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ORIGINAL RESEARCH ARTICLE (CLINICAL)

Clinical Evaluation of *Trikatu* and *Kumari* as Hypolipidemic Drug

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ABSTRACT

Urbanization is characterized by a marked increase in the intake of energy-dense foods, a decrease in physical activity, and a heightened level of psychosocial stress, all of which promote the development of dysglycemia, hypertension, and dyslipidemia. Nowadays, dyslipidemia is a very much common disorder and It is the main disposing factor for the atherosclerosis, and the atherosclerosis is the main pathogenesis factor for Coronary heart disease (CHD) and Cardiovascular disease (CVD). CHD is the most prevalent cause of death and disability in both developed as well as developing countries. *Ayurvedic* classics have mentioned many efficacious herbs which work on digestion and metabolism. This clinical trial was done to evaluate the effect of *Trikatu* (*Piper longum, Piper nigrum* and *Zingiber officinale*) powder and *Kumari* (*Aloe vera*) pulp in the patients of dyslipidemia.102 patients of dyslipidemia were selected and randomly divided into three groups - A, B and C of 34 patients each. The patients of group A, i.e. placebo group were administered two capsules of 500mg filled with wheat flour orally twice a day with luke warm water. The patients of group B were treated with *Trikatu* powder 2 gm. BD with luke warm water and the patients of group C treated with *Trikatu* powder 2 gm with 20gm Aloe vera pulp. The duration of the trial was 3 months, with monthly follow up. Analysis of overall effect of trial drugs on subjective & objective parameters of all the three groups revealed that the results of Group C were highly significant (p<.001).

Key words: Aloe vera, Dyslipidemia, Lipid profile, *Medoroga*, Obesity, *Trikatu*

INTRODUCTION

Ayurveda, the Indian system of medicine can be aptly defined as the science of life or science of healthy living. The origin of *Ayurveda* can be traced beyond the *Vedic* period, i.e. about 5000 BC. [1] The whole philosophy of *Ayurveda* is based on achieving, maintaining and promoting positive health. The equilibrium of various structural and functional units of the body named as *dosha* (the medical humors as per *Ayurveda*), *dhatu* (tissues), *mala* (metabolic wastes), and more importantly the mind results in the state of health, whereas their disequilibrium causes disease. Correction of disturbance of milieu interior is the aim of the *Ayurvedic* management. [2]

Dyslipidemia is a very common metabolic disorder in these days due to the irregular diet habits, quality of food, lack of physical exercise added with stressful life style and other factors that lead to higher or fluctuating levels of the free fatty acids. All these are collectively responsible for altering the metabolic activities of the body, and these factors lead to change in lipid profiles particularly and more importantly, change in ratio of HDL (High Density Lipoprotein) and LDL (Low Density Lipoprotein). Lipid disorders may be associated with various disorders of different etiology like obesity, diabetes mellitus, myxoedema, hypopituatrism, nephrosis, etc. and this augments the major complications of lipid disorders as atherosclerosis, cardiovascular diseases (CVD) and coronary heart disease, which are in fact the major causes for mortality and morbidity not only in western countries but in India too. According to WHO (2002), in 2001 there were 7.3 million deaths and 58 million disability adjusted life years (DALYs) lost due to CHD worldwide. As it has long been known that lipid abnormalities are the major risk factors for premature coronary artery disease (CAD), South Asians around the globe have the highest rates of CAD. According to National Commission on Macroeconomics and Health (NCMH), a Government of India undertaking, there would be around 62 million patients with CAD by 2015 in India and of these, 23 million would be younger than 40 years of age.[3]

Dyslipidemia is elevation of plasma cholesterol, triglycerides (TGs), or both, or a low HDL level that contributes to the development of atherosclerosis. Because fats are practically

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insoluble in plasma water, they must circulate in the blood stream bound to soluble proteins known as lipoproteins. Plasma lipoproteins occur in four major forms which are:-

1. HDL that are also called alpha lipoproteins.
2. LDL that are also called beta lipoproteins.
3. VLDL that are also called alpha 2 or pre- beta lipoproteins.
4. Chylomicrons.

Usually we observe that obesity is the most common cause of dyslipidemia. A linear relationship has been established between obesity and dyslipidemia. The *Ayurvedic* texts have mentioned dyslipidemia as *Medoroga* or disorder arising due to vitiation of *meda dhatu* (lipids and fat) and the related complications. [4] *Ayurveda*, expounds its concept to the disproportionate increase of one particular *Dhatu* i.e. *Medas* which creates obstruction in the *Srotasa* (body pathways) and results in an impairment of *Agnivyapara* (metabolism) which is concerned with intermediary metabolism. Moreover, *Sushruta* has emphasized on metabolic disturbances in the etiopathogenesis of *Sthaulya* (obesity). He has clearly indicated that under certain conditions, the predominantly *madhura* (sweet) substances absorbed from the intestine circulate in un-metabolised form known as *Ama rasa* which is converted into *Meda*. The latter therefore, accumulates in the body and contributes to *Medoroga*, [5] i.e. dyslipidemia.

Of the various complications and sequelae of *MedoRoga*, dyslipidemia has been gaining much medical attention, and emphasis is being laid on procurement of a safe and effective drug. Modern medicine has come up with several drugs like Lovastin, Colestipol, Neomycine, Clofibrate, Cholestyramine etc. which act either by blocking the formation of different lipids or cholesterol at various stages in the biosynthetic pathway, or by increasing the fecal excretion of cholesterol or bile acids. But it is unfortunate that none of them are free from toxicity and may cause only a stationary reduction in the lipids level, [6] that is why it becomes much more pertinent in above context to search out some food supplements that can be used as a medicine as well as routine food. Aim and object of the present study is to search for such a potent and safe hypolipidemic drug.

Sushruta states that *Virukshana* (dry), *Medoghana* (reduces lipids and fat) and *Chedaniya* or *Sroto-visodhaniya* (drugs which forcefully detach unwanted metabolic waste and thus helps open the channels) substances can be used in the treatment of *Medoroga*, [7] as they act against deposition of lipids in body and help to clean off the blocked *Srotasas*.

Medoroga is one of the major diseases caused by excessive fatty diet and its metabolism which leads to production of cholesterol and triglycerides as an intermediary product. Thus these all are related to lipid metabolism. *Yakrita* (liver) is the major organ and acts as a chemical factory of the body. Liver synthesizes cholesterol and esters from lipids. Fatty acids are re-synthesized in the liver and released to circulation for being deposited in the adipose tissues. Thus, liver plays an important role in the metabolism of fat and lipids.

Drug review

Ayurvedic classics have mentioned many efficacious herbs which act on liver, digestive system and metabolism. Two such drugs, *Trikatu* (mixture of equal amount each of *Piper nigrum*, *Piper longum* and *Zingiber officinale*) and *Ghritakumari* (*Aloe vera*) have been taken for the present study on the grounds explained below.

The first drug in this study, *Trikatu* literally means three specific *Katu dravyas* (pungent substances), i.e. ginger, black pepper and long pepper, and coincidentally, these are used frequently as spices in Indian foods. *Trikatu*, has been described by *Sushruta* as *Kaphamedoghana* (alleviate *Kapha dosha*, viz. lipids & fats) and *Deepana* (appetizer), [8] which means that it removes the *Kapha dosha* and *Meda* and improves the *Agni* (metabolism). *Vagbhatta* has also recommends *Trikatu* in the treatment of conditions involving both *Meda* and *Kapha*.[9] *Sharangadhara* has also described the pharmacological actions of *Trikatu churna* (powdered form) and labelled it as *Sleshma-Medoghna*, i.e. it alleviates *Kapha dosha* and *Medo dosha* (lipids disorders).[10]

The second drug, *Ghritakumari* (*Aloe vera*), is a *Yakrituttejaka* drug i.e. it stimulates liver functions. *Ayurvedic* physicians usually use it in the treatment of liver disorders, digestive system and skin diseases. *Bhavaprakasha* has given the detailed descriptions of pharmacological actions and therapeutic indications of *Trikatu* and *Ghritakumari*, both. He recommends the drug *Trikatu* in treatment of *Medoroga*, *Prameha (*diabetes*)*, *Gulma* (abdominal tumor), *Twaka roga* (skin disease), etc. [11] According to him, *Ghritakumari* is *Bhedana* (helps breakdown the fecal matter) and *Rasayana* (rejuvenator), and indicated it for treatment of *Yakrita-Pliha roga* (liver & spleen disorders). [12]

Aims and Objectives of this study

1. To compare the clinical efficacy of *Trikatu* in the management of Hyperlipidemia, i.e. *Medoroga*.
2. To observe the synergic effect of *Trikatu* with *Kumari* pulp in the management of Hyperlipidemia, i.e. *Medoroga*.

MATERIALS AND METHODS

Study participants

A total of 102 patients of hyperlipidemia were registered from the OPD and IPD and randomly allocated into three groups. In the present work, 102 patients who fulfilled the diagnostic criteria of *Medoroga* (dyslipidemia) were selected. Out of which 20 patients had left the treatment at different stages. The remaining 82 patients, 25 patients in group A (Control), 27 patients in group B (*Trikatu* powder treated), 30 patients in group C (*Trikatu* powder with Aloe pulp treated group) completed the trial, whose data is being presented in this study. Informed consent of the participants was obtained and the study was approved by the local Institutional Ethics Committee.

Inclusion criteria

1. Patients aged >16 and <65 years.
2. Patient with clinical signs &symptoms of *Medoroga* as mentioned in the *Ayurvedic* and modern literatures.

Exclusion criteria

1. Patients aged< 16 years and > 65 years.
2. Dyslipidemia along with hypothyroidism, hormonal imbalance, cardiovascular diseases, hemiplegia, diabetes and severe hypertension.
3. Females with history of pregnancy and lactation.

Grouping and design

All the registered cases were divided randomly into four groups as follows-

Group A (n=34): is the control group. The patients of this group were given two placebo capsules BD with lukewarm water. Each capsule was filled with 500 mg wheat flour.

Group B (n=34): Patients of this group were administered *Trikatu churna* 2 gm BD with lukewarm water.

Group C (n=34): Patients of this group were administered *Trikatu churna* 2 gm and 20 gm *Kumari* pulp, BD with lukewarm water.

Diagnostic criteria for obesity

The diagnosis was based mainly upon the signs and symptoms mentioned in textbooks of *Ayurvedic* as well as modern medicine, such as –

- *Ayurvedic* parameters: *Kshudra swasa* (*Dyspnoea*), *Daurgandhya* (foul smell), *Anga gaurava* (heaviness in body), *Ati kshudha* (excessive hunger), *Gatra sada* (weakness), *Sandhi shoola* (pain in joints), *Ati pipasa* (excessive thrust), *Snigdhaangata* (unctuousness in body), *Swedadhikya* (excessive sweating).
- Modern parameters: Lipid profile, weight, BMI (Body mass index), and circumference of waist and hip.

Preparation of trial drugs

Trikatu powder and *Kumari* (*Aloe vera*) pulp both trial drugs were prepared in the Hans Pharmacy of Premnagar Ashram, Haridwar, Uttarakhand, as per the standard method of preparation described in "*Sharangadhara Samhita*".

Duration of the trial

3 months, with monthly follow-ups

Assessment criteria

The effect of therapy was assessed on the basis of improvement in following subjective and objective criteria.

Subjective criteria

A multi-dimensional scoring pattern was adopted for the signs and symptoms of *Medoroga* mentioned in *Ayurvedic* texts. The score for symptoms were assessed before and after the treatment and statistical analysis was undertaken. This assessment was done before starting the treatment and thereafter every month, till completion of the three months duration of therapy.

Objective criteria

1. Lipid profile was recorded before and after treatment.
2. Weight and BMI was recorded before and after treatment.
3. Circumference of hip and waist (in centimeters) were recorded before and after the treatment.

Assessment of overall effect of therapy

For an overall assessment of the therapy, following categories were taken into consideration:

1. Marked improvement: More than 60% improvement noted in signs and symptoms.

2. Moderate improvement: 40-60% improvement was noted in the signs and symptoms.

3. Mild Improvement: 20-40% improvement was noted in the signs and symptoms.

4. Unchanged: No effect in signs, symptoms and weight.

Data analysis

For statistical analysis of observations and results, paired 'T'-test and independent 'T'-test were used.

OBSERVATIONS AND RESULTS

- In the present series of 102 patients of dyslipidemia, maximum number of patients (64%) were in the age group of 30-50 years, males i.e. 67% & females i.e. 33%. 67% were belonged to service class. The most of the patient 44% were of the upper middle socioeconomic status.
- 75.53% patients of this series had mixed dietary habits, 75% were taking excess intake of *Madhura*, *Guru* (heavy), *Snigdha* (unctuous), *Sheeta* (cold) and *Shleshmala aahara* (diet which increase *Kapha dosha*); 66% patients were living sedentary life style; and only 28% patients were having sound sleep.
- In present study, maximum patients (78.43%) were taking *Guru dravyas* (heavy substances), followed by *Snigdha* (unctuous) [76.47%] and *Sheeta dravyas* (substances of inherently of cold nature) [72.55%] in their diet.
- 85% of the patients reported different type of addictions like tobacco chewing, smoking & alcohol, and only 15% had no addictions.
- Maximum number of the patients (64.8%) had no family history.
- *Prakriti* (psychosomatic constitutions): In this series, maximum numbers of patients were of *Kapha-Vata prakriti* (50%) followed by *Kapha-Pitta prakriti* (35%) and *Vata-Pittaja Prakriti* (15%) and maximum number were of *Tamasika Prakriti* (50%), *Rajasa* (36%) and *Satva Prakriti* (14%) respectively.
- Maximum number of the patients 39% of *Vishama Agni* (irregular appetite) and 33% patients were of *Tikshana Agni* (excessive appetite), 44% patients were *Krura-koshthi* (constipation) and 40% patients were *Madhyama-kosthi* (regular bowel).
- Maximum numbers of patients (51%) were in the habit of *Vishamasana* (taking food at irregular time); *Adhyasana* (taking food at irregular time) 34 % and *Samasana* (taking food at irregular time) 15% were also reported.

- In this study, all the patients showed the signs and symptoms of *Medoroga*, 68.65% patients were observed with *Daurbalya* (weakness) followed by 73.6% *Angagaurva* (heaviness in body) and 70.59% *Kshudra shwasa* (dyspnoea). Among the other symptoms maximum *Alasya* (lassitude) was observed in 88.23% of patients, movement of *Udara-Stana-Sfika Chalatva* (movement of abdomen and buttocks on motion) in 71.56%, *Snigdhangata* (unctuousness in body) in 75.50% and *Atikshudha* (excessive appetite) in 65.69%.
- The weight of 36.27% patients was noted in the range of 75-84 kg. and 35.29% were belonging in the range of 65-74 kg. As regards BMI, 48.04% patients were in the range of 25 to 29 kg/m², followed by 40.20% patients in the range of 30 to 34 kg/m².
- Coming to abdominal and hip circumference, maximum range of abdominal girth was found in the range of 115-124 cm. in 33.34% patients and maximum hip circumference was in the range of 125-134cm. in 32.35% patients. 38.24% patients were having abdominal circumference in the range of 105-114cm and hip circumference in the range of 115-124 cm.
- Family history of obesity was recorded in 50% patients.

Table 1: Comparative effect of Trial Drug and Placebo on Serum Lipids

Signs & Symptoms	Group A (n =25)		Group B (n =27)		Group C (n =30)	
	Mean±S.D. BT - AT	P Value	Mean±S.D. BT – AT	P Value	Mean±S.D. BT - AT	P Value
Serum Triglyceride (n =82)	-3.20±6.85 t= -2.34	P >0.05	82.11±23.54 t=18.12	p<0.001	92.53±41.86 t=12.11	p<0.001
Serum Cholesterol (n =82)	-12.84±10. t= -6.39	p<0.001	62.48±30.33 t=11.17	p<0.001	85.77±39.22 t=11.98	p<0.001
HDL Cholesterol (n =82)	.84±1.84 t=2.28	P <0.05	4.78±5.73 t=4.34	p<0.001	.40±6.42 t=.34	p>0.05
LDL Cholesterol (n =82)	-4.04±5.21 t= -3.88	P <0.01	41.22±26.45 t=8.10	p<0.001	69.30±38.98 t=9.74	p<0.001
VLDL Cholesterol (n =82)	-0.52±1.57 t=1.65	P >0.05	16.44±4.70 t=18.21	p<0.001	16.88±14.79 t=6.25	p<0.001
ratio of total cholesterol/ HDL (n =82)	-0.31±0.59 t=2.63	p < 0.05	0.92±0.65 t=7.3	p<0.001	1.98±1.17 t=9.29	p<0.001
ratio of LDL/ HDL (n =82)	-0.18±.263 t=3.50	p < 0.01	0.66±0.58 t=5.88	p<0.001	1.59±1.19 t=7.34	p<0.001
Weight (n =82)	-0.235 ±.554 t= -2.48	P <0.05	0.75 ±.99 t=3.97	p<0.01	1.47±.94 t=8.57	p<0.001
BMI (n =82)	-0.053 ±.14 t= -2.23	P >0.05	0.25 ±.37 t=3.53	P<0.01	0.42±0.36 t=6.4	p<0.001
Abdominal girth (n =82)	-0.11 ±.32 t= -2.10	P <0.05	0.22 ± 0.42 t=2.73	p<0.05	0.76 ± 0.77 t=5.43	p<0.001
hip periphery (n =82)	-0.147 ±.436 t= -1.97	p > 0.05	0.39 ±0.56 t=3.61	p<0.01	0.83±0.70 t=6.53	p<0.001

BT = Before Treatment, AT = After Treatment; Group A= Placebo, Group B= *Trikatu*, Group C= *Trikatu*+ *Kumari* pulp; BMI = Body mass index, LDL = Low density lipid, HDL = High density lipid.

Table 2: Comparative effect of placebo and trial drug on the signs and symptoms

Sign & Symptoms	Group A (n =25)		Group B (n =27)		Group C (n =30)	
	Mean±S.D. BT – AT	P value	Mean±S.D. BT – AT	P Value	Mean±S.D. BT - AT	P Value
Chalatva (Movement of abdomen & buttocks on motion) [n =82]	0.11 ± 0.32	P >0.05	0.12 ± 0.33	P>0.05	0.11 ± 0.32	P>0.05
Kshudra Swasa (Dyspnoea) [n =82]	0.12 ± 0.33	P >0.05	0.29 ± 0.67	P<0.05	0.43 ± 0.82	P<0.01
Daurbalya (Weakness) [n =82]	0.16 ± 0.37	P <0.05	0.26 ± 0.59	P<0.05	0.26 ± 0.52	P<0.01
AngaGaurva (Heaviness in body) [n =82]	0.24 ± 0.43	P <0.05	0.24 ± 0.43	P<0.05	0.50 ± 0.97	P<0.01
Alasya (Lassitude) [n =82]	0.24 ± 0.59	P >0.05	0.25 ± 0.52	P<0.05	0.36 ±0.70	P<0.05
Ati-Kshudha (Excessive hunger) [n =82]	0.28 ±0.68	P >0.05	0.16 ± 0.37	P<0.05	0.26±0.64	P<0.05
Atipipasa (Excessive thirst) [n =82]	0.24±0.66	P >0.05	0.22±0.69	P>0.05	0.28 ± 0.61	P<0.05
Nidradhikya (Excessive sleep) [n =82]	0.36 ±0.70	P <0.05	0.22 ± 0.64	P >0.05	0.20 ± 0.58	P>0.05
Swedadhikya (Excessive sweating [n =82]	0.22 ± 0.64	P >0.05	0.41 ± 0.79	P<0.05	0.28 ± 0.61	P<0.05
Daurgandhya (Foul smell) [n =82]	0.28 ± 0.61	P <0.05	0.24 ± 0.59	P>0.05	0.16 ± 0.37	P<0.05
Snigdhangta (Unctuousness in body) [n =82]	0.16 ± 0.37	P<0.05	0.37 ± 0.79	P<0.05	0.23 ± 0.73	P>0.05

Following charts depict the effect on various parameters in the three groups

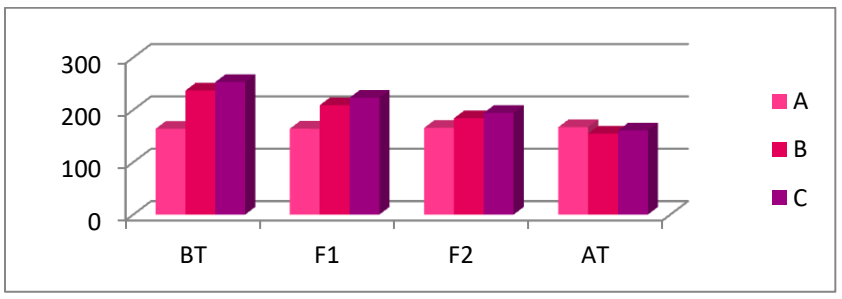

Fig. 1: Effect on Serum Triglyceride in Dyslipidemia

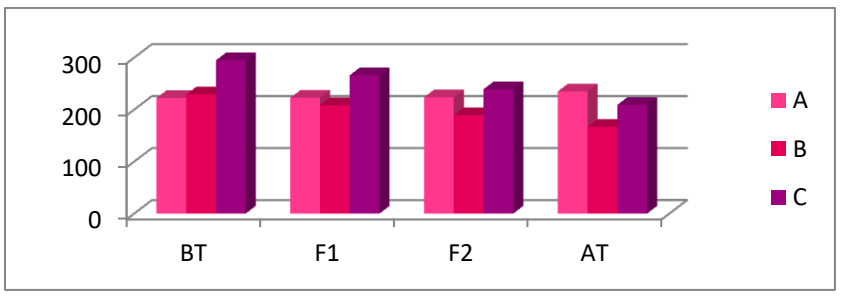

Fig. 2: Effect of on Total Serum Cholesterol

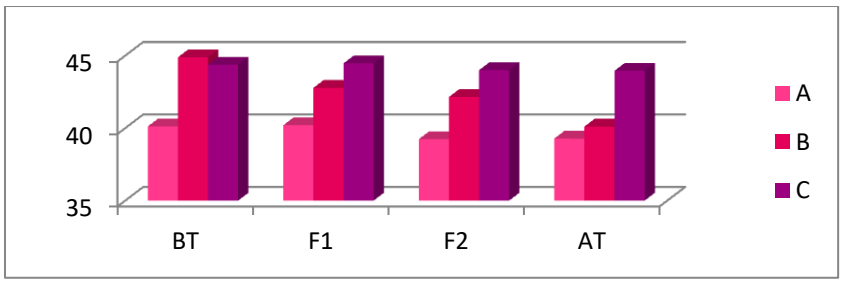

Fig. 3: Effect on HDL Cholesterol in Dyslipidemia

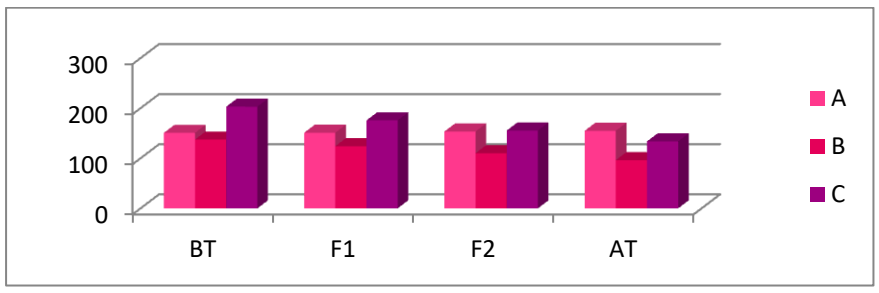

Fig. 4: Effect on LDL Cholesterol

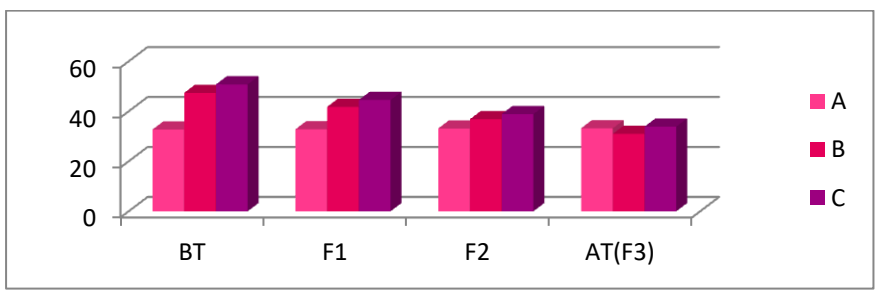

Fig.5: Effect on VLDL Cholesterol

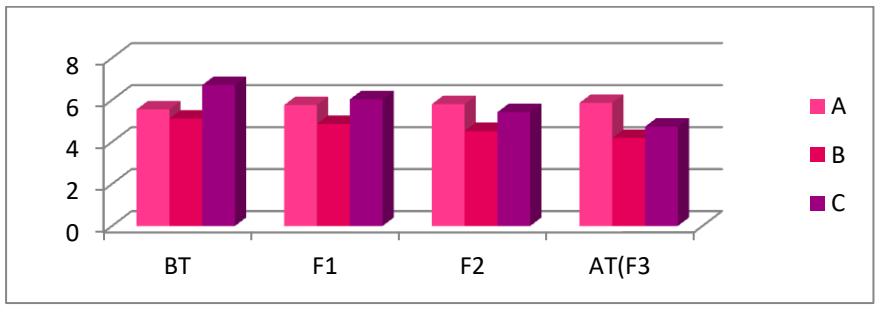

Fig.6: Effect on ratio of Total Cholesterol &HDL

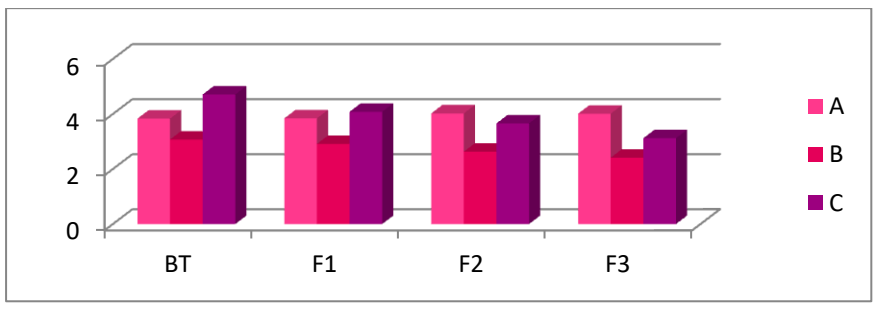

Fig.7: Effect on ratio of LDL/ HDL

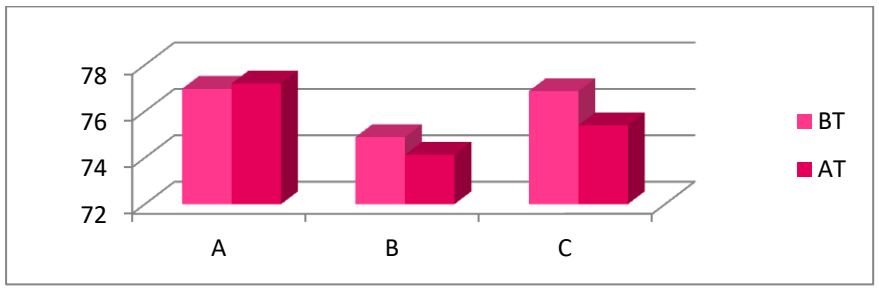

Fig.8: Effect of *Trikatu* and *Trikatu* with *Kumari* pulp on weight

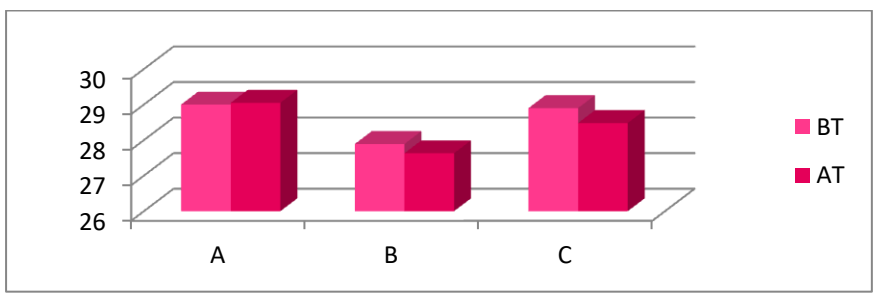

Fig. 9: Effect on BMI

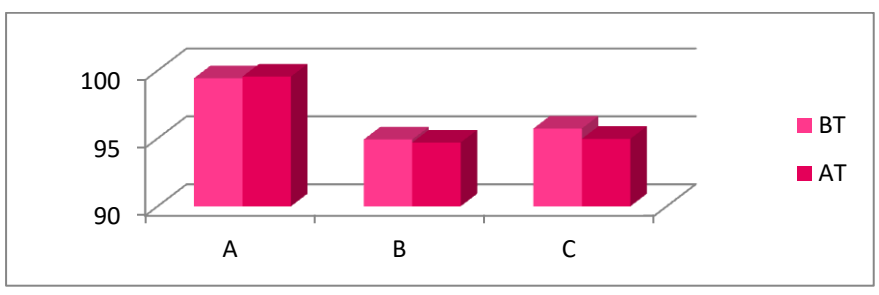

Fig.10: Effect on abdominal girth

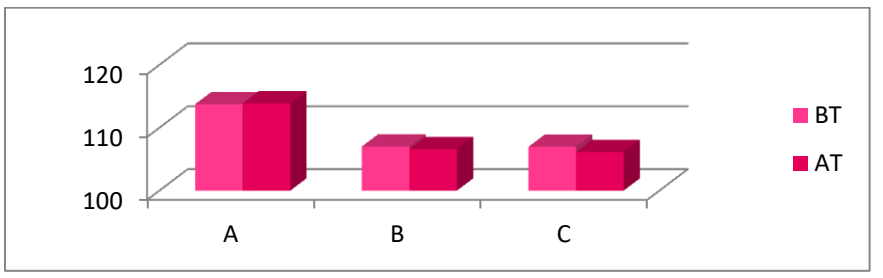

Fig. 11: Effect on hip circumference

A= Placebo, B= *Trikatu*, C= *Trikatu* with *Kumari* pulp; BT = Before Treatment, AT = After Treatment, F1= First follow up, F2= Second follow up

Effects of trial drugs [Table1and 2], [Figure1-11]

Group A: Overall effect of the placebo shows that there is a significant increase in dyslipidemia regarding their subjective and objective parameters.

Group B: *Trikatu churna* showed statistically significant (<0.01) reduction in weight, BMI and hip circumference and ($p<0.05$) in the symptoms of dyslipidemia. Regarding the biochemical parameters, a highly significant decrease was found in lipid profile, including HDL ($p<0.001$).

Group C: In patients on *Trikatu* powder along with *Aloe vera* pulp, as compared to *Trikatu* alone, statistically, a highly significantly reduction ($p<0.001$) was seen in weight and BMI, whereas a significant ($p<0.01$) reduction was observed in abdominal & hip girth ($p<0.01$) and symptoms of dyslipidemia. Regarding the biochemical parameters, a highly significant decrease was found in lipid profile including HDL ($p<0.001$).

. The assessment of overall effect showed that *Trikatu* powder along with *Aloe vera* pulp provided remarked relief in 30%, moderate improvement in 50% and mild improvement in 20% patients. In this study, 0% patients remain unchanged and none of the patient could achieve the 100% cure status. Thus overall study shows that among three groups, the effect in group C was found best. This shows that *Trikatu* with *Kumari* pulp is more effective than *Trikatu* alone as a hypolipidemic drug.

DISCUSSION

Excessive indulgence in oily, fatty and junk foods, sedentary life, irregular eating, late sleep and late morning waking, i.e. in nutshell, irregular modern life style, coupled with lack of physical exercise and hereditary predisposition are the important factors responsible for dyslipidemia. A critical review of the data available in the *Ayurvedic* literatures, on subject of dyslipidemia in form of *Medoroga* brings out an amazing wealth of knowledge about the existing concept with regard to etiopathogenesis and treatment of dyslipidemia and its complications. In pathogenesis of *Medoroga, Kapha, Vayu, Meda* (fat/lipids) and *Medodhatvagni* (factor for metabolism of lipids and fats at tissue level) are the main responsible factors. As per *Ayurveda*, it is mainly by taking sweet natured excessive diet that the *Meda dhatu* increases in body and this obstructs the channels, thereby causing on one hand excess deposition of fat in the body and on the other hand due to hinderance

in *Srotasas*, subsequent *dhatus* go on diminishing (i.e., due to malnutrition). It may thus be seen that the ancient *Ayurvedic* physicians had clearly understood the scientific process of digestion and metabolism. *Ayurveda* lays a great emphasis on the functional maintenance of *Jatharaagni* (digestive fire), upon which depends the functions of subsequent *Dhatwaagni* (factor for metabolism at tissue level) which is responsible for the nourishment of subsequent *Dhatus* one after another in a sequential order. [13] *Medoroga* (lipid disorders) result due to excess/increase of *meda* due to hypo functioning of *Medodhtwagni*.[14] *Meda* results in the obstruction of its channels and also causes hinderance at the microlevel in proper metabolism of fat.

Trikatu and *Ghritakumari* being of *Katu, Tikta rasa* and *Katuvipaka* in nature, i.e. just opposite of *Medodhatu,* reduce the quantity of *Medodhatu* and also make the channels patent for easy conduction of nutrients for nourishment to following *Dhatus*. A number of popular preparations of *Trikatu* are being plasticized by the *Ayurvedic* physicians for treatment of many *Kaphavataja* diseases, including *Agnimandya* (poor digestion) and *Ama* (undigested food and its toxic bye-products). By virtue of the therapeutical actions like *Deepana* (appetizer), *Pachana* (digestive), *Rukshana* (producing dryness), *Lekhana* (producing sliminess), *Karshana* (extraction), and *Shoshana* (absorption) etc., also along with its *Tikshna* (sharp), *Laghu* (light) and *Sukshma* (micro in size) properties, as a whole *Trikatu* reduces the quantity of *Meda* (which has the nature of *Ama*) and also makes the channels patent to carry on the nutrients to subsequent *Dhatus* as per the chronological order mentioned in *Ayurveda*. These pharmacological actions may be due to its chemical substance piperine which enhances the secretion of digestive juices and might catalyze the functions of enzymes in small intestine too, i.e. it helps improve function of *Jatharagni* (digestive fire). Improvement of *Jatharagni* function, in total, also helps in a finer disintegration of nutrients, in turn helping maximum absorption for nourishing rest of the *Dhatus*, and thus also facilitates the function of *Bhutagnis* (metabolism). In short, *Trikatu* acts against the deposition of lipids and thus helps clean the eventually blocked channels.

The second drug, *Ghritakumari* is a *Yakrituttejaka* drug i.e. a potent cholagogue. *Ayurvedic* physicians usually use it in the treatment of liver disorders and digestive system. By virtue of *Tikta rasa*, *Katu vipaka* (bitter in post digestive taste), *Bhedana karma* (breaking down of fecal matter) and other obscure functional properties at macro to micro level, *Ghritakumari* facilitates the functions of *Jatharagni* (digestive fire), *Dhatvagni* and *Bhutagni*. As to how, it is much more effective for the treatment of *Kapha* predominant diseases like *Medoroga* i.e. dyslipidemia etc.; it plays the dual role of medicine as well as *Rasayana* (rejuvenator), as per the principles of *Ayurveda*. Moreover besides above properties, *Ghritakumari* is also a potent cholagogue i.e. enhances the secretion of bile from liver that plays its exclusive action in emulsification of fat. And due to its *Sheeta virya* (cold potency), *Ghritakumari* also suppresses the excessive secretion of *Pitta* and neutralizes excessive *Pitta,* which is acidic in nature in stomach, without hindering the very fundamental function of *Agni*.

So, *Trikatu* probably acts by blocking the formation of different lipids or cholesterol at various stages in the biosynthetic pathway, and *Aloe vera* acts by increasing the fecal excretion of cholesterol or bile acids. Because the main site of lipid metabolism is liver and the action of both these drugs is also seen on liver, so these trial drugs may be effective in controlling dyslipidemia; and because of being a *Rasayana*, they may also cause increase in the HDL cholesterol. Thus it is very obvious why *Trikatu* and *Ghritakumari* jointly summate the action of each other and hence have proved to be very effective drugs in the disease *Medoroga vis a vis* deranged fat metabolism, as seen in this study.

CONCLUSION

On the basis of this study we can conclude following points: *Trikatu* is very effective in reducing lipid profile, weight and BMI as well as in providing relief in all signs and symptoms; whereas *Trikatu* along with *Kumari* reduced lipid profile, weight and BMI in a more pronounced way, as well as provided better relief in all signs and symptoms compared to *Trikatu* alone.

It can be inferred from the present study that best effect of the trial drugs was seen with *Trikatu* and *Ghritakumari* together (Group C), which is most effective in reducing the overall lipid profile, with substantial gains related to subjective as well as objective parameters and that too, without any adverse effects.

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