P <0.05 B Vs C NS
S. HDL	<0.0001	ES	A Vs B NS A Vs C P <0.001 B Vs C P >0.001
S. LDL	0.0027	S	A Vs B P <0.05 A Vs C P >0.05 B Vs C NS

Table 10: Overall effect of therapy in Group A, Group B and Group C.

Improvement	Group A		Group B		Group C		Total	
	N	%	N	%	N	%	N	%
Complete improvement	0	0	0	0	0	0	0	0
Marked improvement	0	0	0	0	0	0	0	0
Moderately improvement	1	5	0	0	7	35	8	13.33
Mild improvement	13	65	20	100	13	65	46	76.66
Unchanged	6	30	0	0	0	0	6	10
Total	20	100	20	100	20	100	60	100

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Discussion

In this comparative study, the efficacy of *Dashanga Guggulu* and *Surya Namaskar* was studied in groups A, B, and C, respectively.

Effect of therapy on Subjective Parameters

Effect of Therapy on *Alasya/Javoparodha* - P-Value for Group A was less than 0.0001, Group B was 0.0001 and Group C was less than 0.0001. Hence, it was concluded that, effect observed in Group A was extremely significant and Group B, C was extremely significant. 39.13% effect was observed in Group A and 42.85% Group B and 58.69% in Group C (Table 6). On the intergroup comparison between Groups A, B & C by "Kruskal Wallis test (non-parametric ANOVA) test" there was a very statistically significant difference was found with P value 0.0034. However, based on percentage relief Group C showed better result than Group B and C. (Table 7) Lack of enthusiasm or *Alasya/Utsahani/Javoparodha* has been the major presenting symptom in the pathology of *Medo Roga*. Symptom is an indicator of increasing *Kapha*, Meda and abnormal fat in the body with its physiological, social, and psychological impact. Although glucose is present at a normal level in the blood of obese person but the fat accumulation in different parts of the body leads to improper functioning/secretion of insulin hormone. Without normal functioning of insulin person feels low esteem and exhausted even with minimal physical movements and subject unknowingly makes own self addicted to inactive lifestyle. *Dashanga Guggulu* with its fat dissolving property, is needful in the patients of *Sthaulya* and with its properties of removing the excess accumulated *Meda* from the body and clearing *Strotas* and brings *Laghuta* in *Sharira* i.e., bring back the normal body shape and body weight. Thus, restore the physiological and hormonal functions in the body as it facilitates the normal movement of *Vata*. Re-establishment of physiological and hormonal function initiates the person to be active and joyful in daily routine life events.

Effect of Therapy on *Atikshudha*

P-Value for Group A was less than 0.0001 and Group B and C was less than 0.0001. Hence, it was concluded that, effect observed in Group A was extremely significant and Group B, C was extremely significant. Further It was observed that, effect observed in Group A was 39.13% and Group B was 45.65% and Group C was 46%. Also, very significant statistically (Table 6). On the intergroup comparison between Groups A, B & C by "Kruskal Wallis test (non-parametric ANOVA)" There was statistically no significant difference found in improvement in symptom *Atikshudha* with p value 0.4123. But based on percentage improvement Group C administered with trial drug *Dashanga Guggulu* and *Surya Namaskar* shown better result with fast disappearance of symptom, *Atikshudha* (Table 7). In *Sthaulya* digestion is regulated by *Jatharagni* (Gastro-intestinal level) and *Dhatvagni* is (cellular level) to maintain basal metabolic rate and other functions of body. These *Agni* may be related to the functions of various enzymes and hormones secreted by various endocrine *glands in* the body. Hormones and enzymes secreted by pancreas, and pituitary gland digests carbohydrates, regulates metabolism and the amount of deposition of *Meda*/fat in *Strotas* (microcirculatory level). Continuous indulgence in *Nidana* causes abnormality in *Agni* (enzymes and hormonal functions) at various levels may cause *Ama* formation in body which can causes *Margavarana* of *Vayu*. This results in the visitation of *Vayu* which finds its way to *Koshta*, which is also the natural seat of *Samana Vayu*. *Samana Vayu* being responsible for digestion and assimilation of ingested food, vitiated *Samana Vayu* act differently, quick, and improper digestion of available food it makes the person a voracious eater. This vicious cycle again adds up to formation of *Aam Meda Dhatu* which in due course of time gets deposited at various sites of body i.e., *Sphika, Udara, Stana* etc.

Effect of Therapy on Excessive *Thirst*

P-Value for Group A was less than 0.0001 and Group B was less than 0.0001, Group C was less than 0.0001 Hence, it was concluded that, effect observed in Group A was extremely significant and Group B and Group C was extremely significant. Further It was observed that, effect observed in Group A was 34.88% and Group B was 47.72% and group C was 53.33% (Table 6). On the intergroup comparison between Group A, B & C by " Kruskal Wallis test (non-parametric ANOVA) test" there was statistically significant difference was observed with p value 0.0314. However, because of percentage improvement subjects of Group C, shown better result with fast disappearance of symptom *Atipipasa* (excess thirst) (Table 7). *Swedavaha Srotus* is the seat of *Samana Vata* and the vitiation of *Samana Vata* will vitiate the *Ashraye Srotus* leading to *Swedadhikya*. Thus, increased perspiration might be the reason behind *Atipipasa. Medavritta Vata* due to blockage of *Strotas* by excess accumulated *Meda* also responsible to the symptom *Atipipasa*. Obese people usually have *hyperphagia* (excess food intake) is also accompanied by excessive thirst/*Atipipasa. Dashang Guggulu* with its properties of ingredients have Karma like *Vata Kaphapaha, Ama Dosahara*, *Medahara, Chhedana, Lekhana* who reduces the body fat percentage and normalize the physiological & hormonal secretions in the body. This normalizes the hyperglycaemic state, insulin level in the blood, pituitary functions and ultimately results in normalizing the demand of water i.e., reduces the symptoms.

Effect of Therapy on *Anga Gaurav*

P-Value for Group A was less than 0.0001 and Group B and C was less than 0.0001. Hence, it was concluded that, effect observed in Group A was extremely significant and Group B and C was extremely significant. Further It was observed that, effect observed in Group A was 32.5% and Group B was 32.55% Group C was 38.29% (Table 6). The sign or symptom because of *Srtoroavrodha* and *Ama, Anga Gauravata* occurs in a variety of disorders.

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The same causes apply in *Sthaulya*, and *Medo Dhatu* is to blame. The *Ama* acts as a foreign material in certain disorders, causing *Anga Gauravata Lakshana*.

Effect of Therapy on *Gatrasada*

In the present study results as show Group A – The mean score before treatment was 1.95 which lowered down to 1.45 after treatment, with SD ± 0.51 giving a relief of 25.64% which was statistically Extremely significant (P value <0.001) (Table 6). Group B– The mean score before treatment was 2.15 which lowered down to 1.13 after treatment, with SD ± 0.52 giving a relief of 37.2% which was statistically Extremely significant (P value <0.001). Group C– The mean score before treatment was 2.2 which lowered down to 1.2 after treatment, with SD ± 0.51 giving a relief of 45.45% which was statistically Extremely significant (P value <0.001).

Effect of therapy on Objective Parameters

Effect on Weight & BMI

In the present study results as show Group A – The mean score before treatment was 44.32 which lowered down to 42.29 after treatment, with SD ± 0.756 giving a relief of 4.59% which was statistically Extremely significant. (P value <0.0001 Group B – The mean score before treatment was 47.52 which lowered down to 45.25after treatment, with SD ± 0.638 giving a relief of 4.99% which was statistically extremely significant (P value <0.001) Group C – The mean score before treatment was 45.25which lowered down to 42.05 after treatment, with SD ± 0.767 giving a relief of 7.07% which was statistically Extremely significant (P value <0.001) Body weight have significant role in calculation of BMI which is the main criteria of the present study (Table 8).

Effect on Body Mass Index (BMI)

Group A – The mean score before treatment was 93.65 which lowered down to 90.7 after treatment, with SD ± 2.235 giving a relief of 3.15% which was statistically Extremely significant (P value <0.0001) Group B – The mean score before treatment was 92.6which lowered down to 86.1 after treatment, with SD ± 6.493 giving a relief of 7.019% which was statistically Extremely significant (P value 0.0001) Group C – The mean score before treatment was 91.4 which lowered down to 84.2 after treatment, with SD ± 4.047 giving a relief of 7.87% which was statistically Extremely significant (P value <0.0001) (Table 8). As weight and height are variable in adolescent age, BMI percentile is more accurate measure along with other criteria to assess weight gain in children. On the intergroup comparison statistically, externally significant difference observed in body weight, but BMI showed significant result with p value 0.0001 & 0.0108 respectively. Based on percentage relief Group C with trial drug *Dashanga Guggulu* showed better results than Group B, C (Table 9). The anthropometric (human body measurements) changes i.e., reduction in body weight, B.M.I etc. depends upon the proportion of fat in the body. Body weight is directly proportional to the BMI and an increase in the body weight increases BMI. Excessive intake of high caloric food substances along with other causative factors of *Sthaulya* may result in excessive weight gain. The trial drug *Dashanga Guggulu* and *Suryanmaskara* possesses the *Lekhana, Karshana,* and *Meda-Kleda Upashoshana* properties.

Effect on Waist Circumference (WC)

In the present study results as show Group A – The mean score before treatment was 55.95which lowered down to 54.3 after treatment, with SD ± 0.6708 giving a relief of 2.94% which was statistically Extremely significant (P value <0.0001) Group B – The mean score before treatment was 73.7which lowered down to 71.65after treatment, with SD ± 0.5104 giving a relief of 2.78% which was statistically Extremely significant (P value <0.0001) Group C – The mean score before treatment was 59.4 which lowered down to 57.05after treatment, with SD ± 0.6863giving a relief of 4.11% which was statistically Extremely significant (P value <0.0001) According to World health organization, risk of metabolic complications increases with increase in waist circumference in obese patients (Table 8).

Effect on Head Circumference (HC)

In the present study results as show Group A – The mean score before treatment was 55.95which lowered down to 54.55 after treatment, with SD ± 0.9403 giving a relief of 2.5% which was statistically Extremely significant (P value <0.0001) (Table 8). Group B – The mean score before treatment was 68.95which lowered down to 67.2after treatment, with SD ± 0.5104 giving a relief of 2.5% which was statistically Extremely significant (P value <0.0001) Group C – The mean score before treatment was 60.25 which lowered down to 57.6after treatment, with SD ± 0.8751giving a relief of 4.39% which was statistically extremely significant (P value <0.0001) Further It was observed that, effect observe in Group A was 2.5% and Group B was 2.5% and Group C was 4.39% (Table 8).

Effect on Chest Circumference (CC)

In the present study results as show Group A – The mean score before treatment was 38.65which lowered down to 37.2 after treatment, with SD ± 0.5104giving a relief of 3.75% which was statistically Extremely significant (P value <0.0001) Group B – The mean score before treatment was 54.9which lowered down to 53.2after treatment, with SD ± 1.081 giving a relief of 3.096% which was statistically Extremely significant (P value <0.0001) Group C – The mean score before treatment was 41.75 which lowered down to 39.45after treatment, with SD ± 0.8645giving a relief of 5.5% which was statistically Extremely significant (P value <0.0001) (Table 8).

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Effect on Mid Arm Circumference (MAC)

In the present study results as show Group A – The mean score before treatment was 30.15which lowered down to 28.6 after treatment, with SD ± 0.759 giving a relief of 5.14% which was statistically Extremely significant (P value <0.0001) Group B – The mean score before treatment was 29.5which lowered down to 27.65after treatment, with SD ± 0.489 giving a relief of 6.27% which was statistically Extremely significant (P value <0.0001) Group C – The mean score before treatment was 30.15 which lowered down to 27.75after treatment, with SD ± 0.8208giving a relief of 7.96% which was statistically Extremely significant (P value <0.0001) Further It was observed that, effect observe in Group A was 5.14% and Group B was 6.27% and Group C was 7.96% (Table 8).

Effect on Mid-thigh circumference (MTC)

In the present study results as show Group A – The mean score before treatment was 29.5which lowered down to 28.35after treatment, with SD ± 0.489 giving a relief of 3.89% which was statistically Extremely significant (P value <0.0001) Group B – The mean score before treatment was 30.65 which lowered down to 29 after treatment, with SD ± 0.5871 giving a relief of 5.38% which was statistically Extremely significant (P value <0.0001) Group C – The mean score before treatment was 31.55 which lowered down to 29.4 after treatment, with SD ± 0.8127giving a relief of 6.81% which was statistically Extremely significant (P value <0.0001) Further It was observed that, effect observe in Group A was 3.89% and Group B was 5.38% and Group C was 6.81% (Table 8).

Effect on Serum cholesterol

In the present study results as show Group A – The mean score before treatment was 136.36 which lowered down to 134.29after treatment, with SD ± 1.319 giving a relief of 1.51% which was statistically Extremely significant (P value <0.0001) Group B – The mean score before treatment was 149.4which lowered down to 147.11 after treatment, with SD ± 1.03 giving a relief of 1.53% which was statistically Extremely significant (P value <0.0001) Group C – The mean score before treatment was 139.04which lowered down to 135.99after treatment, with SD ± 1.36giving a relief of 2.19% which was statistically Extremely significant (P value <0.0001) (Table 8). On the intergroup comparison between Group A, B & C by "ANOVA- Tukey Kramer multiple comparison test" there was statistically significant difference found in cholesterol with p value 0.0397. But based on percentage improvement Group C administered with trial drug *Dashanga Guggulu* and *Suryanamskara* shown better result with fast disappearance in values of cholesterol (Table 9).

Effect on Serum Triglyceride

In the present study results as show Group A – The mean score before treatment was 135.75 which lowered down to 134.12after treatment, with SD ± 1.319 giving a relief of 1.2% which was statistically Extremely significant (P value <0.0001) Group B – The mean score before treatment was 146 which lowered down to 143.81 after treatment, with SD ± 0.983 giving a relief of 1.5% which was statistically Extremely significant (P value <0.0001) Group C – The mean score before treatment was 136.65 which lowered down to 134.41after treatment, with SD ± 1.034giving a relief of 1.64% which was statistically Extremely significant (P value <0.0001) (Table 8). On the intergroup comparison between Group A, B & C by " ANOVA- Tukey Kramer multiple comparison test" there was statistically significant difference found in triglycerides with p value 0.0397. But based on percentage improvement Group C shown better result disappearance in values of triglycerides than in Group B & C (Table 9).

Effect on Serum High Density Lipoprotein (HDL)

In the present study results as show Group A – The mean score before treatment was 51.98which lowered down to 52.80after treatment, with SD ± 3.34 giving a relief of 1.6% which was statistically not Significant (P value <0.2028) Group B – The mean score before treatment was 53.15 which lowered down to 54.26 after treatment, with SD ± 2.78 giving a relief of 2.08% which was statistically Not Significant (P value 0.088) Group C – The mean score before treatment was 37.75which lowered down to 41.44 after treatment, with SD ± 26 giving a relief of 9.94% which was statistically Extremely significant (P value <0.0001) (Table No-8) On the intergroup comparison between Group A, B & C by " ANOVA- Tukey Kramer multiple comparison test" there was statistically significant difference found in S. HDL with p value 0.0397. But based on percentage improvement Group C shown better result fast disappearance in values of S.HDL than in Group B & C (Table 9).

Effect on Serum Low Density Lipoprotein (LDL)

In the present study results as show Group A – The mean score before treatment was 96.32 which lowered down to 102.99after treatment, with SD ± 26giving a relief of 6.9% which was statistically Not Significant (P value 0.2663) Group B – The mean score before treatment was 111.96 which lowered down to 99 after treatment, with SD ± 27.7 giving a relief of 11.56% which was statistically Not Significant (P value 0.0502) Group C – The mean score before treatment was 120.48 which lowered down to 103.39 after treatment, with SD ± 17.29 giving a relief of 14.18% which was statistically Extremely significant (P value 0.0003) (Table 8) On the intergroup comparison between Group A, B & C by "ANOVA- Tukey Kramer multiple comparison test" there was statistically significant difference found in S.LDL with p value 0.0027. But based on percentage improvement Group C shown better result with fast disappearance in values of S.LDL than in Group B & C (Table 9).

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Overall Effect of Therapy in Group A, B And C

Overall effect of therapy in terms of percentage relief in anthropometric profile: in Body weight relief was 4.59%, 4.99 % & 7.071%, in Body Mass Index (BMI) relief was 3.15%, 7.019% & 7.87%, in waist circumference relief was 2.94%, 2.78% & 4.11%, in hip circumference relief was 2.5% , 2.53% & 4.39% and in Chest circumference relief was 3.75%, 3.096% & 5.5%, in Mid Arm circumference relief was 5.14%, 6.27%, 7.96%, in Mid-thigh circumference relief was 3.89%, 5.38% & 6.81% in Groups A, B & C respectively. (Table 10).

Probable Mode of Action of *Dashanga Guggulu*

Ayurvedic pharmacodynamics is primarily based on the *Tridosha* and *Panchamahabhoota* theories, which govern physiochemical and biological occurrences, respectively. Drugs used in the preparation of *Dashanga Guggulu* have *Kapha-Vata Shamaka, Anulomana, Bhedana, Deepana, and Ama, Kapha, vata ahara* properties. That is why this drug is useful to breakdown pathogenesis of *Sthaulya. Dashanga Guggulu* is *Ruksha(dry), Rasayana (rejuvenator), Sara (spreading), Swarya (improves voice), Laghupaki (light in digestion), Deepana (appetizer), Medohara (decreases Medo Dhatu)* and *Mehahara (antidiabetic)*in nature*. Guggulu (Commiphora Wightii Arn. Bhandari)* is the major constituents in *Dashanga Guggulu* have *Katu Rasa, Katu Vipaka, Ushna Veerya,* and *Kapha-Vata Dosha* relieving properties. *Sunthi, Marich, Pippali, Nagarmotha, Amalaki, Bibhitaki, Haritaki,* and *Vidanga* of *Dashanga Guggulu* also having the similar properties and mentioned individually or as an ingredient of various compound in ancient classics for the treatment of *Medo Roga* (hyperlipidemia) and other *Kaphaja Roga* (*Kapha*-related disorders). *Medo Dhatu's* obstruction by *Vata* causes symptoms including exhaustion, exertional dyspnoea, increased sleep, thirst, and increased perspiration among *Medorogi*. Most of the medications in *Dashanga Guggulu* have qualities like hot, pungent, and scraping. These medications digestive (*Ama Pachana*), appetitive, scraping, lightning, and *Vata-Kapha* palliative effects aid in the relief of the symptoms. As a result, via scraping activity, it removes *Medoja* blockage and restores *Vata* balance. Reduction in exertional dyspnoea and fatigue can also be attributed to the loss of body weight caused by the administration of *Guggulu.*

Probable Mode of Action of *Surya Namaskar*

Proper dynamic activity is required to burn off the calories accumulated in the body's adipose tissue. All 40 patients were instructed to do Surya-style dynamic exercises. *Surya Namaskar* is a yoga pose that involves bending forward and backwards to work out the complete body- Compressing and stretching the abdomen, as well as straightening the arms and legs. As a result, body fat percentage is lowered, and endocrine microcirculation is improved. The effect of Surya Namaskar on different systems can be understood as given below.

Circulatory System

Surya Namaskar increases heartbeat and circulatory system activity, which aids in the elimination of waste items from the body. Blood that is sluggish is also removed, and blood that is pure and oxygenated is returned. Additional nutrients are given to all the body's cells, allowing them to function more efficiently.

Digestive System

Surya Namaskar is beneficial to the digestive system because it alternately stretches and compresses the abdominal organs, providing them a good massage and ensuring that they do not get inflamed.

Respiratory System

Most child take shallow breaths. This depletes the body's oxygen supply, making it unable to function correctly. *Surya Namaskar* improves the exchange of air from the lungs, opens and extends lung tissue, and works the surrounding chest muscles when done correctly.

Endocrinal System

Surya Namaskar harmonizes the endocrine system, correcting any irregularities and improving blood flow by massaging the glands directly.

Muscle and Skeleton

Surya Namaskar focuses on all the major muscles and joints in the body. Because the muscles are constricted and expanded, it is an excellent way to lose weight. A necessary workout has an impact on the body's general health.

Conclusion

The present study concluded that Group C administered with trail drug *Dashanga Guggulu* and *Surya Namaskar* has shown highly significant results in reducing the symptomatology of *Sthoulya* in comparison to Group A and B. No adverse effects of the therapy were observed during the present study.

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