



## Feeding Effect of *Terminalia Arjuna* and Guggul on the Biophysical Symptoms of Dyslipidemic Patients

Jain Bharti<sup>1</sup>, Pathak Sakshi<sup>2</sup> and Yadav Shubha<sup>3</sup>

<sup>1</sup>.Professor, Department of Food Science and Nutrition

<sup>2,3</sup>.Research Scholar, Department of Food Science and Nutrition  
Maharshi Dayanand Saraswati University, Ajmer

### Abstract

*Cardio Vascular Disease (CVD) is a chronic, potentially debilitating disease and its prevalence is increasing in all populations in worldwide. Dyslipidemia and Hypertension are closely linked to the pathophysiology of the CVD and are key independent modifiable risk factors for CVD. The bark of the Arjuna is rich in polyphenols and bark of Guggul is rich in guggulsterone and both are useful as an anti-ischemic and cardio protective agents in Hypertension and Dyslipidemia. The present study was undertaken to assess the impact of Arjuna and Guggul on Blood Pressure of the subjects with Dyslipidemia patient. Purposive random sampling method was chosen to select already diagnosed dyslipidemic male. Out of the total 40 subjects 10 subjects comprised the Control group and 30 subjects comprised Experimental group. In the Experimental group A (10 subjects) were given capsules of Arjuna (1 gm. powder), group B (10 subjects) were given capsules of Guggul (1 gm. powder) and group C (10 subjects) were given capsules of Mixed herb (500 mg Arjuna powder and 500 mg Guggul powder). BMI, Diastolic and Systolic blood pressure were assessed at baseline and after intervention. A self-administrated pre-tested questionnaire was developed to collect general and disease specific information from subjects. In the experimental group the mean BMI, Diastolic and systolic blood pressure decreased significantly after intervention. A statistical significant difference in mean BMI, Diastolic and systolic blood pressure was observed in Experimental group. Supplementation with capsules of Arjuna, Guggul and Mixed herb (both Arjuna and Guggul) brought about a decrease in BMI and blood pressure levels. Thus Arjuna and Guggul can be explored for its beneficial effect in management of Obesity, Hypertension, Dyslipidemia and CVD.*

**Key word:** CVD, Dyslipidemia, Hypertension, Arjuna, Guggul, Obesity, Supplementation.

### I. Introduction

The epidemic of cardiovascular diseases (CVDs) is the most prevalent cause of death and disability in both developed as well as developing countries. Rapid urbanization and its accompanying adverse lifestyle changes (i.e., unhealthy diet, physical inactivity, and drug and alcohol addiction) are likely to be the risk factors of CVDs (1). Cardiovascular diseases (CVD) are the most prevalent cause of death and disability in both developed as well as developing countries. Two of the most prevalent and asymptomatic risk factors for CVD are hypertension and dyslipidemia and they commonly co-exist. The CVD risk in patients with co-morbid hypertension and dyslipidemia is greater than the sum of CVD risks for hypertension and dyslipidemia when they occur alone [2,3]. Dyslipidemia signifies the increased concentration of total cholesterol and LDL cholesterol, decreased concentration of HDL concentration and hypertriglyceridemia present alone or in combination.

Dyslipidemia has been closely linked to the pathophysiology of CVD (Cardiovascular disease) and is a key independent modifiable risk factor for CVD[4,5]. Asian Indian are known to have unique pattern of Dyslipidemia with lower HDL cholesterol, increased Triglycerides levels and higher proportion of small dense LDL cholesterol. Cardiovascular disease is the leading cause of death worldwide, and mortality due to CVD is higher in low and middle income countries [6,7]. In India, there has been an alarming increase in the prevalence of CVD over the past two decades so much so that accounts for 24% of all deaths among adults aged 25-69 years [8]. Asian Indians have been found to develop CVD at a Younger age than other populations [9]. The likely causes for the increase in CVD rates include life style changes associated with urbanization and the epidemiologic and nutritional transitions that accompany economic development [10].

In Ayurveda, Arjuna has been documented for its therapeutic potentials; its scientific name is *Terminalia arjuna* belonging to the family of Combretaceae. The bark leaves and fruits of *Terminalia arjuna* have been used in indigenous system of medicine for different ailments. The alcoholic extract of the bark of *Terminalia arjuna* is rich in polyphenols (60-70%), including flavones, flavonols, phenylpropanoids and tannins (20-24%). The bark of *Terminalia arjuna* is useful as an antiischemic and cardio protective agent in hypertension and also in ischemic heart disease. The bark of Arjuna contains Co-enzyme Q-10 which prevents heart attacks and has a general tonic effect in cases of cirrhosis of the liver. It induces a drug-dependent decrease in blood pressure and heart rate. These findings have been substantiated by clinical studies that showed LDL levels dropped 64 per cent while HDL levels rose.

Guggul was first introduced to the scientific world in 1966 by an Indian medical researcher, Satyavati [11]. Guggulsterone isolated from Guggul has been identified as the bioactive constituent responsible for guggul's therapeutic effect. Guggulsterone activates lipolytic enzymes in plasma and liver as well as stimulates receptor mediated catabolism of low density lipoprotein. The hyperlipidemic activity of this drug is mediated through inhibition of hepatic cholesterol biosynthesis, increased fecal bile acid excretion and enhanced plasma lecithin: cholesterol acyltransferase activity [12].

## **II. Materials and Methods**

### **Sample**

A total of 40 already diagnosed Dyslipidemic males were selected for the study using purposive sampling technique, out of which 10 subjects comprised the Control group and 30 subjects comprised Experimental group. In the experimental group, 10 subjects were given capsules of Arjuna Bark, 10 subjects were given capsules of Guggul and remaining 10 subjects were given capsules of Mixed herbs (i.e. Arjuna Bark and Guggul both). The Intervention trial was carried out for one month.

### **Method**

A self-designed Questionnaire was formulated to elicit information regarding the age, education, life style, food habits & disease specific information- age of onset, family history, associated disease and symptoms of subjects.

For the assessment of nutritional status, Anthropometry and Bio-physical method were used. For Anthropometric assessment height and weight were taken using standard methods and BMI was calculated using these measurements and compared with the classification given by Shills [13]

For Bio-physical assessment Diastolic and Systolic blood pressure were measured using Sphygmomanometer-300 and classified according to Braunwald(2000) [14].

### Processing of Material

A powder of Arjuna was prepared by bark by first blanching it followed by drying and then it was ground into fine powder in grinder. Similarly powder of Guggul was prepared by leaves, flower and stem of Guggul.

### Preparation of Capsules

The capsules of Arjuna and Guggul were prepared by filling 1gm of each powder in gelatin capsules separately. Capsules of mixed herb were prepared by filling 500 mg powder of each herb i.e. Arjuna and Guggul in gelatin capsules.

### Intervention

The period of intervention was one month. Anthropometric and Bio-physical assessment was done before the beginning of intervention period and then after 7<sup>th</sup>, 14<sup>th</sup>, 21<sup>st</sup> and finally on the 30<sup>th</sup> day of intervention.

## III. Results and Discussion

The information about personal habits of subjects ( Table 1) which revealed that majority of subjects i.e. 80 per cent were not doing any kind of exercise and remaining 20 per cent were doing exercise. As far as the type of exercise was concerned, out of 20 per cent who were doing exercise, 87.5 per cent preferred yoga/walk and rest 12.5 per cent do Aerobics. The impact of exercise on health depends upon its duration and results showed that 75 per cent of the subjects exercised for 1-2 hours while 25% exercised for 30-45 minutes. Apart from exercise other habits like smoking, consumption of tobacco and alcohol, which have significant relation with CVD (Cardio Vascular Disease) were also assessed. Maximum number of subjects i.e. 37.5 per cent consumes alcohol followed by Tobacco (32.5%) and then smoking (20%).

Detail of Personal Habits		Experimental Group			Control Group N=10	Total N=40
		Arjuna (A) N =10	Guggul (B) N=10	Mix Arjuna and Guggul (C) N=10		
<b>Exercise</b>	Yes	3 (30.0)	2 (20.0)	1 (10.0)	2 (20.0)	8 (20.0)
	No	7 (70.0)	8 (80.0)	9 (90.0)	8 (80.0)	32 (80.0)
<b>Type of Exercise</b>	Walk/Yoga	2 (20.0)	2 (20.0)	1 (10.0)	2 (20.0)	7 (17.5)
	Aerobic	1 (10.0)	-	-	-	1 (2.50)
<b>Duration</b>	30-45 min	1 (10.0)	1 (10.0)	-	-	2 (20.0)
	1-2 hrs	2 (20.0)	1 (10.0)	1 (10.0)	2 (20.0)	6(60.0)
<b>Other habits</b>	Smoking	3 (30.0)	4(40.0)	3 (30.0)	-	8 (20.0)
	Tabaco	4 (40.0)	4 (40.0)	5 (50.0)	-	13 (32.5)
	Alcohol	3 (30.0)	4 (40.0)	5 (50.0)	3 (30.0)	15 (37.5)

Results related to disease specific information (Table 2) showed that 60 per cent of the total were suffering from last 2-3 years and 20 per cent subjects suffering from last 4-5 years and remaining 20 per cent for more than 5 years .Sixty per cent of the respondents did not have any family history while 40 per cent had family history inherited form father ( 27.5 %), mother ( 12.5 %) and from brother (2.5%).

Results related to various symptoms observed due to dyslipidemia (Table 3) depicted that fatigue was the most common symptom i.e. 65 per cent followed by chest pain (17.5%), Exhaustion (12.5%) and the least common symptom was palpitation during physical activity i.e. 5 per cent only.

Results related to associate complications of Dyslipidemia in subjects (Table 4) revealed that Diabetes was the most common associated complication i.e. 60 per cent and Hypertension was noted second major problem (37.5%). CVD was the least common problem (2.5%).

**Table 2. Specific Information of Dyslipidemic Subjects**

Detail		Experimental Group			Control Group N=10	Total N=40
		Arjuna (A) N =10	Guggul (B) N=10	Mix Arjuna and Guggul (C) N=10		
Age of Onset	2-3 years Back	3 (30.0)	5 (50.0)	9 (90.0)	7 (70.0)	24 (60.0)
	4-5 years Back	3 (30.0)	4 (40.0)	1 (10.0)		8 (20.0)
	More Than 5 years Back	4 (40.0)	1 (10.0)	-	3 (30.0)	8 (20.0)
History of Disease	Present	7 (70.0)	-	3 (30.0)	3 (30.0)	16 (40.0)
	Absent	3 (30.0)	7 (70.0)	7 (70.0)	7 (70.0)	24 (60.0)
If Yes, Then Relation	Father	5 (50.0)	3 (30.0)	2 (20.0)	1 (10.0)	11 (27.5)
	Mother	2 (20.0)	-	1 (10.0)	2 (20.0)	5 (12.5)
	Brother	-	-	--	1 (10.0)	1 (2.50)

**Table 3. Distribution of Dyslipidemic Subjects on the Basis of Symptoms Observed**

Details of Symptoms Observed	Experimental Group			Control Group N=10	Total N=40
	Arjuna (A) N =10	Guggul (B) N=10	Mix Arjuna and Guggul (C) N=10		
Chest pain	2 (20.0)	1 (10.0)	1 (10.0)	3 (30.0)	7 (17.5)
Exhaustion	-	3 (30.0)	2 (20.0)	-	5 (12.5)
Palpitation During Physical Activity	-		2 (20.0)	-	2 (5)
Fatigue	8 (80.0)	6 (60.0)	5 (50.0)	7 (70.0)	26 (65)

**Table 4. Distribution of Dyslipidemic Subjects on the Basis of Associated Diseases**

Details of Associated Diseases	Experimental Group			Control Group N=10	Total N=40
	Arjuna (A) N =10	Guggul (B) N=10	Mix Arjuna and Guggul (C) N=10		
Diabetics	3 (30.0)	5 (50.0)	7 (70.0)	9 (90.0)	24 (60)
Hypertension	6 (60.0)	5 (50.0)	3 (30.0)	1 (10.0)	15 (37.5)
Cardiovascular Problem	1 (10.0)	-	-	-	1 (2.5)

The impact of capsule feeding on BMI of experimental and control group revealed (Table 5) that the BMI of Experimental Group i.e. Group A, Group B, Group C before feeding were 26.9 Kg/m<sup>2</sup>, 24.6 Kg/m<sup>2</sup>, 26.4 Kg/m<sup>2</sup> respectively and after intervention it significantly reduced to 23.76 Kg/m<sup>2</sup>, 23.8 Kg/m<sup>2</sup>, 24.7 Kg/m<sup>2</sup> respectively. Higher significant difference was seen in experimental group B and C. Results revealed that guggul has more significant effect as compared to arjunabark intervention. On the other side the BMI of Control group was 26.04 Kg/m<sup>2</sup> before the intervention period of experimental group and 25.7 Kg/m<sup>2</sup> after completion of intervention in experimental group. Slight reduction was seen but the difference was not significant.

**Table 5. Mean and Standard Error of BMI Prior and After Intervention of Dyslipidemic Subjects**

BMI	Experimental Group			Control Group N=10
	Arjuna (A) N =10	Guggul (B) N=10	Mix Arjuna and Guggul (C) N=10	
	Mean±SE	Mean±SE	Mean±SE	
<b>Before Feeding</b>	26.9±0.83	24.6±0.51	26.4±2.08	26.0±0.43
<b>After Feeding</b>	23.76±0.85	23.8±0.46	24.7±2.0	25.7±0.42
<b>t Value</b>	2.49*	6.71***	10.05***	0.76NS

\* Significant at 5% Level \*\*\*Significant at .1% Level , NS-Non Significant

Dyslipidmic are more prone to Hypertension than non-dyslipidmic, therefore blood pressure was measured before and after intervention. Systolic blood pressure prior and after intervention was measured statistically in Table 6. It revealed that the systolic blood pressure of Experimental Groups i.e. Group A, B, C were 188.5 mmHg, 177.5 mmHg and 177.5 mmHg which after intervention reduced significantly to 184 mmHg, 173 mmHg and 171.5 mmHg. Significant difference was observed in group A, B and C after intervention. Higher significant difference was observed in group C after intervention. Though in case of Control group systolic blood pressure reduced to 176.5 from 177.5 mmHg but the difference was insignificant.

**Table 6. Mean and Standard Error of Systolic Blood Pressure Prior and After Intervention**

Systolic Blood Pressure (mmHg)	Experimental Group			Control Group N=10
	Arjuna (A) N =10	Guggul (B) N=10	Mix Arjuna and Guggul(C) N=10	
	Mean±SE	Mean±SE	Mean±SE	
<b>Before Feeding</b>	188.5±3.80	177.5±4.17	177.5±6.17	177.5±4.17
<b>After Feeding</b>	184±3.5	173±3.81	171.5±5.58	176.5±4.08
<b>t Value</b>	1.90*	2.0*	4.8***	1.51NS

\* Significant at 5% Level \*\*\*Significant at .1% Level , NS-Non Significant

A picture of overall mean diastolic blood pressure prior and after feeding the studied population (Table 7) revealed that the mean diastolic blood pressure of all four group were 107.5 mmHg, 100 mmHg, 103 mmHg and 100 mmHg before feeding and 104.4 mmHg, 95.5 mmHg, 96 mmHg and 97 mmHg after feeding. Higher significant difference was observed in group A, B and C after intervention. When results of diastolic blood pressure was compared in control group before and after intervention in experimental group no significant difference was observed.



**Table 7. Mean and Standard Error of Diastolic Blood Pressure Prior and After Intervention**

Diastolic Blood Pressure (mmHg)	Experimental Group			Control Group N=10
	Arjuna (A) N=10	Guggul (B) N=10	Mix Arjuna and Guggul (C) N=10	
	Mean±SE	Mean±SE	Mean±SE	
Before Feeding	107.5±2.81	100.0±1.66	103.0±2	100±1.66
After Feeding	104.44±2.67	95.5±1.25	96.0±1.94	97.0±2.13
t Value	4.58***	4.58***	6.0***	0.58NS

\*\*\*Significant at .1% Level, NS-Non-Significant

#### IV. Conclusion

From the results it can be concluded that *Arjuna* and *Guggul* powder shows significant effect in reducing BMI, Diastolic and Systolic Blood Pressure. Mixture of arjuna and guggul has more significant effect as compared to intervention with arjuna alone in reducing BMI, Diastolic and Systolic Blood Pressure. So it can be said that disease like hypertension, obesity, Dyslipidemia and CVD can be treated through these herbs without any adverse effects. Further researches in this direction can prove major breakthrough in medical field.

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