Clinical Study of effectiveness of the *Amritadya guggulu* in Hyperlipidemia (*Medho roga*)

Abstract

Hyperlipidemia is a medical condition characterized by an increase in one or more of the plasma lipids. According to classical writings, Ayurveda referred to hyperlipidemia as *Medo Roga*.The purpose of the study was to study the effect of *Amritadya guggulu* on hyperlipidemia. Methodology: Study was Randomized, Comparative clinical study. with duration of the eight weeks and two months follow up period. 44 Patients were selected randomly from outdoor patient department of Swastavritta clinic , National Ayurveda Teaching Hospital, Borella. Treatment effectiveness is based on subjective and objective parameters. . The University of Colombo's Institute of Indigenous Medicine was provided ethical clearance Total cholesterol, Triglyceride, HDL, LDL, VLDL and Risk Ratio in Lipid profile were assessed before and after the treatment. Results: The majority of them were between age of 50 and 59 i.e. 36.4%. All were married, with females accounting for 79.5%. Most of the participants were Buddhist (90.9%) and Sinhala (93.2%).The large amounts, 75%, lived in urban areas. There was a family history of hyperlipidemia in 33.3%. *Amrithadya guggulu* significantly reduced total cholesterol ($p<0.01$), LDL ($p<0.05$), and risk ratio ($p<0.05$). Significant reduction in BMI and weight ($p<0.01$). Results showed substantial changes in systolic and diastolic blood pressure levels before and after treatment ($p<0.01$). Symptoms of hyperlipidemia included thirst (*Thrusha*), hunger (*Kshuth*), daytime sleepiness (*Swapna*), hyperhidrosis (*Ati Sweda*), and offensive body odor (*Daugandya*),lack of body strength(*Daurbalya*) and difficulty in breathing(*Kshudra Shwasa*)were greatly reduced ($p<0.001$), except for Impaired or decreased Sexual Performance(*AlpaMaithuna*) ($p>0.05$).The present study concluded as *Amritadya guggulu* had significant result on elevated lipid profile and symptoms of in hyperlipidemic patients.

Key words*: Amritadya guggulu*, Hyperlipidemia, Lipid profile, *Medho roga*

Introduction

A medical disorder known as hyperlipidemia is defined by a decrease in high-density lipoprotein levels and an increase in one or more plasma lipids, such as triglycerides, cholesterol, and plasma lipoproteins, such as very low-density lipoprotein and low-density lipoprotein[1]. Hyperlipidemias can be categorized as acquired (also known as secondary) when they arise from another underlying condition that alters the metabolism of lipoproteins and plasma lipids, or familial (also known as primary) when they are brought on by particular genetic defects.An genetic disorder known as familial hypercholesterolemia results in elevated LDL (low-density lipoprotein) cholesterol levels from birth, a 1 in 2 (50%) probability of passing on the mutated gene to each of the offspring, and early heart attacks.[2].Elevated cholesterol raises the risk of stroke and heart disease. High cholesterol is the cause of one-third of ischemic heart disease worldwide. An estimated 2.6 million fatalities (4.5 percent of all deaths) are attributed to elevated cholesterol. As a risk factor for ischemic heart disease and stroke, elevated total cholesterol is a significant contributor to the disease burden in both the developed and developing worlds.[3].Furthermore, throughout the Asia-Pacific area, cardiovascular disease (CVD) is becoming one of the major health concerns.

In 2008, the WHO estimated that the prevalence of dyslipidemia, which is defined as blood levels of TC > 5 mmol/L [190 mg/dL], was significantly lower in Southeast Asia (30.3%) and the Western Pacific (36.7%) than in Europe (53.7%) and the Americas (47.7%)[4]. An independent risk factor for ischemic heart disease is hyperlipidemia. In 2019, ischemic heart disease was the top cause of hospital deaths. For the majority of the primary leading causes of mortality, male fatalities are comparatively higher than equivalent female deaths[5].

According to basic concepts in Ayurveda text *Amritadya Guggulu* with bee honey was suitable drug for Hyperlipidemia and which is indicated in many Ayurveda texts such as *Govinda Dasji Bhisagratna*, (1956) *Bhaisajya Rathnavali* Volume 2, *MedoRoga*,Chapter 39[6],*Sri Jagadishvara Prasad Tripathy*,(1983)*Chakradatta*,*Athisthulya* Chikithsa,Chapter,33[7] ,*Bulusu Sitaram*(2010) *Bhavaprakasa* of *Bhavamisra* (Original text along with commentary and translation), *Madhyamakhanda*,Chapter 39[8] .

Table 1. Ingredients of *Amrtadya Guggulu*

Sanscrit name	**Scientific name**	**Part used**	**Proportion**
Amrita	*Tinosphora cordifolia*	Stem	1 Part
Ela	*Elittaria cardamomum*	Seed	2 Part
Vidanga	*Embelia Ribes*	Seed	3 Part
Vatsaka	*Holarrhena antidysentrica wall*	Stem	4 Part
Kalinga	*Holarrhena antidysentrica seed*	Seed	5 Part
Pathya	*Terminalia chebula*	Fruit	6 Part
Amalaki	*Phyllanthus emblica*	Fruit	7 Part
Guggulu	*Commiphora mukul*	Oleogum resine (from stem)	8 Part

According to the Table 1. drugs were mixed in an increasing order, thus the highest ingredient being *Guggulu*.

Moreover, they have mentioned that Powder form of *Amritadya Guggulu* administrating with bee honey that is a *Anupana* (vehicle). *Anupana* is a vehicle taken with medicine and which assists the action of main ingredient and plays an integral part of absorption of the medication (*Charaka Samhitha, Chikithsa Adyanaya*)[9] As well as bee honey has hypolipidaemic action[10].In this case bee honey will facilitated absorption of *Amritadya Guggulu* to the body.

According to Ayurveda theories Hyperlipidemia also caused by imbalance of agni and increase of *Kapha* and *Medodhathu*. So *Kaphamedhagna* (Reduced *Kapha* and *Medodhathu*) treatment is essential in this condition. According to the above text books in Ayurveda, which

were *Bhaisajya Rathnavali* and *Chakradatta* have mentioned that *Amritadya Guggulu* has the effect of hypolipideamic actions[6,7,8].

Table 2. Properties of ingredients of *Amritadya Guggulu* according to Ayurveda[11]

Name of the ingredient	***Rasa***	***Guna***	***Virya***	***Vipaka***	***Dosha Ghana***	***Karma***
Tinosphora Cordifolia	*Tiktha, Kasaya Madhura*	*Guru, Snigda*	*Ushna*	*Mdhura*	*Pitta,vata,kapha shamaka*	*Rakthashodaka, Deeepana, Pachana*
Elittaria cardamomum	*Katu. Tikta*	*Ruksha, Laghu*	*Seeta*	*Katu*	*Pitta,vata,kapha shamaka*	*Hardya, Muthrajanaka, Deepana, Pachana*
Embelia Ribes	*Katu, Tikta,*	*Lagu, Thishna*	*Ushna*	*Katu*	*Vata,Kapha shamaka*	*Deepana Pachana*
Holarrhena antidysentrica wall	*Tiktha, Kasaya Katu*	*Ruksha, Laghu*	*Sheetha*	*Katu*	*Kapha, Piththa-shamaka*	*Lekhana,Deepana, Rakthshodaka, Dhathushoshana*
Holarrhena antidysentrica seed	*Tiktha, Kasaya katu*	*Ruksha, Laghu*	*Sheetha*	*Katu*	*Kapha, Piththa-shamaka*	*Deepana, Sangrahi, Vathanulomaa*
Terminalia chebula	*Madura, Amla, Katu, Tikta,Kasaya*	*Ruksha, Laghu*	*Ushna*	*Madhura*	*Vatha-shamaka*	*Deepana, Pachanama, Mruduvirechana*
Phyllanthus emblica	*Madura, Amla, Katu, Tikta Kasaya*	*Ruksha, Guru*	*Sheetha*	*Madhura*	*Vata, Kapha shamaka Specially pitta-shamana*	*Dahaprashamana, Medya, Hardya, Yakruythuththejaka*
Commiphora Mukul	*Tiktha, Kasaya, Madura, katu*	*Purana-Laghu, Theeksh na,Ushn a,,Sara, Sukshm a, Navina*	*Ushna*	*Katu*	*Pitta,,vata, kapha shamaka*	*Lekhana, Vedanasthapana, Deepana, Anulomana*

		Pichchila. *Snigda*				

Acharya Charaka describes in detail the etiology, pathogenesis, pathophysiology, signs and symptoms, complications, prognosis, and management of *sthaulya* in the chapter "*Ashtaunindeetiya Adhyaya*."[12] *Atisthaulya* is also described in relation to *Nanatmaja Vikara* of *kapha. Acharya Charaka* also introduces the concepts of *Bandha* and *Abaddhameda* in relation to *sthaulya*: *Baddhameda* refers to solid or obvious fat of the body, while *Abaddhameda* refers to free or mobile fat. He explains that *Atisantarpana* (over-nourishment) results in obstructive pathology in the *Rakta Marga* (blood channels) and causes morbid *Medodhatu* (fat tissue) and *Kaphadosha*. The text also explains in detail about *Kapha* and *Vata*, their causes for *Vriddhi* (growth) and *Prakopa* (aggravation), and provides a complete picture of the pathophysiology of *Avarana* (blockage)[13].

According to the Table 2.2 Ayurveda each ingredient of *Amritadya guggulu* has properties of *Kapha Vata shamaka* which caused to reduce signs and symptoms of *Medo roga*.

Objectives

To study the effect of the *Amritadya guggulu* on Hyperlipidemic patients.

Methodology

Present study was Randomized, Comparative clinical study. Duration of the clinical research was eight weeks and two months follow up period. 44 Patients were selected randomly from outdoor patient department of *Swastavritta* clinic from, National Ayurveda Teaching Hospital(NATH), Borella. Ethical Clearence was granted by Ethics Review Committee of Institute of Indigenous Medicine, University of Colombo. Patients were registered for the study, after collecting their consent his/her willingness to the volunteer participation for the research. Patients were d examine their general health condition with relevant blood tests.

Inclusion criteria:-Patients who exhibit high levels of total cholesterol, LDL, VLDL, triglycerides, and lower HDL (serum total cholesterol >240 mg/dl, HDL < 40 mg/dl, serum triglycerides >150 mg/dl, LDL >160 mg/dl, and VLDL >30 mg/dl) and in between the ages of 30 and 75 years were included in the study.

Exclusion criteria: Patients with known heart diseases (eg :- Angina, Congenital heart diseases), with severe hypertension (>160/100Hgmm), age below 29 and over 76 years, and pregnant and lactating mothers, patients with chronic disease conditions excluded.

Each selected patients were screened with lipid profile test, liver function tests, fasting blood sugar, serum creatinine, and GFR tests before starting the treatment and after completing the 8-week period. Data on socio-demographic characteristics such as age, gender, religion, ethnicity, and others were gathered through a questionnaire. Patients visited the clinic once more after the follow-up period for a final. check-up.

Patients were prescribed with *Amritadya Guggulu* powder 7.5g mixed with one and half teaspoon of bee honey, Morning (Around 8.00 a.m.) and evening(Around 8.00 p.m.) after meal according to the prescription in *Bhaisajya Rathnavali* [6] .

After the treatment period, each patient was assessed through lipid profile, liver function tests (SGPT, SGOT), serum creatinine, eGFR and fasting blood sugar tests. The signs and symptoms of *Medoroga*(Hyperlipidemia)as*Thrusha* (Thirst),*Kshuth* (Hunger),*Swapna* (Daytime Sleepiness) ,*Ati Sweda* (Hyperhidrosis) *Daurgandya* (Offensive Body Odor). *Daurbalya* (lack of Body Strength) and *Kshudra Shwasa* (Difficulty in breathing) and Maithuna (Impaired or decreased Sexual Performance)and complications of *Medoroga* (Hyperlipidemia) were assessed before and after treatment. Additionally physical examinations (wight, waist circumference, MUAC -mid-upper arm circumference and vital

signs blood pressure, pulse, and respiratory rate) were measured at each weekly clinic visit. Efficacy of the treatment is determined on subjective and objective parameters.

Results

Table 3. Distribution of the Sociodemographic characteristics of the respondents.

Characteristics	Frequency (N)	Percentage %
Age		
30-39	5	11
40-49	9	21
50-59	16	36
60-69	9	21
70-79	5	11
Gender		
Male	9	20.5
Female	35	79.5
Civil status		
Unmarried	0	0
Married	44	100
Monthly income		
Below 10000	21	47.7
10000-20000	1	2.3
20000-30000	6	13.6
30000-40000	1	2.3
40000-50000	5	11.4
Above 50000	10	22.7
Occupation		
Government	5	11.4
Private	12	27.3
Self occupation	3	6.8
Not engaged in occupation	24	54.5
Religion		
Buddhist	40	91
Catholic	2	4.5
Hindu	2	4.5
Race		
Sinhala	41	93.2
Tamil	3	6.8
Education		
Primary	5	11.4

Up to O/L	18	40.9
Up to A/L	15	34.1
Degree	6	13.6
Living area		
Urban	33	75.0
Suburban	7	15.9
Rural	4	9.1
Family history		
Yes	15	34.1
No	29	65.9

In the present study as shown in Table 3. Most of them were 50-59 age group i.e.36.4%.All were married and female 79.5% .Most individuals in private employment (27.3%) and a larger number not engaged in any occupation (54.5%),Higher percentage (47.7%) of them earned below 10,000 Sri Lankan Rupees. The majority of participants were Buddhist 90.9%. Sinhala ethnicity was predominant 93.2%.Most of the respondents were education level up to O/L(40.9%). A majority lived in urban areas 75%. Family history of hyperlipidaemia 33.3%.

Table 4. Effect of the treatment on lipid profile before and after by using Paired sample T test.

	Mean		**Mean Def.**	**Std. D.**	**SEM**	**95% C.I.D**		**T value**	**P value**
	BT	**AT**				**Lower**	**Upper**		
Total Cholesterol	265.15	244.87	20.28	44.828	6.75	6.65	33.91	3.00	**.004**
Triglycerides	171.69	175.07	-3.38	56.800	8.56	-20.64	13.88	-.39	.695
HDL	52.95	52.69	.26	9.1588	1.38	-2.53	3.039	.18	.855
LDL	178.32	157.14	21.18	46.352	6.98	7.09	35.278	3.03	**.004**
VLDL	34.77	34.57	.20	11.917	1.79	-3.42	3.820	.11	.913
Risk Ratio	5.20	4.85	.35	1.094	.16	.02078	.6860	2.14	**.038**

BT-Before Treatment, AT-After treatment, Mean Def.-Mean Difference, Std.D.-Slandered Deviation, SEM-Slandered error of mean, C.L.D-Confidence Interval Difference.

There was a statistically significant reduction in total cholesterol (mean difference = 20.28, p = 0.004), indicating a positive effect of the treatment. There was higher mean difference. As well as a significant reduction in LDL levels was observed (mean difference = 21.18, p = 0.004), suggesting that the treatment had a positive impact on LDL cholesterol. However significant change was not found in VLDL levels (mean difference = 0.20, p = 0.913

Also significant change was observed in the risk ratio (mean difference = 0.35, p = 0.038), which indicates an improvement in cardiovascular risk. Significant change was not observed in triglyceride levels (mean difference = -3.38, p = 0.695), suggested that the treatment did not have a notable effect on triglycerides. Result was found as significant change was not observed in HDL levels (mean difference = -0.26, p = 0.855), indicating that the treatment did not affect the good cholesterol.

Table 5. Effect of treatment on BMI within group before and after by using Paired sample T test.

	Mean		**Mean deff.**	**SD**	**SEM**	**95% C I. D.**		**T value**	**P value**
	BT	**AT**				**Lower**	**Upper**		
BMI	26.900	26.039	.861	1.730	.260	.335	1.388	3.303	**.002**

The Paired Samples T-Test results indicated a statistically significant reduction in Body Mass Index (BMI) before and after the treatment. The mean difference in BMI is 0.861, with a standard deviation of 1.730. With a p-value of 0.002 and a t-value of 3.303, the results show that the reduction in BMI after treatment is statistically significant at a 95% confidence level.

Table 6. Effect of treatment on Liver function and Kidney function test parameters within group before and after by using Paired sample T test

	Mean		**Mean def.**	**Std. d.**	**SEM**	**95% C.I.D.**		**T value**	**p value**
	BT	AT				Lower	Upper		

SGPT	31.334	31.227	.106	18.544	2.795	-5.531	5.744	.038	.970
SGOT	32.911	28.584	4.327	21.279	3.208	-2.142	10.796	1.349	.184
Se. Cre.	.799	.842	-.042	.108	.016	-.075	-.009	-2.58	**.013**
GFR	102.641	82.370	20.271	124.792	18.813	-17.66	58.212	1.078	.287

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Within Group the Paired Samples T-Test results for liver and kidney function parameters showed the following: SGPT with mean difference = 0.106, and p-value of 0.970, indicating no significant change. SGOT with mean difference = 4.327, and p-value of 0.184, indicating no significant change. For kidney function, Serum Creatinine: Mean difference = -0.042, with a p-value of 0.013, indicating a statistically significant change. eGFR with mean difference = 20.271, and p-value of 0.287, indicating no significant change. The results suggested that there were no significant changes in liver function (SGPT and SGOT) or eGFR, but there was a significant change in serum creatinine levels within Group before and after the treatment, with a p-value of 0.013.

Table 7. Effect of treatment on weight before and after by using Paired sample T test.

			Mean def.	**Std. d.**	**SEM**	**95% C.I.D**		**T value**	**P value**
	AT	**BT**				**Lower**	**Upper**		
weight	64.415	62.523	1.892	3.7769	.5694	.743	3.040	3.323	**.002**

In the group the Paired Samples T-Test results showed a statistically significant reduction in weight before and after the treatment. The mean weight difference is 1.892, with a standard deviation of 3.7769. With a t-value of 3.323 and a p-value of 0.002, this change is significant at a 95% confidence level. Reduction in weight is treatment effectively reduced weight within Group .

Table 8. Effect of treatment on FBS before and after by using Paired sample T test.

	Mean		**Mean def.**	**S.D.**	**SEM**	**95% C.I.D**		**T value**	**P value**
	BT	**AT**				**Lower**	**Upper**		

FBS	109.25	113.16	-3.918	15.198	2.291	-8.539	.702	-1.710	.094

Paired Samples T-Test results indicated that there was no statistically significant change in fasting blood sugar (FBS) within Group before and after the treatment. The mean difference in FBS is -3.918, with a standard deviation of 15.198. The t-value is -1.710, and the p-value is 0.094, which is greater than 0.05, showing that the change is not statistically significant**.**

Table 9. Effect of treatment on Systolic and Diastolic blood pressure within group before and after by using Paired sample T test.

			Mean	**SD**	**SEM**	**95% CID**		**T value**	**P value**
	AT	BT				**Lower**	**Upper**		
Systolic .BP	121.14	109.55	11.591	11.603	1.749	8.063	15.118	6.627	**.001**
Diastolic .BP	76.59	71.14	5.455	8.478	1.278	2.877	8.032	4.268	**.001**

The Paired Samples T-Test results indicate significant changes in both systolic and diastolic blood pressure within the group on before and after the treatment. The mean difference was 11.591, and p-value of 0.001, indicating a statistically significant reduction in systolic blood pressure. The mean difference is 5.455, with a p-value of 0.001, indicating a statistically significant reduction in diastolic blood pressure. Both p-values were well below the 0.05, suggesting that the treatment had a significant effect on reducing both systolic and diastolic blood pressure within group .

Table 10. Effect of the symptoms before and after on the treatment by using Wilcoxon signed rank test.

Symptoms	**Z value**	**Mean Rank**		**P value**
		Negative	**Positive**	
Thirst	-5.23	17.58	15.00	.001
Hunger	-4.80	15.00	00.00	.001

Sleepiness	-4.94	18.24	27.50	.001
Hyperhidrosis	-4.09	12.20	7.50	.001
Body Odor	-4.96	14.50	00.00	.001
Sexual performance	-.677	8.88	7.00	.499
Body strength	-4.75	18.38	20.50	.001
Difficult in breathing	-5.23	18.00	00.00	.001

In study group Thirst, Hunger, Sleepiness, Hyperhidrosis, Body Odor, Body Strength, and Difficulty in Breathing all showed statistically significant improvements after treatment, with p-values <0.001. The Z-values for these symptoms are relatively high (ranging from -4.09 to -5.23), indicating substantial changes in symptom severity from pre-treatment to post-treatment. However there were not Significant Improvement in Sexual Performance($p>0.05$) . Sexual performance has a p-value of 0.499, indicating no statistically significant change. The Z-value for sexual performance is -0.677, much lower than for the other symptoms. This result suggests that the treatment did not have a measurable effect on sexual performance in this group.

Table 11. Effect of the symptoms of Santhoma, Xanthelasma and Arcus cornea before and after treatment by using Wilcoxon signed rank test.

Symptoms	**Z value**	**Mean Rank**		**P value**
		Negative	**Positive**	
Arcuscorneae	0.00	00.00	00.00	1.000
Santhoma	0.00	00.00	00.00	1.000
Xanthalesma	-1.00	00.00	00.00	1.000

In group B all three symptoms Arcus cornae, Santhoma, and Xanthalesma have p-values of 1.000. This indicates that there was no measurable improvement in these symptoms after

treatment. Arcus cornae and Santhoma has a Z-value of 0.000, which suggested that there was no observed change in severity for any of these symptoms.

Table 12. Effect of the complication before and after on the treatment.

Symptoms	Z value	Mean Rank		P value
		Negative	Positive	
Pendulous abdomen	-1.73	00.00	2.00	.083
Pendulous Buttoks	-1.73	00.00	2.00	.083
Pendulous Breast	-1.73	00.00	2.00	.083

In group B the p-values for all three parameters Pendulous Abdomen, Pendulous Buttocks, and Pendulous Breast was 0.083. These values were still above the standard threshold of 0.05, meaning they are not statistically significant.The Z-values for all three symptoms were -1.732, indicating some change was observed, but it was not substantial enough to reach statistical significantly.

Table 13. Treatment's effect on the lipid profile both before and after treatment follow-up using the Paired Sample T test.

	Mean		Mean def.	SD	SEM	95% CID		T value	p value
	AT	BT				Lower	Upper		
Follow up TC	263.54	223.16	40.38	42.944	8.766	22.241	58.508	4.606	**.001**
Follow up Try	156.39	160.66	-4.27	59.337	12.112	-29.326	20.785	-.353	.728

follow up HDL	56.912	54.791	2.12	13.971	2.851	-3.778	8.020	.744	.465
Follow up LDL	176.17	136.24	39.93	45.789	9.346	20.602	59.272	4.273	**.001**
follow up VLDL	31.254	32.133	-.879	11.888	2.426	-5.899	4.140	-.362	.720
Follow up risk ratio	4.7804	4.220	.56	1.100	.224	.095	1.024	2.493	**.020**

The Paired Samples T-Test results showed statistically significant changes in Total Cholesterol with the mean difference is 40.38, and the p-value is 0.001, indicating a statistically significant change in total cholesterol levels after the follow-up. LDL with the mean difference was 39.93, and p-value of 0.001, showing a significant increased in LDL levels after the follow-up. Risk Ratio with the mean difference is 0.56, and p-value of 0.020, indicating a significant change in the risk ratio after the follow-up.

There were no statistically significant changes of Triglycerides with the mean difference was -4.27, and p-value of 0.728, indicating no significant change in triglyceride levels. HDL with the mean difference was 2.12, and p-value of 0.465, indicating no significant change in HDL levels. VLDL with the mean difference is -0.879, with a p-value of 0.720, indicating no significant change in VLDL levels.

Table 14: Treatment effects on FBS, kidney function test, and liver function test before and after follow-up using the Paired Sample T test.

	Mean		**Mean**	**SD**	**SEM**	**95% C.I.D**		**t value**	**P value**
	AT	BT				**Lower**	**Upper**		
Follow-up SGOT	23.916	23.625	.291	9.87	2.014	-3.876	4.459	.145	.886
Follow-up SGPT	24.500	24.083	.416	11.57	2.362	-4.469	5.303	.176	.862
Follow-up S.cr.	.775	.733	.041	.10	.0219	-.003	.087	1.900	.070
follow-up	116.95	86.724	30.229	168.07	34.307	-40.740	101.199	.881	.387
Follow-up FBS	115.12	106.04	9.083	48.84	9.971	-11.543	29.710	.911	.372

Table 14. represented the results of a paired samples t-test, comparing pre- and follow-up values for various parameters (SGOT, SGPT, serum creatinine, GFR, and FBS) across group. According to the Observations SGOT : No significant difference (p = .886).SGPT : no significant differences (p = .862).

Serum Creatinine.: not significant (p = .070).GFR : no significant differences (p = .387).FBS : no significant differences (Group B: p = .372).The results of the Paired Samples Test indicate that there were no statistically significant differences between the pre- and follow-up measurements across all variables. Overall, the analysis suggests that there were no substantial changes in SGOT, SGPT, serum creatinine, GFR, or FBS levels from pre- to follow-up measurements in group.

Discussion

Hypolipidemic Action of *Amritadya Guggulu* according to Ayurveda

According to the antient text *Amritadya Guggulu* contained *Amrita* (*Tinosphora cordifolia*),Ela(Elittaria *cardamomum*),*Vidanga*(*Embelia Ribes*),*Vatsaka* (*Holarrhena antidysentrica wall*),*Kalinga*(*Holarrhena antidysentrica seed*),*Pathya* (*Terminalia chebula*),*Amalaki* (*Phyllanthus emblica*) and *Guggulu*(*Commiphora mukul*) in increasing quantity. Most of the ingredients were kaphahara in mode of action. As the drugs are mixed in an increasing order, thus the highest ingredient being *Guggulu* which was *Kaphahara*[9].Additionally, the largest concentration of Guggulu is seen in *Shuddha Guggulu*. Furthermore, it possesses the qualities of *Katu rasa, laghu ruksha guna, Ushnaveerya, Katuvipaka,* and *KaphaVata Shamaka*. Additionally, it has the following qualities: *Kleda-Meda Shoshaka* (scrap out excess *Meda* and *Kapha*), *Srotovishodhaka* (open the microchannels), Paachana (improves digestive power), Deepana (enlighten the *Agni*), and potent in *Lekhana* property[14]. According to Ayurvedic teachings, hyperlipidemia is also brought on by an increase of *Kapha* and *Medodhathu* and an imbalance in Agni. Therefore, treatment with *Kaphamedhagna* is crucial for this illness. Therefore, all of these constituent qualities assisted in eliminating excess *Meda* and *Kapha* and dismantling the pathophysiology of hyperlipidemia.

The resin known as *guggul* (gum guggul) is made by the *Commiphora mukul*. Guggulipid, which is extracted from *guggul*, contains plant sterols (guggulsterones E and Z), which are its bioactive compounds. Research has shown that guggulipid significantly lowers serum total cholesterol, LDL, and triglycerides while increasing HDL[15].

In connection with *sthaulya, Acharya Charaka* also presents the ideas of *Baddha* and *Abaddhameda*: *Abaddhameda* denotes free or mobile fat, whereas *Baddhameda* denotes solid or visible body fat[13].*Abaddha medas*, which travel throughout the body. *Medovilayana* (liquefaction of fat) will result from *Tikta, Katu*, and *Kashaya rasas*. Drugs that are *Rooksha, Sookshma,* and *Ushna* in nature, such *Guggulu, Haritaki, Vidanga,* and *Guduch*i, penetrate deeper channels and eliminate *Sanga* or blockage. Because fat deposits in the arteries, obstruction in the case of hyperlipidemia may manifest as atherosclerosis. Therefore, it aids in the liquefaction of these fatty obstructions due to the aforementioned qualities. *Theekshnagni* are calmed by drugs like *Ela, Amalaki*, and *Kutaja* by their *Sheeta veerya. Haritaki* is 3rd highest ingredient amongst the ingredients, which is *Kashaya rasa pradhana* and best Vatanulomana[16].

A statistically significant decrease in total cholesterol was seen in our study (mean difference = 20.28, p = 0.004), suggesting that the treatment was effective. The mean difference was greater. Additionally, a significant decrease in LDL levels was observed (mean difference = 21.18, p = 0.004), indicating that the therapy improved LDL cholesterol. The risk ratio also showed a significant change in our study (mean difference = 0.35, p = 0.038), indicating a reduction in cardiovascular risk.

Effect on Lipid profile

A previous study found that one group received 30 days of treatment with *Amritadya Guggulu*, and another group received 30 days of treatment with *Amritadya Guggulu* combined with *Yavamalaki Choorna*. Both groups' total cholesterol, LDL, VLDL, and triglycerides were statistically significant at p<0.001, but the group that only received treatment for *Amritadya Guggulu* exhibited a statistically significant decrease in HDL (P=0.043)[16].

Antiobesity effect

Additional findings showed that the Body Mass Index (BMI) decreased statistically significantly both before and after the treatment. The results demonstrated that the decrease in

BMI following therapy is statistically significant at a 95% confidence level, with a mean difference of 0.861 and a p-value of 0.002.According to a previous study, *Amrithadya guggulu* treatment within a group was substantially linked with BMI ($p<0.001$).[16].

Weight loss before and after treatment was statistically significant, according to the results of our study; this difference is significant at a 95% confidence level. Weight loss is a treatment that successfully decreased weight in the study group.A previous study found a strong correlation between weight and receiving *Amrithadya guggulu* within a group ($p<0.001$)[17].

Effect on Blood pressure

With a p-value of 0.001, the medication significantly decreased the group's systolic and diastolic blood pressure in the current study. According to previous research, *guggulu's* hypotension activity was caused by *Meda Shoshana* (lowering *Meda*), *Srotovishodhana* (cleaning the channels), and *Lekhana* (scraping) properties, which are dominant in the body's circulatory system[20]

Effect on Sign and symptoms of *Medoroga*

Thirst, hunger, sleepiness, hyperhidrosis, body odor, body strength, and difficulty breathing all exhibited considerable improvement in the current investigation, indicating that treatment significantly improved these symptoms.According to a previous study, *Amritadya Guggulu* is useful in managing *medogoga* since it possesses *Rasa- Katu, Tikta, Kashaya, Guna- Laghu, Ruksha* and *Virya- Ushna, Vipaka- Katu*, and *Dosha Karma- Kapha Vatashamaka*. The drug's components were clearly detected in *Kapha*-predominant pathologies by its *Rasapanchaka* (Five taste)[18]. It resulted in the symptoms becoming less severe.

Arcuscornae ,Santhoma and Xanthalesma did not exhibit any statistically significant changes when compared before and after. Additionally, no statistically significant alterations were seen in the pendulous breast, pendulous buttocks, or pendulous abdomen. This implied that the medication had no effect on these physical traits. It can result in a longer treatment period than two months. However, a previous study found that when hyperlipidemic individuals received the Ayurvedic medications *Navaka Guggulu* and *Sthaulyahara Kashaya*, the results showed statistically significant cases of pendulous breast, pendulous buttocks, and pendulous abdomen.[19].

Conclusion

Amrithadya guggulu treatment resulted in a statistically significant decrease in the study group's total cholesterol ($p<0.01$), LDL ($p<0.05$), and risk ratio ($P<0.05$). Weight and Body Mass Index (BMI) decreased statistically significantly ($p<0.01$). Both the diastolic and systolic blood pressures changed significantly before and after the treatment, according to the results with $p<0.01$. Symptoms of hyperlipidemia of *Thrusha* (Thirst),*Kshuth* (Hunger),*Swapna* (Daytime Sleepiness),*Ati Sweda* (Hyperhidrosis),*Daurgandya* (Offensive Body Odor),*Daurbalya* (lack of Body Strength) and *Kshudra Shwasa* (Difficulty in breathing)($p<0.001$) were statistically significant observed ($p<0.05$), except *Alpa Maithuna* (Impaired or decreased Sexual Performance) ($p>0.05$). *Amritadya Gugguluis* considered to be a effective Ayurvedic drug for the treatment of hyperlipidemia.

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