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An Experimental Study on Anti Dyslipidemic Activity of *Gavedhuka Yavagu* on Albino Rats treated with High Cholesterol Diet

Author: Nand Kishor Prasad Kushbaha[1]

Co Authors: Vijay B Negalur[2], Sandesh Kumar Shetty[3] and Sudhakar[4]

[1-3]PG Studies in Dept. of Swasthavritta, SDM College of Ayurveda, Udupi, KA, India
[4]SDM Centre for Research in Ayurveda and Allied Sciences, Udupi, KA, India

ABSTRACT

Dyslipidemia is an abnormal amount of lipids in the blood. Dyslipidemia may be manifested by an elevation of total cholesterol, LDL cholesterol and triglycerides concentration and decrease in HDL cholesterol concentration in the blood i.e. presence of one or more abnormal serum lipid concentration. Dyslipidemia is becoming one of such lifestyle disorder leading to multitudes of diseases like cardiovascular diseases, strokes, metabolic syndrome and even hypertension. Dyslipidemia is a condition which shares a lot of similarity in pathogenesis and clinical presentation of Medoroga. Medoroga is a condition in which there is abnormal and unequal elevation and collection of Medodhatu in the body. In comprehensive Ayurveda literature Medoroga has been synonymously described as Sthoulya. Which has been explained under Ashta Nindita Purusha. The incidence and the magnitude of the problem are on constant rise due to changing lifestyle, environment and dietary habits etc. The treatment strategy is to implement lifestyle changes including diet and exercise, anti-obesity and lipid lowering drugs. Gavedhuka Yavagu and Madhu is one such combination explained in Brihattrayee for Medoroga. In Charaka Samhita, Apamarga Tanduleeya Adhyaya explains that the combination of Gavedhuka and Madhu are Karshana (Emaciating) in nature. On the basis of above reference,a study is planned on anti-dyslipidemic activity of Gavedhuka Yavagu and Madhu in albino rats.

Key Words: *Dyslipidemia, Medoroga, Gavedhuka-Madhu, High cholesterol*

INTRODUCTION

Dyslipidemia may be manifested by elevation of total cholesterol, LDL cholesterol, and triglycerides and decrease in HDL cholesterol concentration in blood. i.e. presence of one or more than one abnormal serum lipid concentration[1].

A study conducted by ICMR in India showed 13.9% had hypercholesterolesterolemia, 29.5% had hypertriglyceridemia, 72.3% had low HDL-C, 11.8% had high LDL-C levels and 79% had abnormalities in one of the lipid parameters. Urban residents had the highest prevalence of lipid abnormalities compared to rural residents[2].

In Ayurveda lifestyle disorders, their predisposition and the consequences are briefly summarized in the context of Santarpaniya Adhyaya in classics, where over eating, lack of exercise and certain psychological entities are said to have impact on the individual.

Dyslipidemia is a condition in which the levels of lipoproteins (cholesterol, triglycerides or both) are

raised in the plasma, which can be co-related to raised 'Medas' in body. Attempts were made by various scholars of Ayurveda to clinically co-relate it to Santarpanajanya vyadhis like Sthoulya, Medoroga, Shonitabhishyanda, Dhamnipratichaya etc.

Dyslipidemia is manifested by intake of high fat diet and sedentary lifestyle etc. These Nidana can be compared to use of Snigdha (Oily), Guru (Heavy), Picchila (Slimy) Guna and Chesthadvesha (lack of physical activity) which leads to Medodhatu vikara. All the Santarpanotta Nidana has similar pancha bhoutika composition of Kapha and Meda. So, these Nidanas exposed in excess way leads to increase Kapha and Medas resulting in Medovaha Srotodushti. Similarly increased caloric intake specially the high fatty diet causes dyslipidemia. Dyslipidemia is a turmoil of lipoprotein digestion, which can incorporate over creation or insufficiency of lipoproteins or both. On the off chance that it isn't appropriately overseen, at that point dyslipidemia end up in various conditions like Cerebrovascular accident, Hypertension, cardiovascular disease which may require optional and tertiary treatment and hospitalization. Henceforth viable medications are required which are affordable, sheltered and viable, which ends the prognosis of dyslipidemia in further difficulty and turn around it. Ayurveda emphasis on different 'Shamana yoga' for the treatment of Meda Sleshma vikara. Vikrita Medas, Sleshma can be correlated with pathophysiology of dyslipidemia. There are variety of drugs and Ahara mentioned for Medodushti and Atisthoulya. Gavedhuka Yvagu and Madhu is one combination explained in Samhita. In Charaka Samhita Apamaga Tanduleeya Adhyaya told that "Gavedhukanam bhristanam karshaniya sa makshika[3]." Madhu is also a dravya advised as a Nityasevaniya dravya and having the property of "Guru Cha Atarpana". Gavedhuka Anna is Karshaniya, Kaphapittahara and Vata Vardhak in nature. It is indicated in Meda, Sleshma and Ama Vikara[4]. Madhu is Guru and Kapha chhedaka in nature[5]. These two drugs are easily available, economic and cost effective; hence Gavedhuka Yavagu and Madhu were selected to assess the safety and efficacy in Dyslipidemia as experimental base. Both drugs are individually Medohara due to their inherent qualities. Considering Medodushti in parlance with Dyslipidemia the study is planned to experimentally evaluate the Antidyslipidemic activity of Gavedhuka Yavagu and Madhu in Wister Albino rats.

OBJECTIVES

1. To evaluate Anti-dyslipidemic activity of Gavedhuka Yavagu with Madhu in Albino rats.
2. To evaluate Anti-dyslipidemic effect of Gavedhuka Yavagu in Albino rats.
3. To evaluate the safety and efficacy of Gavedhuka yavagu with Madhu in Albino rats.

MATERIALS AND METHODS

STUDY DESIGN

It is a randomized experimental trial. 30 rats are allocated into 5 groups.The first group or normal

control group rats were administered with normal diet and water. The second or positive control group rats were administered with hyper lipidemic diet that contain 40 % cholesterol suspension in hydrogenated vegetable oil. The suspension was administered at a dose of 1ml/100g rat, daily for 28 consecutive days, orally, in the morning and evening sessions. The third group or the standard group was administered with atorvastatin 5mg/kg along with hyper lipidemic diet. The fourth group was given Gavedhuka Yavagu at a dose of 0.00432 × body weight of rats in gram in morning session and the cholesterol suspension in the morning and evening sessions. The fifth group rats was given Gavedhuka Yavagu at a dose of 0.00432×body weight of rats in gram and *Madhu* at a dose of weight of the rats divided by 100 in morning session and the cholesterol suspension in the morning and evening sessions, following the Animal dosage formula for 28 consecutive days along with the normal diet. On 28th day after overnight fasting, the animals were sacrificed with ether overdose after collecting the blood from retro- orbital plexus. Liver, kidney and heart were excised out, cleaned, weighed and transferred to 10% formalin solution and sent for histopathological investigations.

Table 1 Grouping of Animals

Group	No. of rats	Diet
1	6	Normal diet
2	6	High cholesterol diet
3	6	Atorvastatin and High cholesterol diet
4	6	*Gavedhuka Yavagu* and high cholesterol diet
5	6	*GavedhukaYavagu* along with *Madhu* and High cholesterol diet

Drug Selection:

1. *Gavedhuka* seeds has been taken from Herbarium & Botanical Garden Pilikulla and Shiradi forest, Mangalore. Authentication is done by Dept. of Pharmacognosy, SDM centre for research in Ayurvedic and Allied sciences, Udupi.
2. *Madhu* is collected from genuine sources and authentication is done by Dept. Of Pharmacognosy, SDM centre for research in Ayurvedic and Allied sciences, Udupi.

Dose Selection:-

The dose selection was done on the basis of body surface area ratio using the table of Paget and Barnes. It was done as follows.

Human Dose of *Yavagu*: 1 Pala (48ml)

Dose for rats: Human dose×0.018×5×wt. of the rat/ 1000g

Dose of *Gavedhuka Yavagu* = 48 ×0.018×5/1000g
= 4.32/1000g
= 0.00432×body wt. of rat in gram

Dose of Madhu = Body wt. of Rat/100 (ml)

Dose of cholesterol = Body wt. of rat/100(ml)

Route of Drug Administration:

The test drugs were administered according to the body weight of the animals by oral route with help of gastric catheter.

Inclusion criteria:-

Not less than eight week old healthy albino rates of either sexes weighing about 150- 250g were selected and categorized them in group randomly.

Exclusion criteria:-

Diseased rats, rats under trial for other experiments, pregnant rats and below 150g and more than 250g.

Ponderal changes:-

Weight of organs like Heart, Liver and Kidney were recorded and expressed and in terms of relative values.

Clinical chemistry:

Blood collected from the orbital plexuses, serum were separated and analysed for the following parameters in each animal (collected at the end of the study or at the time of sacrificing moribund or intercurrently ill animals. The animals were subjected to overnight fasting)

Serum Bio- Chemical Parameters:

For estimation of bio-chemical parameters, Serum was separated from collected blood and requisite quantity of serum was fed to the auto analyzer which was automatically drawn into the instrument for estimating different parameters. Bio-chemicals parameters like Blood sugar, Serum cholesterol, Serum Triglyceries, Serum HDL-cholesterol, Serum LDL-cholesterol, Blood urea, Serum creatinine, Serum Glutamic oxaloacetic transaminase (SGOT), Serum Glutamic Pyruvic transaminase(SGPT) activity, Total protein, Serum Albumin, Serum Alkaline Phosphate activity, Total bilirubin, Direct bilirubin were estimated. Serum (LDL +VLDL) was calculated by subtracting HDL cholesterol value from total cholesterol instead of using both values separately, as in rats whose serum cholesterol is <100mg/dl Fried Wald formula over estimates LDL levels.

STATISTICAL TEST:

The data were generated and analyzed by employing one way ANOVA with Dunnet's multiple 't' test as post hoc test.

OBSERVATIONS & RESULTS

Table 2 Effect of *Gavedhuka Yavagu* and *Gavedhuka Yavagu - Madhu* on Cholesterol level

Groups	Cholesterol(mg/dl)	% change
Normal control	76.33 ± 7.64	-
Cholesterol control	100.2 ± 7.88	31.27↑@
Standard	54.8 ± 2.13**	45.30↓#
Gavedhuka Yavagu	108.5 ± 7.44	8.28↑#
Gavedhuka Yavagu Madhu	65 ± 5.11**	35.12↓#

Data: MEAN ± SEM ***P<0.001
@ - Compared with normal control
# - Compared with cholesterol control

The data shows that due to hyperlipidemic diet there was increased in serum cholesterol level in cholesterol control group when compared to the normal group. Observed increase was found to be statistically not significant

The data shows there was decrease in serum cholesterol level in standard and *Gavedhuka Yavagu* along *Madhu* group and increase in *Gavedhuka yavagu* group when compared to the cholesterol control group.

Observed decrease in serum cholesterol level in standard and *Gavedhuka Yavagu* along with *Madhu* was found to be statistically very significant and increase in serum cholesterol level in *Gavedhuka Yavagu* group was found to be not significant.

Table 3 Effect of *Gavedhuka Yavagu* and *Gavedhuka Yavagu - Madhu* on Triglycerides level

Groups	Triglycerides (mg/dl)	% change
Normal control	98.5 ± 6.29	-
Cholesterol control	179.8 ± 50.26	82.53↑@
Standard	105 ± 6.26	41.60↓#
GavedhukaYavagu	226.66 ± 75.21	26.06↑#
Gavedhuka Yavagu + Madhu	178 ± 11.40	1.00↓#

Data: MEAN ± SEM P> 0.05

The data shows that due to hyperlipidemic diet there was increased in serum triglycerides level in cholesterol control group when compared to the normal control group. Observed increase was found to be statistically not significant.

The data shows was the decrease in serum triglycerides level in standard group and *Gavedhuka Yavagu* along with Madhu group and an increase in Gavedhuka Yavagu group when compared to the normal control group. Observed decrease and increase was found to be statistically not significant.

Table 4 Effect of *Gavedhuka Yavagu* and *Gavedhuka Yavagu - Madhu* on HDL cholesterol level

Groups	HDL Cholesterol (mg/dl)	% change
Normal control	36.33 ± 4.27	-
Cholesterol control	43.6 ± 5.52	20.01↑@
Standard	61.8 ± 6.08	41.74↑#
Gavedhuka Yavagu	76.5 ± 10.75**	75. 45↑#
Gavedhuka Yavagu Madhu	51.33 ± 3.39	17.72↑#

Data: MEAN ± SEM **P< 0.001

The data shows that due to hyperlipidemic diet there was increase in serum HDL level in cholesterol control group when compared to the normal control group. Observed increase was found to be statistically not significant. The data shows there was increase in serum HDL level in standard, *Gavedhuka Yavagu* and *Gavedhuka Yavagu* along with *Madhu* group when compared to the cholesterol control group. Observed increase in HDL level in Gavedhuka was found to be statistically very significant.

Table 5 Effect of *Gavedhuka Yavagu* and *Gavedhuka Yavagu - Madhu* on LDL cholesterol level

Groups	LDL Cholesterol (mg/dl)	% change
Normal control	21.16 ± 9.81	-
Cholesterol control	21.8 ± 3.15	3.02↑@
Standard	28.32 ± 5.55	29.90↑#
Gavedhuka Yavagu	5.8 ± 1.80	73.39↓#
Gavedhuka Yavagu Madhu	11.2 ± 0.69	48.62↓#

Data: MEAN ± SEM P> 0.05

The data shows that due to hyperlipidemic diet there was increase in serum LDL level in cholesterol control group when compared to the normal control group. Observed increase was found to be statistically not significant.

The data shows there was increase in serum LDL level in standard group and decrease in *Gavedhuka Yavagu* and *Gavedhuka yavagu* along with *Madhu* group when compared to the cholesterol control group.

Observed increased in LDL level in standard group and decreased in *Gavedhuka Yavagu* and *Gavedhuka Yavagu* along with *Madhu* was also statistically not significant.

Table 6 Consolidated statement of biochemical parameters on administration of *Gavedhuka yavagu* and *Gavedhuka yavagu* along with *Madhu*

Parameters	Compared with normal control	Compared with cholesterol control		
	Cholesterol control	Cholesterol +standard	Cholesterol +Gavedhuka yavagu	Cholesterol + Gavedhuka yavagu - Madhu
Serum cholesterol	NSI	SD	NSI	SD
Triglycerides	NSI	NSD	NSI	NSD
HDL	NSI	NSI	SI	NSI
LDL	NSI	NSI	NSD	NSD
Serum urea	SD	NSI	NSI	NSD
Serum creatinine	NSI	NSD	NSD	NSD
Blood Sugar	SI	NSD	NSD	NSD
SGOT Activity	SI	SD	NSD	SD
SGPT Activity	SI	NSD	NSD	NSD
ALP Activity	SI	SD	SD	SD
Total protein	NSD	NSI	NSI	NSI
Albumin	SD	SI	SI	NSI
Total bilirubin	NSI	NSD	NSI	NSI
Direct bilirubin	NSD	NSI	NSI	NSI
Wt. of Liver	SD	SI	NSI	NSI
Wt. of Kidney	NSI	NSI	NSD	SD
Wt. of Heart	NSI	NSI	NSD	SD

(SD – Significantly decrease, SI- Significantly increase, NSI- non significantly increase, NSD- non significantly decrease)

DISCUSSION

Any idea or statement emerged from classical and experimental study can simplest be regularly occurring if there is right reasoning (*Tarka*) of the observations. In keeping with ancient studies methodology, earlier than establishing any concept, *Upanaya* (dialogue) is previous step to *Nigmana* (end). Dialuge is a procedure of re-examining and forms the bottom for conclusion. In spite of detailed literature and experimental study, a concept is ordinary must effective after the right reasoning of statement. *Acharyas* used their way of experimentation and reseaches throughout their length for the upliftment of our technological know – how. *Charaka* says in *sutrasthana* 10th chapter that the ones by myself are smart who act after research. Even he noted about testing tablets and food in animals earlier than administreting to human. *Sushruta Samhita* has dealt with animal experiment by way of devoting a separate bankruptcy-*Yogya Vidhi*. It's miles said that any process, which is to be accomplished on person, have to undergo trial on animals or other things, having similar traits. Additionally in *kalpasthana* of *Sushruta Samhita* there may be comparable discussion dealing with the observations of animal experiments. For this reason earlier than administering any drug to human it's miles proper to test the same on lower animals.

As a consequence of medical clarification of any phenomena experimentation is essential.

Although the richness and potential of Ayurveda is well known even to not unusual people, it's for constantly considered better to establish such a knowledge based on experimental findings, that is the grasp key to make such information great to indicates its depth of knowledge and desirable to everywhere in the world.There are many concepts in *Ayurveda* which need distinctive scrutiny to evaluate their application within the discipline of technology. Among them one concept in *Medoroga*. *Medoroga* is the most important problem which this era is going through. This is mainly due to our existence and meal habits.

Effects of Gavedhuka Yavagu- Madhu on lipid profile (Table no. 2,3,4,5)

Administration of hyperlipidemic diet lead to non-significant elevation in serum cholesterol, Triglycerides, HDL, and LDL. These hyperlipidemic diet induced changes were significantly reversed by the administration of *Gavedhuka Yavagu- Madhu*, thus providing evidence for its efficacy in reversing the dyslipidemia induced changes. The above information shows that *Gavedhuka Yavagu- Madhu* have very good potential as dietary intervention for the treatment of hyperlipidemic condition. It would be interesting to analyse the probable mechanisms involved in this effect. This can be done by focusing on the mechanisms of action of atorvastatin. Atorvastatin are competitive inhibitors of HMG-CoA reductase, the rate limiting step in cholesterol synthesis. In response to decreased cholesterol production, the number and activity of LDL receptors are upregulated, stimulating removal of circulatory LDL. Statins also have modest effect on HDL levels in the same way *Gavedhuka Yavagu- Madhu* have also same action on reduce the LDL, cholesterol which might have been cause of the observed increase HDL in positive control group. High amounts alpha- sitosterol, beta- sitosterol, stigmasterol present in Gavedhuka may be responsible for the hyperlipidemic effect.[6] Literature revels that on increase in HDL cholesterol and decrease in Total cholesterol, LDL cholesterol and TG is associated with a decrease in the risk of ischemic heart diseases. In general, consumption of more fat may lead to the increased VLDL, resulting in the formation of maximum amounts of LDL which may stick to the walls of the blood vessels causing blockages for the normal flow of blood. The strong association between the risk of coronary artery diseases (CAD), high level of LDL-C and low levels of HDL-C has been well established.

The results showed that *Gavedhuka Yavagu- Madhu* produced a significant reduction in cholesterol and plasma triglycerides levels. The reduction of total cholesterol by the *Gavedhuka Yavagu- Madhu* may be associated with a decrease of LDL, which is the ultimate aim of many hypolipidemic agents. It may also be suggested that cholesterol lowering activity of the *Gavedhuka Yavagu- Madhu* may increase the faecal exertion of bile acids and neutral sterols with the consequent reduction of hepatic cholesterol because of its use in the biosynthesis of these bile acids. These fractions also slow down

the rate of diffusion through the intestinal mucosa thereby reducing the absorption of cholesterol and triglycerides. Anti-oxidant constituents of *Gavedhuka Yavagu- Madhu* also present the endogenous oxidation of cholesterol resulting in decrease in the concentration of low density lipoprotein and again conform the hyperlipidemic activity.

Park Y et al studied the effects of Coix lacryma-jobi on lipid metabolism in Sprague Dawley male rats. They found that it may have an inhibitory action on cholesterol synthesis in liver, a facilitating effect on the biliary exertion of triglycerides, and an accelatory action as phospholipid synthesis in liver. Kim S. O. et al found that the crude extract of seeds could modulated the expression of leptinand TNF-alpha and reduced body weights, food intake, fatisize, adipose tissue mass and serum hyperlipidemia in obese rats. Based on this they suggested that it could be considered for use in antiobesity therpy. They further found that the water extracts of the seed exhibit anti- obesity activity through regulatory neuroendocrine activity in the brain. Huang BW et al the effect of Coix lacryma- jobi seeds oil on plasma lipids, insulin and leptin in rats and found it could decrease low density lipoprotein cholesterol (LDL-C), insulin, and leptin and thiobarbituric acid reactive substance (TBARS) concentrations after 4 weeks of feed.

As part of biomarkers assessment –total protein, serum albumin, SGOT, SGPT activity was measured as on index of liver function along with serum bilirubin level, serum urea and creatinine activity was assessed as a measure of kidney function. Disturbance in the tissue integrity especially of liver would get reflected in the form of elevation. The serum SGPT, SGOT and ALPase activity were found to be significantly elevated due to hyperlipidemic diet.

Serum bilirubin is normally tested through serum total bilirubin and serum direct bilirubin. Increased level of total bilirubin suggest heamolysis. Decreased direct bilirubin indicates excessive excretion of bilirubin through bile and urine. In present study also impaired bile pigment metabolism seen but effect was significantly reversed by *Gavedhuka Yavagu – Madhu* in comparison to positive control. The above effects of hyperlipidemic diet are indicative of impaired liver functions. Most of these parameters were found to be reversed by *Gavedhuka Yavagu – Madhu* combined group. *Gavedhuka Yavagu* alone has non-significant effect. The observed effect may be the result at the reversal at the hyperlipidemic diet induced changes or they may be a hepatoprotective component also. It is to be noted that pondarable as well as histopathological changes induced by the hyperlipidemic diet were also reversed by the combined treatment providing strong experimental basis for the classical medication of this diet for the treatment of *Medoroga.*

B-sitosterol and citric acid present in *Gavedhuka* has been reported to produce anti Proliferative and antioxidant properties in a number of in vitro and small animal models respectively. The anti-proliferative properties of β-sitosterolmay be due

to its ability to directly inhibit the DNA binding of certain carcinogens, including nitrosamines and polyayalic aromatic hydrocarbons. Citric acid has a chemo protective effect in cellular models by reducing oxidative stress.

Serum urea:

Generally, Urea is produced from the catabolism of various muscle proteins and amino acids. Large amount of ammonia produced from various metabolic reactions is harmful for the body. So, it is degraded into urea in order to reduce its toxicity effect in body and is circulated through blood. This urea helps in metabolism of nitrogen containing compounds, reabsorptions of water, carries nitrogenous waste and helps in the counter-current exchange system. *Gavedhuka Yavagu-Madhu* shows non- significantly reduced serum urea level compared with positive control group. This is indicative of impact on nitrogen metabolism.

Effect on serum creatinine:

Generally, Creatinine is a breakdown product of creatinine phosphate in muscle metabolism. It is synthesized in the liver from the mythylation of Glycocyamine, transported through the blood to organ such as brain and muscle, undergo phosphorylation and becomes phosphocreatine is catalysed by creatinine kinase into creatinine, which is removed through kidney by tubular secretion. A rising level in creatinine in the blood stream indicates a decline in the Kidney's capacity to filter blood. Feeding of hyperlipidemic diet leads to non-significantly increase the serum creatinine level and significantly decrease in serum urea indicates that this diet did cause impairment of kidney function. These hyperlipidemic diet induced changes were non-significantly reversed by the administration of *Gavedhuka Yavagu- Madhuu*, thus providing evidence for its efficacy in reversing the dyslipidemia induced changes in the level of creatinine.

Effect on blood Sugar level:

Gavedhuka Yavagu- Madhu reduced blood sugar level compared with positive control group. This effect was moderate and non- significant. This moderate effect may be useful to improve insulin sensitivity. B-sitosterol and stigmasterol isolated from Coix lacryma-jobi has been shown to antihyperglycemic activity. Stigmasterol reduced serum glucose concentrations by reducing the activity of hepatic glucose-6-phosphate with concomitant increase of circulating insulin level. B-sitosterol has been also demonstrated to reduce serum glucose concentration both in normal and hyperglycemic rats by improving the oral glucose test with an increase in glucose – induced insulin secretion. Since this phytochemical is present in *Gavedhuka* it might have such an enzyme activity inhibitory effect. It may be useful in the treatment of obesity induced diabetes mellitus.

Weight of the kidney and Heart:

Administration of hyperlipidemic diet lead to non-significant elevation in weight of the kidney and heart .These hyperlipidemic diet induced changes in were non significantly reversed by administration of *Gavedhuka Yavagu- Madhu* and Significantly reversed by administration by

Gavedhuka Yavagu, thus providing evidence for its efficacy in reversing the dyslipidemia induced changes. High cholesterol diet contribute to both atherosclerosis and glomerulosclerosis as cholesterol relocates to and accumulates in renal and vascular tissues. Due to excess deposition of cholesterol in renal and vascular tissue the weight of the kidney and heart may be elevated. High level of α-sitosterol, β-sitosterol and stigmasterol present in *Gavedhuka* may be decreased the elevated cholesterol and due to decrease in cholesterol level may be also decreases the weight of kidney and heart respectively.

Weight of the liver:

Administration of high cholesterol diet lead to significant decrease in weight of the liver. These hyperlipidemic diet induced changes were non-significantly reversed by *Gavedhuka Yavagu-Madhu* and *Gavedhuka Yavagu*, thus providing evidence for its efficacy in reversing the dyslipidemic induced changes.

Discussion on histological examination:

Histological examination of heart, kidney and liver showed that hyperlipidemic diet in present study were seen moderate degenerative changes (1 rat) in positive control group of heart in the form of degeneration with vacuolation of cardiac muscle and inflammation seen in one tissue section and mild degenerative changes were seen in kidney of positive control group in form of very few tubules in all section are degenerated with vacuolated cytoplasm and pyknotic nuclei. 1 section showed inflmatory cells.

However, mild to severe degeneration were seen in the liver of positive control group in the form of sinusoidal dialation, congestion and inflammation. Degenerated cells were also seen.

No toxic changes were seen and protection and protection seen in the form of no degeneration, necrosis and inflammation in most of the tissue section compared with positive control group 1 rat section showed mild degenerstive changes in heart of *Gavedhuka yavagu* and *Gavedhuka Yavagu – Madhu* group.

Mild degenerative changes were seen in the form of degenerated tubules similar to positive control groups and 1 section did not show any degenerated tubules in kidney of *Gavedhuka Yavagu* group and no degeneration to modrate degenerative changes were seen in the form of 2 section showed few degenerative tubule and 1 section does not show degenerated tubules and 1 section showed mild inflammation in kidney of *Gavedhuka Yavagu-Madhu group.*

However, mild degenerative changes and protection were seen in the form of reduction in sinusoidal dilation, congestion and inflammation and degenerated cells compared with positive control group in liver of Gavedhuka Yavagu group and mild degenerative changes and protection seen in the form of degenerated cells with sinusoidal dilation. Inflammation reduced compared to positive control group of liver of *Gavedhuka Yavagu-Madhu* group. Thus, Better protection were seen in heart, kidney, and liver of *Gavedhuka Yavagu- Madhu* group.

For any disease line of treatment depends on the basis of their *Samprapti Vighatana*. In the treatment of *Medoroga* the drug needed to tackle the *Vikrit meda, prakupit Vayu* and *Tikshna Jathragni*. Here *Gavedhuka* has *Kattu and Madhura rasa, Ushna virya, Kattu Vipaka, Kaphapittahara, Laghu-ruksha Guna* and *Karshaniya* in property and *Madhu* have *Kashaya, Madhura rasa* and *Ruksha, Guru Guna*. It is *Kaphapittahara, Chhedaka* and also *Yogavahi*. So, combination of both *Dravya* fulfils the *guru cha atarpana* criteria for samprapti Vighatana. Administration of *Gavedhuka Yavagu & Madhu* tackle the *prakupit Vayu, Tikshna Jathragni* and remove *prakupit meda* by improving the *Medo Dhatvagni*. Ultimately the proper *Upachaya* of *Medo Dhatu* occurs and removes the obstruction of *Srotas*. In this way it is the best combination to tackle the *Medoroga*.

Discussion on Chikitsa

Briefly *Chikitsa* of *Medoroga* can be compiled into the following forms i.e. *Nidana Parivarjana*- Success of any treatment becomes very limited until and unless the *nidana sevana* is avoided.

Guru cha Atarpana- critically analyzing the condition, it is apt to administer *Guru Ahara* i.e. food heavy for digestion but not leading to *Santarpana*, the reason being- Patients will be with increased appetite, so in such condition of *Atarpana ahara* is administered it will not lead to excess calories, and *Guru Ahara* will also take care of *Kshudha atimatra*. *Sthoulya chikitsa* commentators like *Chakrapani* and *Gangadhara* had mentioned that *"Sthoka bhojana"* or *"Alpa bhojana"* are the best *Karshana*. They have also given importance for *Laghu* and *Rooksha Ahara sevana*. *Ahara dravya* should be used after converting it to *Guru Samskara*. *(Prakritit Guru or Sanskarit Guru)*

Vata Sleshma Medohara – The basic cause for *Medoroga* is *Kapha* and *Meda*, hence all the three have to be taken care by *vata sleshma Medohara Ahara.*

Rukshana – *Rukshana* is administration of therapeutics in the form of *Bahya Parimarjana Chikitsa* – *Teekshna rooksha Udvartana* for *Kapha Meda vilayana* by which the main *Dosha* and *Dushya* are treated. *Antah parimarjana chikitsa* – *Ruksha Ushana basti, lekhana basti* both these therapies maintain the *vata sthana* at same time checks *Kapha* and *Medo dhatu.*

CONCLUSION

Dyslipidaemia can be studied under the broad Umbrella of *Medoroga.* It is one of the major modifiable risk factors for atherosclerosis and its consequences. *Gavedhuka-Madhu* group showed statistically significant reduction in serum Triglycerides, cholesterol, LDL and significant reduction in the weight of the Heart, Kidney and Liver compare to positive control group.There were statistically significant difference between the results of *Gavedhuka-Madhu* group and positive control group.*Gavedhuka-Madhu* is very effective combination to prevent and manage the Dyslipidaemia.

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