



ROLE OF *RASONA RASAYANA* AND YOGIC PRACTICES IN MANAGEMENT OF HYPERLIPIDAEMIA

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ABSTRACT

Introduction: Hyperlipidemia is increased levels of lipids (fats) in the blood, including cholesterol and triglycerides, and lead to complications like CAD, stroke, ischemia, infarction etc. About 17.3 million people died from CVDs in 2008, i. e 30% of all global deaths. This is going to progress exponentially in coming years. *Rasona* (*Allium sativum* Linn.) is a commonly used dietary item having *Rasayana* property and a *Pathya* in *Medovikara*. Yoga being a mind-

body therapy has considerable potential in the prevention and management of hyperlipidemia. Hence to establish the effect *Rasona Rasayana* and Yogic practices, study entitled “Role of *Rasona Rasayana* and Yogic Practices in management of Hyperlipidaemia” was conducted. **Materials and Methods:** About 90 patients of Hyperlipidaemia were selected based on the fulfillment of diagnostic criteria and randomly allocated into 3 groups (30 patients in each group) after getting their written informed consent. Group A (Control with Standard drug therapy), Group B (Standard drug therapy + *Rasona* +*Pathyapthya* advices) and Group C (Standard drug therapy + *Rasona* + *Pathyapthya* advices +Yogic practices) were assessed before treatment and at an interval after every month up to 3 months. **Results and Conclusion:** On intra-group comparison all the three groups were highly significant with respect to most of the objective parameters and subjective parameters. Among three groups, Group C was most effective showing the synergistic effect of *Yoga* and *Rasona Rasayana*.

The treatment is non-pharmacological, cost effective and devoid of side effects, so it can be applied in the community easily.

KEYWORDS: Hyperlipidemia, *Medoroga*, *Rasona Rasayana*, Yogic practices.

INTRODUCTION

Hyperlipidemia is a silent menace and a potential risk factor for dreaded diseases like cardiovascular diseases, cerebro-vascular disease, hypertension etc. Hyperlipidemia refers to increased levels of lipids (fats) in the blood, including cholesterol and triglycerides. Although hyperlipidemia is a symptomless condition, its complications like CAD, stroke, ischemia and infarction can lead to chest pain, headache etc. Now hyperlipidemia and its complications are turning out to be pandemic. According to an estimate by World Health Organization, approximately 17.3 million people died from CVDs in 2008, representing 30% of all global deaths. It is anticipated that by 2020 cardiovascular diseases are predicted to be the major cause of morbidity and mortality in most developing nations around the globe.

In management of Hyperlipidemia lifestyle management with dietary modification are essential. *Rasona Rasayana* included in daily life results in prevention and management of hyperlipidemia. *Rasona Rasayana* due to its *Agnivardhana* and *Srotosodhana* property is selected in this study for evaluating its hypolipidemic actions.

Rasona Rasayana mentioned in *Charaka Samhita Chikitsasthana*, *Gulma Chikitsadhyaya* for *Gulma* along with other indications like *Udavarta*, *Gridhrasi*, *Vishama Jwara*, **Hridroga**, *Vidradhi* and *Shotha*. In *Bhaishajya Ratnavali* also *Rasona* is mentioned as one of the *Pathya* in *Hridroga chikitsa*, which is considered to be good and favourable in curing heart problems. In many books of *Dravya guna* like *Dhanvantari Nighantu*, *Kaiyadeva Nighantu*, *Bhavaprakasha Nighantu* and *Raja Nighantu* have mentioned the use of *Rasona* in *Hridroga*. *Kashyapa Samhita* includes a chapter on various pharmaceutical preparations of garlic. *Vagbhata* in *Ashtanga Hridaya* also advocate it as *Rasayana*. Yogic practices have been known for centuries to improve physiology and provide mental relaxation. So considering preventive aspect for hyperlipidemia in this study effect of *Rasona Rasayana* and Yogic practices in management of hyperlipidemia is evaluated. *Rasayana* which should be included in daily life for prevention and management of hyperlipidemia is *Rasona Rasayana* due to its *Agnivardhana* and *Srotosodhana* property is selected in this study for evaluating its hypolipidemic actions.

Aims and objectives

- To evaluate the efficacy of *Rasona Rasayanain* the management of Hyperlipidaemia
- To study the effect of Yogic practices in the management of Hyperlipidaemia.

MATERIAL AND METHODS

Present study was conducted at Swasthyarakshana OPD of Swasthavritta and Yoga in Ayurvedic wing and OPD of Dept. of Cardiology in Modern wing of Sir Sunderlal Hospital, Institute of Medical Sciences, Banaras Hindu University, Varanasi. The approval was obtained from DRC of the department of Swasthavritta and Yoga and Institutional Ethical committee before the commencement of the study. About 90 patients of Hyperlipidaemia belonging to different age groups, gender and socio-economic status were selected based on the fulfillment of diagnostic criteria and randomly allocated into 3 groups (30 patients in each group) after getting their written informed consent.

Inclusion Criteria

1. Patients fulfilling the following general and diagnostic criteria were selected for the study
2. Patients having age more than 20 years and below 60 years.
3. Patients willing to undergo treatment.

Diagnostic Criteria**(A) Clinical Diagnosis**

It was made on signs and symptoms of *Medoroga* as per Ayurvedic classics.

(B) Laboratory Diagnosis

Patients were diagnosed on the basis of Lipid Profile. Any one or more of the following criteria were selected.

- S. cholesterol (201 mg/dl or more)
- S. Triglycerides (151 mg/dl or more)
- S. LDL (131 mg/dl or more)
- S. VLDL (41 mg/dl or more)

Exclusion Criteria

1. Patients having serious cardiac disorders like cardiac failure.
2. Patients having major illness like IDDM.
3. Patients having a history of untreated thyroid disorders.

4. Pregnant females and lactating mothers.

Clinical Aspect

90 cases were selected after getting their written informed consent for the above study from O.P.D. of Dept. of Swasthavritta and Yoga and Dept. of Cardiology, IMS, B.H.U. Varanasi. After the initial registration and basal study, the patients were randomly allocated into 3 groups (30 patients in each group), the patients were assessed after one month interval for a period of three months for the assessment of therapeutic response. For each follow up the patients were assessed for clinical symptoms, including, Estimation of blood sugar (Fasting and Postprandial), Lipid profile, BP, weight, waist circumference at each follow ups, while status of BMI were assessed before and after treatment.

- (a) Group A: Control (Standard drug therapy)
- (b) Group B: Standard drug therapy + *Rasona* + *Pathyapthya* advices
- (c) Group C: Standard drug therapy + *Rasona* + *Pathyapthya* advices + Yogic practices

GROUP A

The patients in group A were administered with lipid lowering drug of statin group in standard dose.

GROUP B

The patients in group B were treated with *Rasona* and advised general *Pathya-Apathya* as per classics along with standard treatment. Patients were advised to take 6-7gm of *Rasona Kalka* daily twice before or with meal. Along with the above *Kalka* they were also suggested to take *Pathya Ahara* and avoid *Apathya*.

Pathya – Apathya

Registered patients were advised to follow specific dietary changes. Patients were made to limit the use of oil, ghee, egg white and meat. They were also made to decrease the use of energy rich foods like rice, potatoes, fried foods and bakery products. All the patients were advised to avoid over and repeated eating with day sleeping. All the patients were advised to leave 1/3rd stomach capacity empty. They were also advised to drink lukewarm water and avoid refrigerated water. Following is the list of general *Pathya-apthya* advice to patients.

(Refer to Table 1, Table 2 & Table 3).

GROUP C

The patients belonging to Group C were advocated with Yogic practices additional to *Rasona Rasayana* and general *Pathya-Apathya* suggestions as given in Group B. Patients of this group were advised to practice the following yoga schedule.

YOGA SCHEDULE

(A) Preparatory practices (Joint Movement exercises): Flexion and extension of toes, feet, finger, elbow for 5 times each / day, rotation of ankle, knee, hip, wrist, shoulder and neck for five times each in clockwise and anti-clock wise direction for 5 times each.

(B) *Suryanamaskara* 5 Rounds

(C) *Asanas*- in standing position *Tadasana*, *Ardha Katichakrasana* for 3 Rounds. In sitting position *Vajrasana* 2 Rounds, *Mandukasana* and *Paschimottasana* 3 Rounds. In lying down position *Bhujangasana*, *Shalabhasana*, *Pavanmuktasana* 3 Rounds each, followed by *Shavasana* with deep relaxation technique for 10 – 15 Minutes.

(E) *Pranayama*- *Anuloma – Viloma Pranayama* for 10 – 15 Minutes, *Bhramari* for 5 rounds

(F) *Dhyana*- *Omkara Dhyana*

Out of 90 patients registered, only 83 patients completed the treatment and 7 dropped out in the middle. 28 in Group A 27 in group B and 28 in group C completed the course of research study. The data collected were tabulate and analysed using statistical software SPSS version 16.0. The intragroup comparison was done to see the effect of treatment using Friedman's test for subjective parameters and paired t-test for objective parameters. The intergroup comparison between different groups for subjective parameters were done by Pearson's Chi-square test and objective parameters were done by One Way ANOVA (F test) and significant pairs were identified by Post Hoc test.

OBSERVATIONS AND RESULTS

Demographic Profile: In the present study maximum patients (50.0%) were belonging to 40-50 years age group. Majority of patients were females (56.7%), and belonged to Hindu religion (86.7%). Further maximum patients were graduates (52.2%) belonged to middle class (47.8%). Regarding occupation maximum patients were housewives (40.0%) followed by patients in service (35.6%). maximum patients were married (88.9%) residing in rural area (53.3%).

Constitutional profile: Regarding body constitution maximum patients had *Kaphapradhana Pittanubandhi Prakriti* (52.2%), followed by *Pittapradhana Kaphanubandhi Prakriti* (17.8%) and *Kaphapradhana Vatanubandhi Prakriti* (16.7%). Further in *Manas Prakriti* maximum patients had *Tamasika Manas Prakriti* (70.0%) and *Rajasika Manas Prakriti* (23.3%). Regarding parameters of Sara maximum patients (57.7%) belonged to *Pravara Sara* followed by *Madhyama Sara* (32.2%), Further majority of patients had *Madhyama Samhanana* (73.3%), *Madhyama Satva* (71.1%) and *Pravara Satmya* (92.2%). In the aspect of *Pramana i.e body weight* maximum patients (26.7%) had body weight in the range of 71-80 kg, followed by 24.4% patients in the range of 81-90 Kg. 23.3% in >91, 20.0% in 61-70 kg range and only 5.6% in 51-60 Kg range. It is to be noted that maximum patients i.e; 34.4% had BMI in the range of 29-32 (grade 3 obesity) followed by 27.8% of patients having BMI greater than 32(qualifying for bariatric surgery). 12.2%, 11.1%, 7.8% and 6.7% of patients had BMI in the ranges of 27-29 kg/m² (obesity grade 2), 25-27 kg/m² (obesity grade 1), between 23-25 kg/m²(overweight) and less than 23 kg/m² (normal)respectively. Regarding **Waist Circumference** maximum male patients (46.1%) had waist circumferences between 91- 100 cm. and maximum female (47.0%) had waist circumference >100. This shows that maximum patients had abdominal obesity. Maximum patients (73.3%) had *Madhyama Vyayama Shakti*. **Family history** of Hyperlipidaemia was found positive in maximum patients (80%). In this present study it was observed that maximum patients (65.5%) had **associated disease** like hypertension, followed by patients with diabetes mellitus (57.7%), Hypothyroidism (23.3%) and erectile dysfunction (11.1%).

Effect of Treatment on Subjective Criteria

➤ There was significant remission of severity of symptoms in all the three trial groups after treatment as compared to pretreatment grades. But patients of Group B (treated with Ongoing conventional treatment + *Rasona rasayana* + general *Pathyapthya* advices) and Group C (Ongoing conventional treatment + *Rasona rasayana* + general *Pathyapthya* advices + yogic practices) showed better results compared to Group A (Control). The intragroup comparison with respect to *Chala Sphik Udara Stana* (Pendulous hips, abdomen, breast), *Kshudra Shwasa* (difficulty on exertion), *Swedadhikya* (excessive sweating), *Daurgandhya* (foulsmell), *Atipipasa* (excessive thirst), *Jaranashakti* (digestion power), *Angagaurava* (heaviness of the body), *Sandhishoola* (joint pain) and *Gasrasada* (body ache), the severity of symptoms decreased markedly in all the groups and also they were statistically highly significant (p<0.001). On inter group comparison by chi-square

test, no significant difference was seen with respect to *Swedadhikya* (excessive sweating), *Snidhangata* (unctuousness of the body), *Atipipasa* (excessive thirst) and *Gatrasada* (body ache).

- On inter group comparison by Chi-square test, with respect to *Chala Sphik Udara Stana*, *Daurbalya* (general weakness), *Nidradhikya* (excessive sleep) and *Angagaurava*, significant difference was seen in third follow up in Group C and Group B, while with respect to *Alasya*, *Kshudra Shwasa*, *Daurgandhya*, *Jarana Shakti*, *Sandhishoola* highly significant difference was seen in second and third follow up in Group C and Group B.
- **Effect of Treatment on Objective Criteria**
- In present study mean weight observed was 77.2 ± 3.2 , mean FBS observed was 113.5 ± 7.03 , mean Serum Cholesterol, Serum triglycerides, Serum HDL, Serum LDL, Serum VLDL, Serum urea, Serum Creatinine, TC/HDL observed were 211 ± 13.36 , 180 ± 44.78 , 42 ± 2.49 , 122 ± 4.6 , 44 ± 6.34 , 22.3 ± 4.6 , 0.8 ± 0.06 , 5.0 which comes under optimal or average risk. In present study mean LDL/HDL ratio found was 2.9 which comes under normal or low cardiovascular risk.
- On intragroup comparison (between BT and AT) the effect of therapy with respect to weight change (Table 4) was significant in all the 3 groups. On intergroup comparison (One Way ANOVA), the result was statistically insignificant. But based on the difference between the means the efficacy of treatment given to different trial groups was in this order group C > group B > group A.
- With respect to BMI (Table 5), Chest Circumference (Table 6), Abdominal Circumference (Table 7), intragroup comparison (between BT and AT) group B and C showed highly significant changes. While Group A was not significant. The intergroup comparison (One Way ANOVA), the result was statistically insignificant. But based on the difference between the means the efficacy of treatment given to different groups was in order of group C > group B > group A.
- With respect to Waist Circumference (Table 8), intragroup comparison (between BT and AT) showed significant result in all the three groups. But based on the difference between the means the efficacy of treatment given to different groups was in order group C > group A > group B.
- On intragroup comparison (between BT and AT) the effect of therapy with respect to FBS, Serum Cholesterol, LDL, HDL, Serum Triglycerides, Serum VLDL and Sr. Creatinine was highly significant in all groups.

- The inter group comparison (One Way ANOVA) showed that all the three groups were equally effective as $P > 0.5$ with respect to FBS, Serum Cholesterol (Figure 1), LDL (Figure 2), HDL (Figure 3), Serum Triglycerides (Figure 4), and Sr. Creatinine. But based on the difference between the means Group C is most effective in improving Serum Cholesterol, LDL, HDL, VLDL (Figure 5), Serum Triglycerides, Blood Urea and Sr. Creatinine. While Group B was most effective with respect to FBS.
- There was a significant difference between the three Groups with respect to Blood Urea, VLDL and Serum triglycerides. Based on the difference in means efficacy of treatment given to different trial groups was in this order group C > group B > group A.
- On intergroup comparison (One Way ANOVA) of Serum triglycerides (Figure 4) the result was statistically significant in F1. There was a significant decrease in the levels in Group C and B. Based on the difference between the means efficacy of treatment given to different trial groups was group C > B > A.
- On intergroup comparison (One Way ANOVA) of Serum VLDL (Figure 5), the result was statistically significant in F2. In F2 there is significant difference ($p = 0.01$) between the net changes of Serum VLDL in Group B & C with the treatment (Post-Hoc). But on the basis of differences in mean the efficacy of treatment given to different trial groups was group C > B > A
- The based on the difference in means of Serum Creatinine the efficacy of treatment given to different trial groups was in this order group C > group B > group A.

Table 1

S.No.	AharaVarga	Pathya	Apathya
1.	Cereals	Old rice, Wheat, Jowar, Barley (<i>Jau</i>), Millet (<i>Sava</i>), Italian millet (<i>Kanguni</i>), Laja (<i>Layi</i>)	<i>Naveen Dhanya</i> (Newly harvested cereals)
2.	Pulses	Green gram (<i>Mung</i>), Cowpea (<i>Lobiya</i>), Horse gram (<i>Kulthi</i>), Bengal gram (<i>Chana</i>), Lentils (<i>Masura</i>), Red gram (<i>Arhar</i>), Moth bean (Moth)	<i>Masha</i> (<i>Black gram</i>), <i>Til</i>
3.	Vegetables	Gourd (<i>Parwal</i>), leafy vegetables, drumstick (<i>Sahjan</i>), Brinjal (<i>Baingan</i>)	<i>Kanda Shaka</i> <i>Madhura Potato</i> (<i>Aluka</i>)
4.	Fruits	Radish (<i>Muli</i>), Ginger (<i>Ardraka</i>), Papaya (<i>Papita</i>), Jambu (<i>Jamun</i>), Cardamom (<i>Ela</i>), pepper (<i>Maricha</i>)	<i>Madhura Phala</i> like Jack fruit,
5.	Beverages	Honey, milk, Butter milk (<i>Takra</i>), hot water (<i>Ushnajala</i>), Sesame and	Excess milk products like curd, ghee

		mustard oil (<i>Tila&Sarshapa Tail</i>),	(<i>Dugdha, Dhadhi Sarpi</i>), Sugar cane products (<i>Ikshuvikara</i>)
6.	Non vegetarian	variety of fish (<i>Rohu Matsya</i>)	Meat of marshy animals like beef, pork etc. (<i>Anupa</i>), Aquatic animals (<i>Audaka</i>)

Table 2: PATHYA – APATHYA VIHARA (Regimen)

PATHYA	APATHYA
<i>Shrama</i> (Physical activity)	<i>Sheetala Jala Sevan</i> (Excess intake of cold water)
<i>Jagarana</i> (Night awakening)	<i>Diwaswapna</i> (Day sleep)
<i>NityaBhramana</i> (Regular walking)	<i>Avyayam</i> (Sedentary habits)
<i>Upavasa</i> (Fasting)	<i>AtiAshana</i> (Excessive eating)

OBJECTIVE RESULTS

Table 4: Effect of treatment on WEIGHT (n=83)

Groups	WEIGHT Mean \pm SD				Within the group comparison, Paired 't' test, (BT - FU3)
	BT	FU1	FU2	FU3	
Group A (n=28)	75.7 \pm 4.9	77.0 \pm 2.1	76.5 \pm 2.5	74.1 \pm 1.9	1.2 \pm 0.9 t = 2.193 p = .036 S
Group B (n=27)	77.4 \pm 3.0	77.5 \pm 2.8	74.8 \pm 2.6	74.6 \pm 2.6	1.8 \pm 0.8 t = 2.126 P = .042 S
Group C (n=28)	76.46 \pm 3.6	75.7 \pm 3.1	74.2 \pm 3.34	74.6 \pm 2.9	2.8 \pm 0.8 t = 3.298 p = .003 HS
Between the group comparison, One-Way ANOVA	F=1.094 p=.341 NS	F=3.046 p=.054 NS	F=2.266 p=.112 NS	F=.152 p=.859 NS	-
Post-Hoc test (Bonferroni), Significant pairs (p<0.05)	-	-	-	-	-

Table 5: Effect of treatment on BMI (n=83)

Groups	BMI Mean \pm SD		Within the group comparison, Paired 't' test, (BT - AT)
	BT	FU3	
Group A (n=28)	31.7 \pm 0.91	29.6 \pm 1.3	2.4 \pm 0.29 t = 8.027 p = 0.000 NS
Group B (n=27)	31.9 \pm 0.7	29.07 \pm 1.4	2.9 \pm 0.31 t =9.393 p =0.000 HS
Group C (n=28)	32.4 \pm 0.9	28.9 \pm 1.3	3.4 \pm 1.4 t =13.120 p =0.000 HS
Between the group comparison, One-Way ANOVA	F=3.631 p= .072 NS	F =.754 p=.475 NS	

Table 6 : Effect of treatment on CHEST CIRCUMFERENCE (n=83)

Groups	CC. Mean \pm SD		Within the group comparison, Paired 't' test, (BT - FU3)
	BT	FU3	
Group A (n=28)	102.10 \pm 10.62	97.70 \pm 19.22	4.40 \pm 18.457 t =1.306 p = .202 NS
Group B (n=27)	99.03 \pm 10.0	97.8 \pm 10.0	1.23 \pm 0.8 t = 7.870 p=.000 HS
Group C (n=28)	100.17 \pm 10.655	90.87 \pm 8.1	9.3 \pm 6.04 t =8.424 P =.000 HS
Between the group comparison, One-Way ANOVA	F=.660 p=.519 NS	F=2.644 p=.077 NS	-

Table 7 : Effect of treatment on ABDOMINAL CIRCUMFERENCE (n=83)

Groups	AC. Mean \pm SD		Within the group comparison, Paired 't' test, (BT - FU3)
	BT	FU3	
Group A (n=28)	108.80 \pm 12.8	108.17 \pm 13.4	0.69 \pm 0.4 t =7.206 p = .678 NS
Group B (n=27)	114.6 \pm 11.4	112.20 \pm 11.5	1.3 \pm 0.9 t = 10.6 p=.000 HS
Group C (n=28)	114.93 \pm 10.2	108.10 \pm 10.8	5.83 \pm 0.4 t =4.536 P =.000 HS
Between the group comparison, One- Way ANOVA	F=2.663 p=.075 NS	F=1.484 p=.233 NS	-

Table 8: Effect of treatment on WAIST CIRCUMFERENCE (n=83)

Groups	WAIST CIRCUMFERENCE Mean \pm SD		Within the group comparison, Paired 't' test, (BT - FU3)
	BT	FU3	
Group A (n=28)	77.06 \pm 3.12	72.70 \pm 0.94	4.64 \pm 2.08 t=2.71 p = 0.014 S
Group B (n=27)	76.2 \pm 3.4	73.0 \pm 1.2	3.16 \pm 3.05 t =4.536 P =.000 HS
Group C (n=28)	78.7 \pm 3.0	72.7 \pm .7	6.02 \pm 3.1 t = 10.6 p=.000 HS
Between the group comparison, One- Way ANOVA	F=4.884 p=.010 NS	F=1.351 p=.264 NS	-

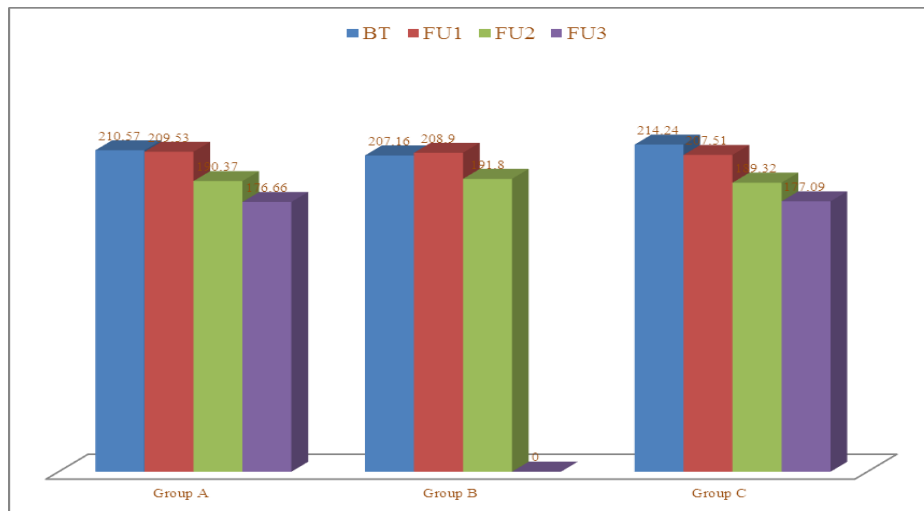


Figure 1: EFFECT OF TREATMENT ON SERUM CHOLESTEROL

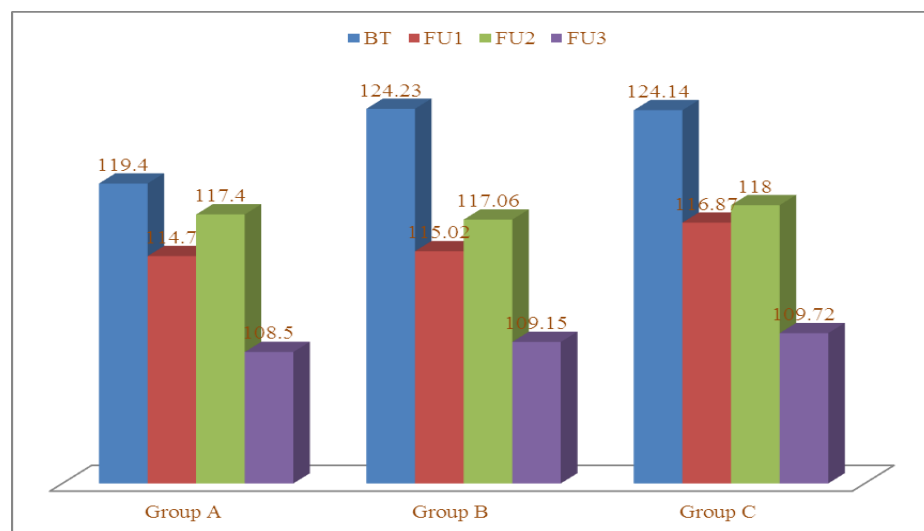


Figure 2: EFFECT OF TREATMENT ON LDL

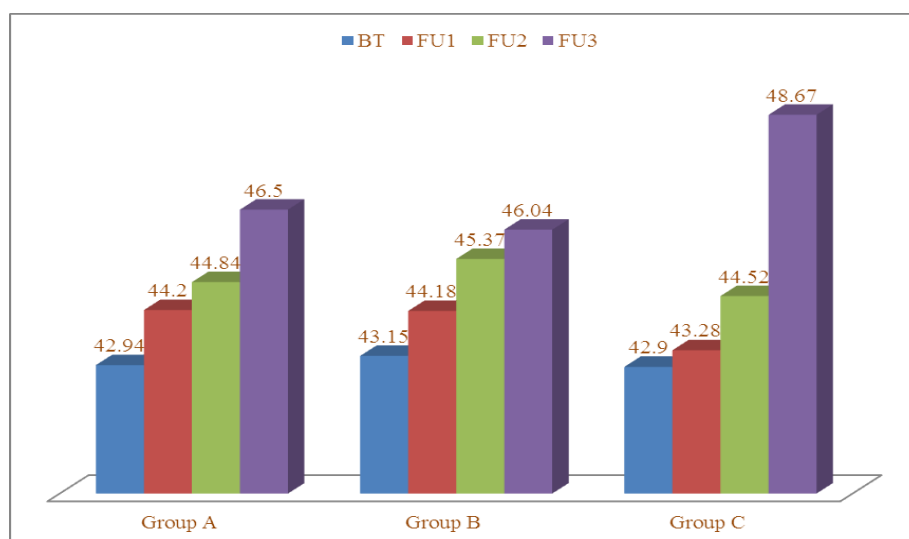


Figure 3: EFFECT OF TREATMENT ON HDL

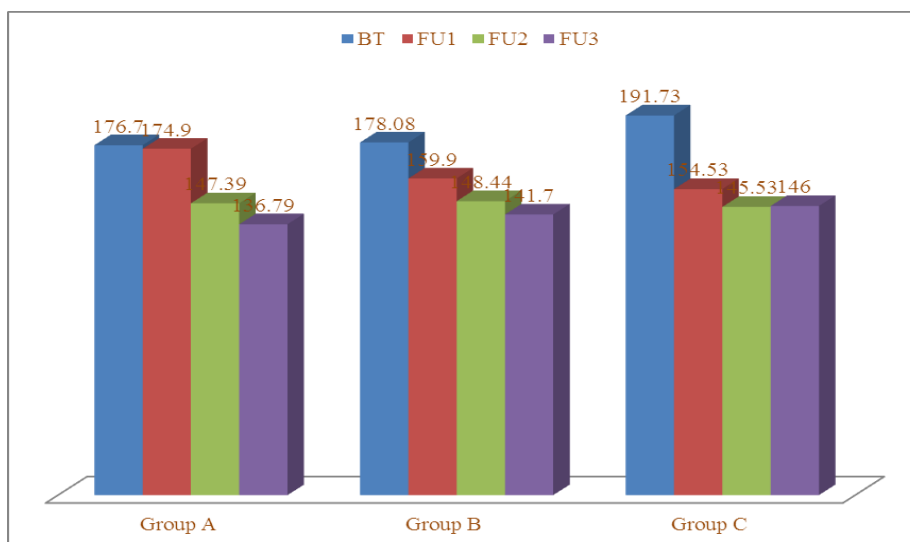


Figure 4: EFFECT OF TREATMENT ON TRIGLYCERIDES

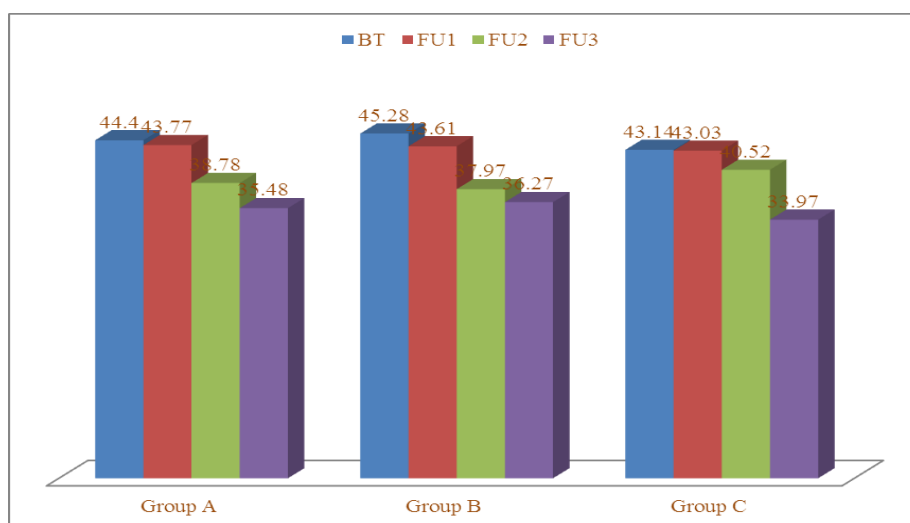


Figure 5: EFFECT OF TREATMENT ON VLDL.

DISCUSSION

Demographic data: Age of 45 yrs or more in males whereas an age of 55 yrs or more in female are predisposing factors for hyperlipidaemia.^[1] Regarding the **gender**, the results correlate with Chadha et al. which reported 50% among women of hypercholesterolemia and 44% among men.^[2] High prevalence among women is due to less physical activity relatively to men. With respect to **income** similar findings are found in the study of Mohan et al., higher incidence of hypercholesterolemia in middle income group (24.2%) as compared to low-income group(14.2%).^[3] This is due to high intake of fast foods or oily stuff added with less physical activity by middle income as compare to low income groups where hyperlipidemia are prevalent. Regarding the **occupation status**, Housewives are adapted to a sedentary

lifestyle which in turn results in fat accumulation. Persons doing service were also having sedentary lifestyle, and deal with stressful conditions. They also mostly consuming fast food or canteen foods rich in calories and fat leading to Hyperlipidaemia. Regarding the **marital status**, the Hyperlipidemia mostly occurs in the middle age (after general wedding age). This is due to their high calorie diet of personal choice at home and lack of exercise. Regarding the **residence**, large number of patients come from nearby rural area to BHU hospital, hence more patients are from rural background. Regarding **Deha Prakriti**, maximum belonged to *Kapha Pradhana Prakriti*, because there is dominance as well as an association of *Kapha Dosha* in the causation of hyperlipidemia. Individual with a *Kapha* predominant constitution, associated with *Kapha* aggravating factors it results in an instantaneous aggravation of *Kapha Dosha*.^[4] Vitiating of *Kapha Dosha* leads to the *Dhatvagni Mandya* resulting in *Amamedha Dhatu* which is main culprit in pathogenesis of hyperlipidaemia. Regarding **Manasa Prakriti**, predominance of *Tamasa and Rajasa Pradhana* individuals is supported by *Bhavaprakash*, as he advocates increase *Tamo Guna* and declined *Satvaguna* for the occurrence of *Medo Roga*.^[5] *Tamasic* persons practices excessive sleep, sedentary lifestyle and excessive indulgence in food^[6] which in turn leads hyperlipidemia. *Rajasic* persons also inclined towards pleasures of the palate and are habituated to various indulgences in food, alcohol, smoking etc. All of the mentioned factors result in an excessive intake of calories, smoking and alcohol intake leads to impair the lipoprotein metabolism and hyperlipidemia. The present data with respect to **Sara**, revealed that had *Pravara sara* reflects increased quantity of *Medo Dhatu* present in hyperlipidemia. Further *Pravara Satmya* predominance reflects the patient of hyperlipidemia consume all rasa in excess amount lead to fat accumulation and impair lipid metabolism. Most had **positive family history**, indicating that it is inherited like hypertension, Diabetes mellitus and obesity. This may be due to faulty lifestyle and diet practices in family.

Objective parameters: Maximum were obese with increased **BMI**, they have high levels of leptin reflect resistance to its weight reducing effects but its stimulatory effects on the sympathetic nervous system are preserved. This selective leptin resistance contributes to its role in obesity related hyperlipidemia.^[7] On the other hand, circulating plasma concentration of adiponectin is decreased with visceral fat accumulation, and hypo adiponectinemia is now recognized as a strong risk factor for hyperlipidemia and CVD in obese subjects.^[8] Obesity is associated with adipose tissue inflammation with macrophage infiltration, and the production of a number of pro-inflammatory cytokines, which inhibit adiponectin synthesis and release.

Regarding increased **waist circumference** in most of the patients, the absolute waist circumference greater than 102 cm (40 inches) in men and greater than 88 cm (35 inches) in women confirm the existence of abdominal obesity.^[9] Abdominal adiposity assessed using waist circumference is considered to be more appropriate to predict metabolic disorders than generalized adiposity assessed by BMI. Higher level of leptin and lower level of adiponectin were found among subjects with higher WC (≥ 71 cm) which is consistent with the reported association between low adiponectin and high leptin with the risk of hyperlipidemia and CVD.^[10] In the present study it was observed that, Modern psychiatric research also shows the relation between stress and depression through disturbance of Hypothalamo-Pituitary-Adrenal (HPA) axis releasing more amount of Cortisol- stress hormone in the blood. Cortisol results in increase FFA and impaired lipoprotein metabolism. Although stress-induced hyperlipidemia and increased oxidative stress have been reported and implicated in etiology of atherosclerosis^[11] Even in Ayurveda excessive worries are causative factors for the vitiation of *Rasavaha Srotas* (*Rasavaha Srotas Dusti Hetu Rasavahini Dusyanti Chintanam Ati Chintanat*) and it can be linked with oxidative stress mentioned in modern science. Regarding **Associated diseases**, previous research reviews that hyperlipidemia induce oxidative stress on vascular wall, leads to atherosclerosis^[12] and also causes also impairment in several mechanisms implicated in blood pressure control such as increase sympathetic system, decrease NO, increase RAS and increase sodium and water retention.^[13] In diabetes all lipids and lipoproteins are effected. High blood glucose and insulin resistance leads to more FFA, accumulation of Chylomicron and very-low-density lipoprotein (VLDL) remnants and triglycerides enrich high-density lipoprotein (HDL) and low-density lipoprotein (LDL), leading to high levels of potentially atherogenic particles and low levels of HDL cholesterol.^[14] Thus hyperlipidaemia go hand by hand with Hypertension and DM. Low thyroid levels (hypothyroidism) are associated with higher risk for high total and LDL cholesterol, and triglycerides and can be taken as a secondary causative factor for Hyperlipidaemia. High prevalence are found of ED in hyperlipidemia.^[15]

Effect of treatment on various subjective criteria: The difference in the results obtained is attributed to the *Rasayana* effects of the *Rasona* along with the dietary and lifestyle changes in Group B and additional Yoga practices in group C over that of solitary conventional modern treatment in group A. The above findings are consistent with the *Ama Pachana*, *Deepana* and *Agnivardhana* properties of the drug which result in the reduction in *Ama Medho Dhatu* and thus reduction in *Chala Sphik Udara Stana*, *Kshudra Shwasa*,

Swedadhikya, Daurgandhya, Atipipasa, Jaranashakti, Angagaurava, Sandhishoola and *Gasrasada*. Reduction in *Anga Gaurava, Anga Chalatra, Kshudra Shvasa* and *Sandhishoola* can also be attributed to the loss of body weight caused by the yogic practices.

Mode of Action of Rasona: *Lashuna (Allium sativum)* possess the predominantly *Katu Madhura Rasa, Snigdha, Teekshna, Guru, Sara, Ushna Virya, Katu Vipaka* and as the *Vatahara, Kaphahara* properties. With its predominant *Katu rasa*, it facilitates *Deepana, Paachana* action and helps in the correction of *Medodhatwagnimandya*. According to *Charaka, Katu rasa* possesses, *Mamsa Lekhana, Kaphahara* properties and according to *Bhavamisra Katurasa* is *Medasthoulyapakarshanam, Shleshmaharam*. *Katu rasa* has also got *Sneha, Meda, Kleda Shoshana* properties. *Rasona* also has *Tikta Kshaya Rasa*. *Tikta rasa* possess the *Lekhana* (scraping), *Karshana* (decreases fat), *Rasa, Meda, Kleda, Upashoshana* properties. *Kshaya* is said to be *Lekhanakari, Amastambhakara*. These properties may help in curing *Medoroga*. *Teekshna guna* (sharp) of *Rasona* is opposite to the *Mandaguna* of *Kapha* and also acts as *Srotoshodhaka* and may relieve *Srotoavarodha* (clearing the obstruction of channels) which is found in this disease. *Ushna veerya* and *Katu vipaka* of *Rasona* helps in *Ama Pachana* and *Agni Deepana*. *Ushna* which is said to be *Kaphavata shamakam*. So it may also reduce *Dustakapha* and *Medodhatu*. This metabolic disease demands "*Agnivridhhi*", particularly at the level of *Meda dhatvagni*. When any *Agni* is not proper, *Dhatu*s are not produced properly. Improper function of *Agni* is the root cause for all disease. *Rasona* with its *Deepana* and *Pachana* action encounters *Dhatvagnimandya* and help in *Ama-Pachana*, there by alleviates *Aparipakwa Dhatu* and *Ama*. That in turn helps to proper formation of *Dhatu*s in proper proportion with *Samyak* qualities. There by it ensues *Sarvadhatushoshana*. As the *Lashuna* is *Agrya* in *Vatahara* and also possesses *Kaphahara* property, it reduces *Kapha* or excess *Meda Dhatu* and also balances *Vata* (insulin and other hormone enzyme activity). Hence it may help in promoting the *Medhya*. In this way *rasona* manage both the metabolic and neural pathology of hyperlipidemia. Organo-sulphur compounds are the main active substances responsible for the hypolipidemic and hypocholesterolemic effects of garlic. Allicin extracted from garlic decreases total serum lipids, cholesterol and phospholipids contents in rats fed allicin as compared to control animals.^[16] All these compounds may exert their hypocholesterolemic effect by three different mechanisms; by inhibiting hepatic cholesterol biosynthesis^[17], by enhancing cholesterol turnover to bile acids and its excretion through gastrointestinal tract^[18], or, in the case of plant saponins, by inhibiting cholesterol absorption from intestinal lumen without changing HDL cholesterol levels in hypercholesterolemic animal models.^[19]

Mode of Action of Yoga: Although the mechanisms underlying the putative beneficial effects of *Yoga* therapy on cardiovascular risk profiles are not yet well understood, the observed changes probably occur primarily through 2 pathways. First, by reducing the activation and reactivity of the sympatho-adrenal system and the hypothalamic pituitary adrenal (HPA) axis and promoting feelings of well-being, *Yoga* may alleviate the effects of stress and foster multiple positive downstream effects on neuroendocrine status, metabolic function and related inflammatory responses.^[20] Second, by directly stimulating the vagus nerve, *Yoga* may enhance parasympathetic output and thereby shift the autonomic nervous system balance from primarily sympathetic to parasympathetic, leading to positive changes in cardiac-vagal function, in mood and energy state, and in related neuroendocrine, metabolic and inflammatory responses.^[21] *Yoga* may also provide a positive source of social support, a factor strongly associated with CVD risk, may aid in improving health-related attitudes and lifestyle choices, in part by enhancing psychological well-being, and in this way may play an important role in hyperlipidemia^[22] prevention and health promotion.

CONCLUSION

Hyperlipidemia is the major cause for cardiovascular diseases. In Ayurveda *Medoroga* a condition characterized by abnormal accumulation of *Medodhatu* can be correlated with Hyperlipidaemia. *Rasona* should be included in daily life as a *Rasayana* for prevention and management of hyperlipidemia. Yogic practices reduce *Kapha* and *Meda*, and brings about purification of *Nadi* and relaxation of mind, thus normalize the body metabolism and thus help in controlling hyperlipidemia and also preventing the complications. On intra-group comparison all the three groups were highly significant with respect to most of the objective parameters and subjective parameters. On inter-group comparison among three groups, Group C was most effective showing the synergistic effect of *Yoga* and *Rasona Rasayana*. The treatment is non-pharmacological, cost effective and devoid of side effects, so it can be applied in the community easily.

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