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Access this article online
Website: www.ayujournal.org
DOI: 10.4103/0974-8520.77150
Quick Response Code:

Clinical Research

Randomized placebo-controlled trial of *Mustadi Ghanavati* in hyperlipidemia

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Abstract

Hyperlipidemia is one of the major lifestyle disorders. Its role has been appreciated in the manifestation of serious diseases like ischemic heart disease, diabetes, stroke etc. These lifestyle diseases are a result of lifestyle factors such as overnutrition etc., which have been referred to as the *Santarpanjanya Vyadhis* in the classical texts. *Mustadi Ghanavti* is a modified form of the classical formulation *Mustadi Kwath* that has been advocated by Acharya Charaka for the management of *Santarpanjanya Vikaras*. This placebo-controlled randomized trial of *Mustadi Ghanavati* was carried out on 61 patients suffering from hyperlipidemia; of the 61 patients, 50 completed the entire course of treatment. The results of the study revealed that *Mustadi Ghanavati* decreased serum cholesterol by 22.4%, serum triglycerides by 19.6%, serum LDL by 18.2%, and serum VLDL by 4.2%; serum HDL increased by 5.6%. Thus *Mustadi Ghanavati* was able to effect a total improvement of 58.8% in the lipid profile. It brought about mild improvement in 42.86% of patients and moderate improvement in 14.28% of patients. *Mustadi Ghanavati* was also found to have a significant effect on other subjective as well as objective parameters considered for the study.

Key words: Hyperlipidemia, *Mustadi Ghanavati,* placebo-controlled trial.

Introduction

The growing challenges of modernization have resulted in human beings readjusting their customary behavior by modifying their dietary and lifestyle preferences. Fast foods, lack of exercise, stress, and various addictions are some of the factors which are adversely impacting the lifestyle of man in the 21st century. This has resulted in a discrepancy between the external environment and man's internal mechanism, leading to a multitude of diseases, mainly due to impaired metabolism; these are popularly referred to as lifestyle diseases. Hyperlipidemia is one such disorder. It has been identified as a potential risk factor for many diseases, including cardiovascular diseases, the metabolic syndrome, and hypertension.

Hyperlipidemia is defined as the presence of raised or abnormal levels of lipids and/or lipoproteins in the blood.[1] Hyperlipidemia has drawn worldwide interest for its ability to participate in the pathology of atherosclerotic diseases like coronary heart disease (CHD), which is an important cause of morbidity and mortality the world over. Hyperlipidemia is term used to denote raised serum levels of cholesterol or triglycerides or both. The lipid hypothesis proposed by Rudolph Virchow in 1856 suggested that blood lipid accumulation in arterial walls caused atherosclerosis.[2] In 1913, a study by Anitschkow showed that feeding rabbits cholesterol could induce symptoms similar to atherosclerosis, suggesting a role for cholesterol in atherogenesis.[3] Since then raised levels of cholesterol and triglycerides have been identified as the prime modifiable risk factors in atherosclerotic disease. Globally, raised cholesterol is estimated to be responsible for 18% of cerebrovascular disease and 56% of ischemic heart disease. Overall, these diseases accounts for about 4.4 million deaths (7.9% of the total) and 40.4 million disability adjusted life years (DALYs) (2.8% of the total).[4] Raised total cholesterol, being a risk factor for ischemic heart disease and stroke, is a major cause of the disease burden in both the developed and developing world.[5] Also, after controlling for LDL and HDL cholesterol, increased serum levels of triglycerides have been shown to be an independent risk factor for coronary heart disease.[6]

There is no precise term for hyperlipidemia in the Ayurvedic classics. Yet various scholars have tried use distinct nomenclature for hyperlipidemia, e.g., *Rasagata Sneha Vriddhi*, *Rasa Raktagata Sneha Vriddhi*, *Medovriddhi*, *Medoroga* or *Medodosha*, *Ama Medo Dhatu*, etc. A detailed study of hyperlipidemia reveals its similarity to *Asthayi Medo Dhatu Vriddhi* with regard to the pathophysiology. Also, this excessively increased *Asthayi Medo Dhatu* is *Ama* in nature, due to which it is retained in the body for a longer time, resulting in further complications.

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From the Ayurvedic point of view hyperlipidemia is a result of *Santarpana*. Acharya Charaka has stated that regular administration *of Mustadi Kwath* as a formulation can cure all the *Santarpanjanya Vyadhis* or diseases due to overnutrition.[7] Considering the lack of definite Ayurveda comprehension of hyperlipdemia, as well as the role of hyperlipidemia in the causation life-threatening diseases, we carried out this study to evaluate the efficacy of *Mustadi Ghana Vati* in the management of hyperlipidemia. The classical formulation of *Mustadi Kwatha* was modified and made into a *Ghanavati* form for better efficacy and patient compliance.

Materials and Methods

Patients fulfilling the criteria and attending the OPD and IPD of the Department of Kayachikitsa, Institute for Post Graduate Teaching and Research in Ayurveda Hospital, Jamnagar, were selected for the present study irrespective of age, sex, religion, etc. A detailed proforma was specially designed encompassing all the aspects of the disease to collect the data.

Diagnostic criteria

Patients were diagnosed on the basis of the lipid profile. Lipid profile showing any one or more of the following criteria was considered diagnostic of hyperlipidemia.[8]

- Serum cholesterol 201 mg/dl or more
- Serum Triglycerides 151 mg/dl or more
- Serum LDL 131 mg/dl or more
- Serum VLDL 41 mg/dl or more

Inclusion criteria

Patients fulfilling the following general and diagnostic criteria were selected for the present study.

1. Patient's age more than 20 years and below 60 years
2. Body Mass Index (BMI) <40

Exclusion criteria

1. Patients having history of serious cardiac disorders like myocardial infarction, cardiac failure, etc.
2. Patients having any major illness, insulin-dependent diabetes mellitus, diabetes mellitus that was poorly controlled or newly diagnosed or if the patient was taking some new therapy or recently adjusted therapy
3. Patients having a history of untreated thyroid disorder
4. Hyperlipidemia due to drugs (e.g., glucocorticoids)
5. Pregnant females and lactating mothers
6. Renal insufficiency

Concomitant medication

Known lipid-lowering drugs like statins or fibrates were stopped during the study.

Investigations

- Routine hematological examination was done before treatment to rule out any pathological conditions.
- Biochemical examination - Complete lipid profile, fasting blood glucose, serum creatinine, and blood urea was checked before and after treatment.
- Apolipoprotein B was investigated as a biomarker for hyperlipidemia in selected patients.

Study design

This was a placebo-controlled randomized clinical study. The study was cleared by the institutional ethics committee. Informed consent was taken from all the patients before including them in the trial.

Drugs and posology

The selected patients were randomly allocated into two groups as follows:

	Group A	Group B
Drug	*Mustadi Ghanavati*	Placebo (roasted rava)
Dose	500 mg 2 TID (3 g/day)	500 mg 2 TID (3 g/day)
Duration	30 days	30 days
Anupana	Lukewarm water	Lukewarm water
Kala	Before meals	Before meals

Contents of *Mustadi Ghanavati*

Name	Latin name	Part
Musta	*Cyperus rotundus* Linn.	1 part
Aragvadha	*Cassia fistula* Linn.	1 part
Patha	*Cissampelos pareira* Linn.	1 part
Amalaki	*Emblica officinalis* Gaertn.	1 part
Haritaki	*Terminalia chebula* Retz.	1 part
Bibhitak	*Terminalia belerica* Roxb.	1 part
Devdaru	*Cedrus deodara* (Roxb) Loud.	1 part
Gokshur	*Tribulus terristris* Linn.	1 part
Khadir	*Acacia catechu* Willd.	1 part
Nimba	*Azadirachta indica* A. Juss.	1 part
Haridra	*Curcuma longa* Linn.	1 part
Daruharidra	*Berberis aristata* D. C.	1 part
Tvak	*Cinnamomum verum* Presl.	1 part
Kutaj	*Holarrhena antidysenterica* Wall.	1 part

Pathya apathya (dietary advice)

All the registered patients were advised to follow specific dietary changes and exercise patterns.

Assessment of therapy

Criteria for assessment

The patients were examined weekly and a suitable scoring pattern was designed comprising of objective signs to assess any changes in the patients. After completion of 1 month of treatment, the efficacy of the therapy was assessed on the basis of the following subjective as well as objective criteria:

Subjective criteria: Symptomatic evaluation of all the patients was undertaken for which a multidimensional scoring pattern was adopted. The patients were assessed twice, before and after the therapy, to assess the severity of the symptoms. The severity was scored according to the criteria shown below and the percentage relief was calculated to assess the efficacy of the therapy.

- Absence of symptoms 0
- Mild degree of symptoms 1
- Moderated degree of symptoms 2
- Severe degree of symptoms 3

A detailed scoring pattern was prepared and used for the main signs and symptoms, such as *Chala Sphika Udara Stana*,

Alasya/Utsahahani, *Kshudra Swasa* (*Ayasena Swasa*), *Daurbalya* (*Alpa Vyayama*), *Nidraadhikya*, *Swedadhikya*, *Daurgandhya*, *Snigdhangata*, *Ati Pipasa*, *Ati Kshudha* (*Ati Kshudha* was decided on the basis of *Ruchi*, *Abhyavaharana Shakti*, and *Jarana Shakti*), *Anga Gaurava* (heaviness of body), *Sandhishoola*, and *Gatra Sada*.

The assessment was done before starting the treatment and after 30 days of treatment (i.e., the completion of the treatment) and the improvement was assessed on the basis of the percentage relief obtained and statistical evaluations.

Objective criteria: The following objective criteria were assessed:

1. Biochemical test: Complete lipid profile, including serum cholesterol, serum triglycerides, serum HDL, serum LDL, and serum VLDL was done before and after treatment. Since the plasma levels of apolipoprotein B are known to reflect the total numbers of atherogenic particles,[9] it was used as a biomarker for hyperlipidemia and was assessed in selected patients before and after treatment.
2. Body fat percentage: Body fat percentage was measured in selected patients using the Omron Body Fat Monitor (Model HBF- 306, Omron Healthcare Co. Ltd., Japan). Body fat percentage refers to the percentage of the body fat mass (weight of the fat) in relation to the total body weight.[10] The weight of the body that is exclusive of fat is referred to as the fat-free body mass.
   Body fat percentage = {Body fat mass (kg) / Body weight (kg)} × 100
   Body fat mass = Body weight (kg) – Fat free mass (kg)
3. Body circumference measurements: Measurement of the girth of the following areas, where adipose tissue is generally found to be more, was taken:
   a. Chest: In normal expansion, at the level of the nipples
   b. Waist: At the level of the umbilicus
   c. Pelvis: At the level of the anterior superior iliac spine
   d. Hip: At the level of the highest point of distension of the buttocks
   e. Mid-arm: Middle of the arm between the shoulder joint and the elbow joint
   f. Mid-thigh: Middle of the thigh between the hip joint and the knee joint
   g. Mid-calf: Middle of the calf between the knee joint and the ankle joint

   In case of girth measurements, the mean values were taken before and after treatment.
4. Skin-fold thickness: The effectiveness of therapy on body fat was assessed by measuring the skin-fold thickness using Vernier calipers before and after treatment; measurement was taken in the following areas:
   a. Skin-fold thickness over the middle portion of the biceps muscle
   b. Skin-fold thickness over the middle portion of the triceps muscle
   c. Skin-fold thickness over the abdomen
5. Body mass index (BMI): The body mass index (BMI) or Quetelet index, a measurement that compares a person's weight and height, was also assessed.

Statistical analysis

The data was mainly analyzed using Student's paired *t* test. The obtained results were interpreted as:

Insignificant	$P<.05$
Significant	$P<.01$
Highly significant	$P<.001$

The overall effect of the therapy was judged based on assessment of the lipid profile, for which a specialized scoring pattern was devised. Lipid profile was given a total score of 100, with each of the parameters of the lipid profile, i.e., serum cholesterol, serum triglycerides, serum HDL, serum LDL, and serum VLDL, given a score of 20. The range for the lipid profile was decided as per the American Journal of Lifestyle Medicine[8] and accordingly the scoring pattern was set.

Serum cholesterol	Score
>240 mg/dl	0
200–239 mg/dl	10
<200 mg/dl	20
Serum triglyceride	Score
<150 mg/dl	0
150–199 mg/dl	5
200–499 mg/dl	10
>500 mg/dl	20
Serum HDL	Score
<40 mg/dl	0
40–60 mg/dl	10
>60 mg/dl	20
Serum LDL	Score
>190 mg/dl	0
160–189 mg/dl	5
130–159 mg/dl	10
< 130 mg/dl	20
Serum VLDL	Score
>120 mg/dl	0
80–120 mg/dl	5
40–80 mg/dl	10
< 40 mg/dl	20

The scores taken after treatment were subtracted from the scores taken before treatment. The result if found negative was considered to be deterioration of condition. Thus, the total effect of the therapies was graded as following:

Complete remission	75%–100% relief
Marked improvement	50%–75% relief
Moderate improvement	25%–50% relief
Mild improvement	0–25% relief
Unchanged	0
Worsened	<0

Observations

The study was conducted on 61 patients. Among the patients, 47.54% were in the age-group of 40–50 years; 59.02% were females, 83.60% were married, and 86.89% were Hindu by religion.

The *Dashvidha Pariksha* revealed that 32.79% of the patients had *Kaphapradhana Pittanubandhi Sharir Prakriti*, 49.18% had *Tamasic Manas* Prakriti, 65.57% were *Madhyama Sara*, 52.46% were *Madhyama Satva*, and 65.57% were *Madhyama Samhanana*. The majority of the patients had *Pravara Pramana*, characterized by body weight between 71–80 kg (36.06%), BMI greater than 25 kg/m^2 (81.96%), waist circumference greater than 102 cm in male patients (32%) and greater than 88 cm in female patients (66.67%), waist-to-hip ratio greater than 0.9 in male patients (96%) and waist-to-hip ratio greater than 0.85 in female patients (55.56%). Among the male patients 86.67% had body fat percentage greater than 25%, and among the female patients 95.45% had body fat percentage greater than 32%. Most of the patients had *Pravara Abhyavahrana Shakti* (50.82%), *Pravara Jarana Shakti* (47.54%), *Tikshnagni* (49.18%), and *Madhyama Koshta* (67.21%). In *Nidanas*, *Ahara* was found to be dominant in *Madhura Rasa*(57.38%), *Guru Guna*(73.77%) and *Snigdha Guna* (63.93%). *Adhyashana* (73.77%) and *Vishamashana* (33.70%) were found to be the dominant dietary habits. Consumption of fried foods (70.49%) and bakery products (42.62%) was also found to be common. In *Vihara*, *Divaswapa* (75.41%) and *Avyayama* (70.49%) was found to most commonly, whereas in *Manas Nidana Atichinta* (45.90%) was dominant. Most of the patients (62.30%) had insidious onset of disease; 57.37% had had disease for less than 1 year, and 63.30% had negative family history of hyperlipidaemia. Most of the females (58.33%) had attained menopause. The majority of the patients showed symptoms of *Bharavriddhi* (68.85%), *Angagaurava* (63.93%), and *Daurbalya* (50.82%), and there was associated obesity in 81.96%. *Dushti* of *Kapha Dosha* was present in 88.52%, *Medo Dhatu* in 90.16%, *Rasa Dhatu* in 47.54%, and *Sweda* in 73.77%.

Effect of therapy

Effect on symptoms: In the *Mustadi Ghanavati* group, there was relief of symptoms like *Anga Gaurava* (100%), *GatRasada* (95.31%), *Atipipasa* (90.58%), *Kshudra Shvasa* (89.36%), *Alasya* (85%), *Sandhishoola* (84.29%), Nidradhikya (83.61%), *Daurbalya* (70.97%), Snigdhangata (55.56%), *Daurgandhya* (55.17%), *Swedadhikya* (41.45%), *Angachalatva* (22.45%), and *Atikshudha* (18.18%). The relief in *Alasya*, *Kshudra Shwasa*, *Daurbalyata*, and *Atipipasa* was statistically significant ($P \leq .05$). On *Sandhishoola*, *GatRasada*, *Angagaurava*, and *Nidradhikya* the relief was statistically highly significant ($P \leq .01$). Statistically significant results were also obtained in relief of *Snigdhangata* ($P \leq .02$) and *Jarana* ($P \leq .05$) .

In the placebo control group, relief was found in *Atikshudha* (105.06%), *Ksudra Shvasa* (73.33%), *Anga Gaurava* (65.38%), *GatRasada* (62.5%), *Alasya* (58.33%), Snigdhangata (35.48%), and *Daurbalya* (34.48%); relief was also seen in *Nidradhikya* (33.33%), *Atipipasa* (33.33%), *Sandhishoola* (29.95%), *Swedadhikya* (29.03%), *Daurgandhya* (20%), and *Angachalatva* (2.56%).

Effect on body parameters

Mustadi Ghanavati reduced body weight in 2.57% of the subjects, BMI in 2.65%, and body fat percentage in 7.75%. All the results were statistically highly significant ($P<.001$). In the placebo control group reduction in body weight was seen in 1.52% and reduction of BMI in 1.52%; these changes were found to be statistically significant ($P<.05$). There was an increase in the body fat percentage in 0.27%, but this was not statistically significant ($P>.5$)[Figure 1]

Effect on body circumferences

Mustadi Ghanavati reduced the mid-arm circumference in 5.35% of the patients, chest circumference in 2.49%, abdomen circumference in 5.23%, hip circumference in 4.04%, and pelvis circumference in 3.64%. The results were found to be statistically highly significant ($P<.001$). It was also seen to reduce the mid-thigh (3.66%) and mid-calf circumferences (1.24%); this was found to be statistically significant ($P<.05\%$). In the placebo control group there was reduction in the circumferences of mid-arm (3.98%), chest (2.52%), and pelvis (2.20%). The results were found to be statistically highly significant ($P<.001$). There was also reduction of the circumferences of the abdomen (3.67%), hip (2.69%), mid-thigh (3.76%), and mid-calf (1.44 %), which were all found to be statistically significant ($P<.05$)[Figure 2].

Effect on skin-fold thickness

Mustadi Ghanavati reduced biceps skin-fold thickness in 18.11%, triceps skin-fold thickness in 18.8%, and abdominal skin-fold thickness in 18.52% of patients. These results were found to be statistically highly significant ($P<.001$). In the placebo control group there was reduction of biceps skin-fold thickness in 9.37%, triceps skin-fold thickness in 9.33%, and abdominal skin-fold thickness in 7.68%; These changes were statistically significant ($P<.05$)[Figure 3].

Effect on lipid profile

On statistical evaluation by paired 't' test, *Mustadi Ghanavati* Group was seen to decrease S.Cholesterol (3.28%), S. Triglycerides (11.1%), S.HDL (2.06%), S.LDL (1.98%), S.VLDL (11.50%) and increase S. Apolipoprotein B (1.14%). However the effect was found to be statistically insignificant. Placebo Control Group was seen to decrease S.Cholesterol (7.82 %), S.Triglycerides (3.93 %), S. VLDL (3.93 %), S.HDL (6.45 %), S.LDL (9.78 %) and S. Apolipoprotein B (13.35%). However the results were found to be statistically insignificant. In the placebo control group, serum cholesterol decreased in 7.82% of subjects, serum triglycerides in 3.93%, serum VLDL in 3.93%, serum HDL in 6.45%, serum LDL in 9.78%, and serum apolipoprotein B in 13.35%. However, the results were found to be statistically insignificant [Figure 4].

On the basis of evaluation by scoring pattern *Mustadi Ghanavati* Group was seen to decrease S. cholesterol (22.4 %), S. Triglycerides (19.6%), S. LDL (18.2 %) and S. VLDL (4.2%) whereas an increase was seen in S.HDL (5.6%). *Mustadi Ghanavati* exhibited a total improvement of 58.8%. Placebo Control Group was seen to decrease S. Cholesterol (19.8%), S. triglycerides (3.3%) and S.VLDL (3.3%).It was also seen to raise the levels of S.LDL (16.5%) and S.HDL (4.4%). Placebo control group was seen to exhibit a total improvement of 5.5% [Figure5].

Overall effect of therapy

In group A (*Mustadi Ghanavati*), 28 patients completed the full course of treatment; 12 patients (42.86%) showed

mild improvement, 4 patients (14.28%) showed moderate improvement, 7 (25%) patients were unchanged, and the condition of 5 patients (17.86%) worsened. In group B (placebo group), 22 patients completed the entire course of therapy, out of which 10 patients (45.45%) showed mild improvement, 1 patient (4.54%) showed moderate improvement, 5 (22.72%) patients remained unchanged, and the condition of 6 (27.27%) patients worsened [Figure 6].

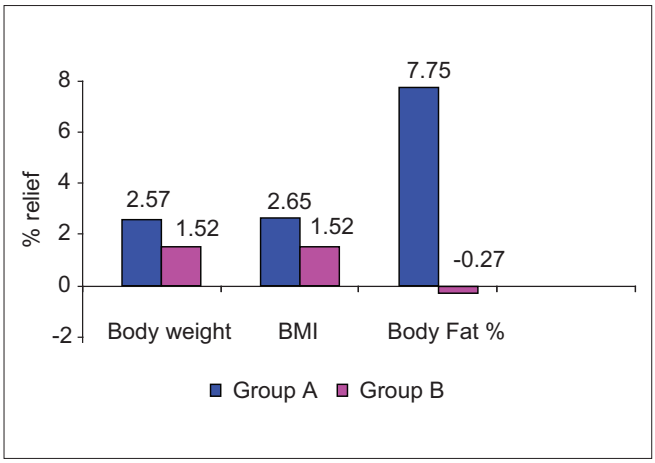

Figure 1: Effect on body parameters

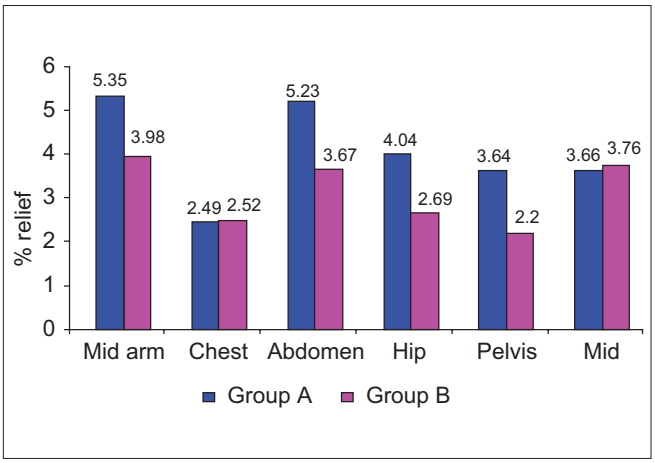

Figure 2: Effect on body circumferences

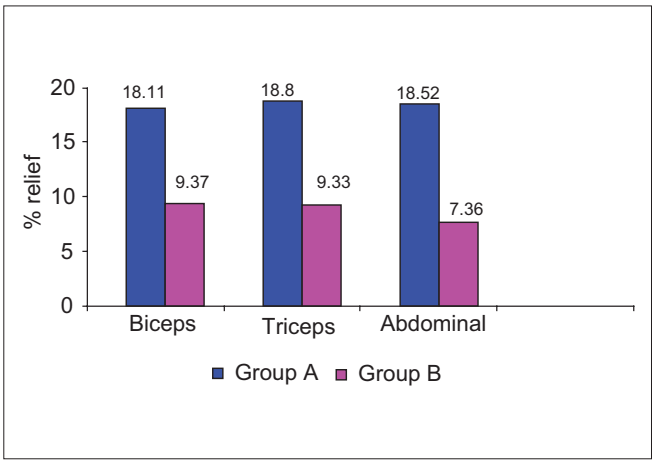

Figure 3: Effect on skin fold thickness

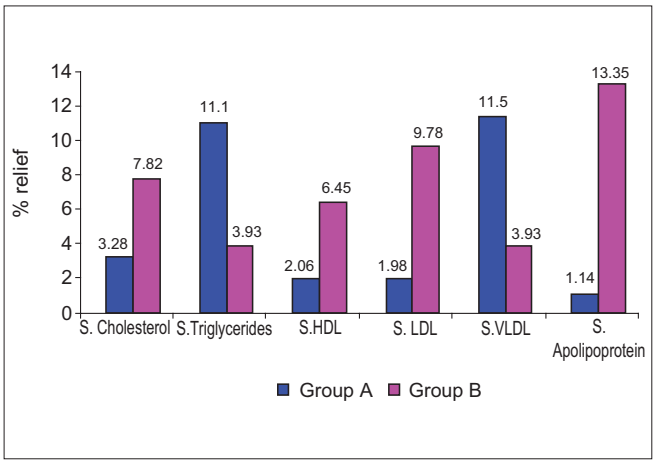

Figure 4: Effect on lipid profile (paired 't' test)

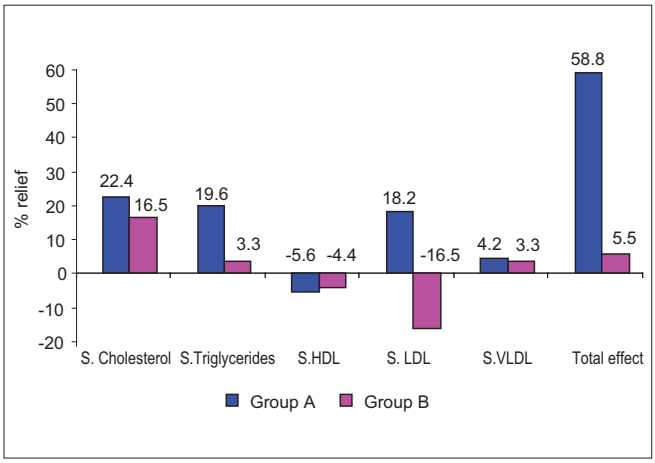

Figure 5: Effect on lipid profile (scoring pattern)

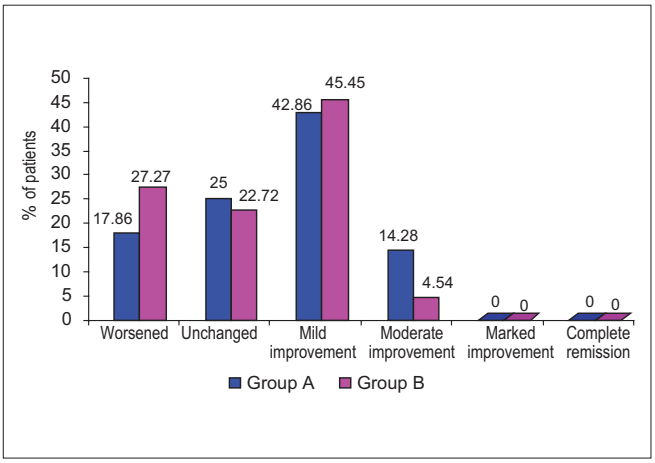

Figure 6: Overall effect of therapy

Adverse events

During the study only one adverse event was noted. In the *Mustadi Ghanavati* group, a 55-year-old female patient complained of loose motions with severe abdominal cramps. This was confirmed with a positive challenge test to be the result of drug administration. On further evaluation of the cause it was noted that the patient had a *Pitta Pradhana Prakriti* along with *Mridu Koshta*, displaying a history of loose motions after intake of milk and milk products or raisins. The formulation *Mustadi Ghanavati* contains *Aragvadha* and *Triphala*, which are known *Virechana* drugs and might have served as a stimulus for *Mridu Koshtha*, initiating the loose motions with and abdominal cramps.

Discussion

Thus, *Mustadi Ghanavati* is a true drug possessing pharmacological activity. All the patients in both the groups followed strict dietary restrictions as well as lifestyle changes. Therefore, the difference between the two groups can be attributed to the pharmacological efficacy of the drug (along with some benefit from the dietary and lifestyle changes). The above findings are consistent with the *Ama Pachana*, *Lekhana*, and *Upashoshana* properties of the drug, which result in the reduction of *Anga Gaurava*, *GatRasada*, *Alasya*, *Nidradhikya*, *Snigdhangata*, *Angachalatva*, and *Swedadhikya*. Reduction in *Anga Gaurava*, *Anga Chalatva*, *Kshudra Shvasa*, and *Sandhishoola* can also be attributed to the loss of body weight caused by the administration of *Mustadi Ghanavati*. *Atipipasa* may be reduced because of the *Trishnanigrahana* property of *Musta*. *Atikshudha* was seen to decrease to a greater extent in the placebo group. Placebo provides psychological relief in patients hence some symptoms of the disease are seen to decrease as a result of it.

Mustadi Ghanavati was not seen to be successful in reversing the dyslipidaemic changes in the patients, which may be due to relatively short duration of the therapy, change in the method of preparation of the classical formulation, failure of patients to follow dietary and lifestyle changes, chronicity of the disease, stress, etc.

Serum cholesterol was found to rise in some patients on starting drug therapy and dietary restrictions. This may be because of excessive endogenous production of cholesterol in the body in response to the decreased dietary supply. Serum triglycerides showed a better response to *Mustadi Ghanavati* than serum cholesterol; the response however was not significant, which may be due to the fact that The stored triglyceride in our body is changed every 2-3 weeks due to its constant synthesis and utilization, whereas it takes a longer duration to work on cholesterol.

Mustadi Ghanavati showed better results on other objective parameters related to obesity (i.e., body weight, BMI, body fat percentage, body circumferences, and skin-fold thickness), which shows its depletory action on *Sthayi Medo Dhatu*.

In this study we also observed that the patients who shed their excess weight during the course of study showed better improvement in their lipid profiles as compared to the patients whose weight remained constant. Thus, a relationship can be established between obesity and hyperlipidemia, which is in accordance with the *Poshya Poshaka Meda Dhatu* relationship described in Ayurveda.

Thus, *Mustadi Ghanavti* was seen to reduce the levels of 'bad' cholesterol (serum LDL) and increase the levels of 'good' cholesterol (serum HDL), thereby correcting dyslipidemia. HDL is known to have protective action against atherosclerosis and to reduce the risk for cardiovascular disease.

Probable mode of action of *Mustadi Ghanavati*

The total effect of the *Mustadi Ghanavati* is *Tridosha Shamaka*, especially *Kapha Vata Shamaka*. It is *Tikta*, *Kashaya*, and *Katu* in *Rasa*; *Laghu* and *Ruksha* in *Guna*; and *Katu* in *Vipaka*; and thus pacifies the vitiated *Kapha Dosha*, which is dominant in the pathogenesis of hyperlipidemia. It also depletes the excessively produced *Rasa*, *Mamsa*, *Meda*, *Vasa*, *Sweda*, and *Kleda*, which are all similar in attributes to *Kapha Dosha*. It should be noted here that one of the ways of synthesis of *Kapha Dosha* in the body is as a *Mala* of *Rasa Dhatu*. Similarly, *Sweda* is the *Mala* of *Meda Dhatu*. Thus, it is known to act against the *Santarpanottha* pathogenesis of hyperlipidemia. *Aragvadha* and *Triphala* have mild purgative action, which causes *Anulomana* of *Vayu* which further corrects the body *Vayu*, bringing an end to the *Vatapradhana Samprapti*. Drugs like *Patha* and *Gokshur* are *Mutravirechana*, which bring about diuresis and thus relieves the body of the excess of *Kleda*. *Aragvadha*, *Kutaj*, *Patha*, *Nimba*, *Khadir*, *Haridra*, and *Daruharidra* are known to act on *Medo Dhatu* and allied *Dhatus* and are indicated in diseases like *Kushtha*, *Medo Roga*, and *Prameha*. Hyperlipidaemia has the vitiation of *Kapha Dosha* and *Rasa*, *Mamsa*, *Meda*, *Vasa*, *Sweda* which as *Dushyas*. Involvement of the same *Doshas* and *Dushyas* is seen in the pathology of the diseases like *Medoroga*, *Prameha* and *Kushtha*. Hence *Mustadi Ghanavati* which is indicated in *Santarpanajanya* diseases like *Medoroga*, *Prameha* and *Kushtha* can be used in the treatment of Hyperlipidaemia. These drugs relieve the body of excess of *Kapha*, *Meda*, *Kleda*, *Vasa*, and *Sweda* by diminishing their *Drava Guna*. Drugs like *Neem*, *Patha*, and *Triphala* bring about augmentation of the digestive fire, leading to proper formation of the *Rasadi Dhatus*. *Patha*, *Musta*, *Triphala*, *Haridra*, and *Daruharidra* digest the *Ama Dosha* present at the *Jatharagni* level as well as the *Medodhatvagni* level. Also drugs like *Triphala* and *Khadir* are *Rasayana* in nature, leading to the formation of optimal *Dhatus*, and thereby protect the body from injury due to vitiated *Doshas*.

Conclusion

Hyperlipidemia can be treated on the principles of *Apatarpana* and by following the line of treatment of *Sthaulya* or *Prameha* since all the three arise due to *Medo Dushti*. *Mustadi Ghanavati* showed a better result on all the subjective and objective parameters than placebo. Dietary and lifestyle changes are supportive to therapy in hyperlipidaemia and obesity.

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हिन्दी सारांश

हायपरलिपिडिमीया में मुस्तादि घनवटी का चिकित्सात्मक अध्ययन

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हायपरलिपिडिमीया व्याधि का आयुर्वेदिय दृष्टिकोण से चिकित्सात्मक अध्ययन किया गया। चिकित्सार्थ रुग्णों को दो समूहों में बांटा गया। मुस्तादि घनवटी एवं प्लासिबो का ३० दिनों के लिये ३ ग्राम की मात्रा में दिन में तीन बार प्रयोग किया गया। मुस्तादि घनवटी समूह में १४. ८६ % रुग्णों में मध्यम लाभ तथा ४२. ८६ % रुग्णों में अल्प लाभ प्राप्त हुआ।