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RESEARCH ARTICLE

HYPOGLYCEMIC AND HYPOLIPIDEMIC EFFECT OF ASH GOURD (*Benincasa hispida)* AND CURRY LEAVES (*Murraya koenigii*)

Dr. M. Amirthaveni* and V.Priya

Department of Food Science and Nutrition, Avinashilingam University for Women.

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ABSTRACT

Diabetes mellitus and cardiovascular diseases represent an enormous, medical, social and economic burden to the public. Many genetic and lifestyle factors are involved in the etiology of these diseases. Hence, the present study was undertaken with an objective to select and study the background information and nutritional status of hyperlipidemic diabetics, elicit details on medical history and to study the impact of ash gourd and curry leaves on the blood glucose and lipid profile. A group of 200 diabetics were selected initially. Salad was prepared by using 100gm of ash gourd and one gram of curry leaves (10 curry leaves) and five grams of skimmed milk powder (made into curd) and pepper and salt are added for taste. This salad was freshly prepared every day and distributed personally to the selected hyperlipidemic diabetics in experimental group (N=20) as mid morning for a period of three months (90 days) to find out the effect of supplementation of ash gourd and curry leaves. Supplementation of ash gourd and curry leaves had significant hypoglycemic and hypolidemic effect and it had reduced the blood glucose level (both fasting and post prandial), within the period of three months.

INTRODUCTION

Non-insulin dependent diabetes is a chronic disease characterized by elevated blood glucose level resulting from defects in insulin secretion, insulin action or both (Kochhar *et al.*, 2008). Cardiovascular diseases refer to any condition affecting the ability of heart or blood vessels to function properly (http://www.cardiac.disease). The greatest increase will be in India from 19.4 million to 57.2 million while in China from 16 million to 37.6 million and USA from 13.9 million to 21.9 million during the same period, unless effective. Preventive measures are implemented to curb this enormous increase in type 2 diabetes mellitus (King and Rewers, 2003). India is the diabetic capital of the world with 41 million Indians have diabetes. Every fifth diabetic in the world is an Indian. It also leads in prevalence of metabolic syndrome as well as obesity. But the real impact of obesity and diabetes is through cardiovascular diseases and hypertension (Joshi and Parikh, 2007). World Health Organization (2006) states that cardiovascular diseases claim a new victim every 65 seconds and cardiovascular diseases alone will kill five times as many people as HIV/AIDS in developing countries. Seventeen million people around the globe die of cardiovascular disease every year which covers over 38 per cent of all deaths globally. By 2020, cardiovascular diseases will become the leading cause of not only deaths, but also of disability worldwide with the number of fatalities projected to increase, more than 20 million to more than 24 million a year by 2030. By 2020, half of the world population and about two thirds of the global cardiovascular disease burden will be in Asia. This will happen because heart diseases have no geographic gender or social economic boundaries (Cathy, 2005). In India, especially in the past five decades, cardiovascular disease rates have raised more in urban populations, from four per cent to eleven per cent. Among 35 per cent of Indian deaths were found to be due to cardiovascular diseases in the recent years from 2000-2004 and six per cent of world's cardiac patients will be Indians by 2010 and even children are falling prey to it. Six out of every thousand people in the country affected by heart diseases are children. (http://www.cardiovasculardisease/ healthzine.org/heart-disease). People with diabetes are two to four times more likely to develop cardiovascular diseases due to variety of risk factors including high blood pressure, lipid disorders, high LDL (bad) cholesterol, high triglycerides, low HDL (good) cholesterol, smoking, obesity and lack of physical activity and poorly controlled blood sugars (too high) or out of normal range. Another emerging risk factor is insulin resistance, a care metabolic dysfunction of type 2 diabetes (Jackson, 2009). Economic transition, urbanization, industrialization and globalization bring about lifestyle changes that promote heart disease. These risk factors include tobacco use, physical inactivity, unhealthy diet. Life expectancy in developing

**Corresponding author:* amirthaveni@gmail.com

countries is rising sharply and people are exposed to these risk factors for longer period. Newly emerging CVD risk factors like low birth weight, folate deficiency and infections are also more frequent among the poorest in low and middle income countries ((Lencet, 2002; Wang *et al.*, 2004). Functional foods play an important role in the prevention of chronic and degenerative diseases such as cancer, cardiovascular diseases, diabetes, cataract, osteoporosis, lowering cholesterol, memory and immune function, energy enhancing activities and managing obesity. The food industry manufacturers functional foods through incorporation of physiologically active ingredients into conventional foods. The annual growth rate for the function food segment is 15 to 20 per cent, where as many of the ingredients are dietary antioxidant (Gopalan *et al.*, 2005). The healing power of foods is a popular concept that focuses on how "super foods" can have health protecting properties. Medicinal foods or "nutritionally high powered foods" have been part and parcel of the natural products industry for a long time and through emerging scientific research and particularly through growing public interest, they have reached the main stream (www.medicine.com).

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Ash gourd (*Benincasa hispida*) is an annual, hairy climbing herb. It is an ash-coloured, large fruit vegetable like pumpkin. It is commonly cultivated for its nutritive and medicinal values (http://www.divine-remedies.com/ashgourd.htm). Ash gourd (*Benincasa hispida*) is wholesome and nutritive. Being low in calories, it is particularly useful for diabetes and obese people. It is cooling and laxative and also it helps to cure peptic ulcer, bleeding, general debility, intestinal worms, dandruff, etc. (http://www.divineremedies.com/ashgourd.htm). Curry leaves (*Murraya koenigii)* strengthen the functions of stomach and promotes its function. They are mainly used for digestive disorders, diabetes for reducing cholesterol, kidney disorder, premature greying of hair, eye disorders, insect bites and it is also used as a natural flavouring agent in sambar, rasam and curries (http://www.homeremidiesguide.com/herbs/curryleaves. htm). Through a few studies carried out in India has proven many varied effect of ash gourd and curry leaves the hyproglycemic and hypolipidemic effect of combination of ash gourd and curry leaves is unreaveal in diabetes and cholesterol still. It has very good potential to control and cure various health disorders. Hence, the present study was undertaken with an objective to select and study the background information and nutritional status of diabetics and hyperlipidemics, elict details on medical history and to study the impact of ash gourd and curry leaves on the blood glucose and lipid profile.

MATERIALS AND METHODS

Collection of data

Based on their willingness to participate in the study, two hundred, type II diabetics belonging to the age group of 40-65 years from both sexes were selected by purposive sampling method from the Diabetic clinics in Erode city, namely, Nassir Diabetic Centre and KG Diabetic Centre, were selected from the concerned authorities and with the co-operation of the physicians. An interview schedule was formulated to elicit information regarding the socio-economic status including age, educational status, income and type of activity, dietary habits, lifestyle pattern such as exercise, presence of additive habits like chewing, smoking, drinking and also health status. Anthropometric indices namely BMI and WHR and biochemical parameters namely fasting and post prandial blood glucose by GOD-PAP method, and total lipid profile tests were estimated for all the subjects. Blood glucose and lipid profile were recorded for all the subjects before and after supplementation.

Supplementation of ash gourd and curry leaves salad

Nutritive value of the supplement

Nutritive value of the supplement given was calculated by using Nutritive value of Indian Foods (Gopalan *et al.*, 2004) and presented below in Table I.

Preparation of Ash Gourd, Curry Leaves Salad

Ash gourd and curry leaves are washed and cleaned hygienically, peel of the outer hard skin of the ash gourd and cut into small pieces and then fresh curry leaves are cut into very small pieces. For each subjects salad was prepared by using 100gm of ash gourd and one gram of curry leaves (10 curry leaves) and five grams of skimmed milk powder (made into curd) and pepper and salt are added for taste. This salad was freshly prepared every day and distributed personally to the selected hyperlipidemic diabetics in experimental group (N=20) as mid morning for a period of three months (90 days) to find out the effect of supplementation of ash gourd and curry leaves (Plate I).

RESULTS AND DISCUSSION

Socio Economic Profile

The above Table revealed that out of 200 subjects surveyed, majority were males (N=140), followed by females (N=60). The prevalence of diabetes among males was 10.38 per cent, females it was 7.6 per cent and the prevalence was 18.2 per cent in the age group of 40-49 years, which was quite high compared with other age groups. Among the diabetics selected 10 per cent of male and 18.4 per cent of female were graduates and 13 per cent of male were post graduates. Remaining 25 per cent of male and 30 per cent of female were illiterates. Majority of the male diabetics (86 per cent) and female diabetics (100 per cent) were doing sedentary type of activity. Remaining 14 per cent of male were doing moderate type of activity. None of the selected diabetics belong to heavy activity group. It was also revealed that majority (38.5 per cent) of the families had earned their monthly income more than Rs.7500 (high income), 32 per cent are earning Rs.4501 to Rs.7500 (middle income) monthly and 29.5 per cent are earning less than Rs. 4500 (low income) per month. This study showed that the prevalence of diabetes is tremendously increased in high income groups than the low and middle income groups.

Lifestyle Pattern of the Selected Diabetics

From Table II, it was revealed that among the 140 selected male diabetics, 51 per cent of male had the habit of smoking and 49 per cent of male do not have the habit of smoking. About 80 per cent had the habit of smoking cigarette and three per cent had the habit of smoking beedi and only 17 per cent

Table 1. Nutritive Value of the Supplement

Nutrients	Ash gourd (100g)	Curry Leaves (1g)	Skimmed milk Powder (5g)	Total nutrients Supplied
Energy (Kcal)	10	1.08	17.85	29.0
Protein (g)	0.4	0.061	1.9	2.4
Fat (g)	0.1	0.01	0.005	0.12
Fibre (g)	0.8	0.064	-	0.9
Carbohydrates (g)	1.9	0.187	2.55	4.6
Calcium (mg)	30	8.3	68.5	106.8
Iron (mg)	0.8	0.0093	0.07	0.88
Thiamine (mg)	0.06	0.0008	0.0225	0.08
Riboflavin (mg)	0.01	0.0021	0.082	0.09
Niacin (mg)	0.4	0.023	0.05	0.47
Vitamin C (mg)	1	0.04	0.25	1.29
Moisture (g)	96.5	0.638	0.205	97.3
Phosphorus (mg)	20	0.57	50	70.57

Table 2. Socio– Demographic Characteristics of the Diabetics

Socioeconomic variables	Male %	Female %	Total %
Age in Years			
40-45	13	12	12.5
46-50	25	23	24.5
51-55	30	38	32.5
56-60	16	17	16.5
61-65	16	10	14.0
Total	100	100	100
Educational status			
Primary	10.0	18.3	12.5
High School	21.0	20.0	20.5
Higher Secondary	21.0	13.3	19.0
Undergraduate	10.0	18.4	12.5
Postgraduate	13.0	-	9.0
Illiterates	25.0	30.0	26.5
Total	100	100	100
Type of activity			
Sedentary	86	100	90.5
Moderate	14	Nil	9.5
Heavy	Nil	Nil	Nil
Total	100	100	100
Income level (Monthly)			
Low Income	18.0	57	29.5
Middle Income	33.5	28	32.0
High Income	48.5	15	38.5
Total	100	100	100

Table 3. Lifestyle Pattern of the Selected Diabetics

Variables	Male %	Female %	Total %
Chewing Habit			
Tobacco	10	Nil	5.0
Pan Masala	5	Nil	2.5
Betel Leaves	15	25	20.0
None	70	75	72.5
Total	100	100	100
Pattern of smoking			
Yes	51	Nil	51
No	49	Nil	49
Total	100	Nil	100
Type			
Cigarette	80	Nil	80
Beedi	3	Nil	3
Cigar	17	Nil	17
Total	100	Nil	100
Number / day			
1-5	13	Nil	13
6-10	29	Nil	29
11-20	55	Nil	55
21-30	3	Nil	3
Total	100	Nil	100
Duration of smoking			
1-3 years	11	Nil	11
4-6 years	19	Nil	19
7-9 years	46	Nil	46
> 9 years	24	Nil	24
Total	100	Nil	100
Frequency			
Twice in a week	Nil	Nil	Nil
Once in a week	Nil	Nil	Nil
Daily	100	Nil	
Total	100	Nil	
Alcohol consumption			
Yes	58	Nil	41
No	82	Nil	59
Total	140	Nil	100
Type			
Brandy	32	Nil	55
Whisky	8	Nil	14
Wine	18	Nil	31
Total	58	Nil	100
Quantity			
100-150ml	28	Nil	48
150-200ml	19	Nil	33
200-250ml	11	Nil	19
Total	58	Nil	100
Duration			
4-6 years	18	Nil	31
7-9 years	13	Nil	22
>9 years	27	Nil	47
Total	58	Nil	100
Frequency			
Daily	25	Nil	43
Once in a week	6	Nil	10
Occasionally	27	Nil	47
Total	58	Nil	100

had the habit of smoking cigar. With regard to smokers 13 per cent smoke 1-5 cigarettes per day, 29 per cent smoke 6-10 cigarettes per day, 55 per cent smoke 11-20 cigarettes per day and three per cent smoke 21-30 cigarettes per day. Almost 11 per cent of male had the habit of smoking less than 1-3 years, 19 per cent had the habit of smoking within 4-6 years, 46 per cent had the habit of smoking within 7-9 years, 24 per cent of male had the habit of smoking for more than nine years. Mostly all the subjects (72 per cent) are engaged with smoking daily. It was revealed that from the 140 selected male diabetics, 41 per cent of male had the habit of drinking alcohol and 59 per cent of male do not have the habit of drinking alcohol. Among the drinkers, 55 per cent had the habit of drinking brandy, 14 per cent had the habit of drinking whisky and 31 per cent had the habit of drinking wine. On discussing the quantity of drinking 48 per cent of male were drinking within the quantity of 100-150ml, 33 per cent were drinking within the quantity of 150-200ml, 19 per cent were consuming about 250ml,. the duration also varies about 31 per cent of male had the habit of drinking alcohol within 4-6 years, 22 per cent of male had the habit of drinking alcohol within 7-9 years, 47 per cent had the habit of drinking alcohol for more than nine years. The survey on frequency of drinking reveals

Table 4. Effect of Supplementation on Body Mass Index

Body mass index (BMI) (NIN, 2005)	Experimental Group(%)		Control Group(%)	
	Initial	Final	Initial	Final
Underweight (18.5-20.0)	Nil	Nil	Nil	Nil
Normal (20.0-25.0)	30	80	30	30
Grade I (25.0-30.0)	70	20	60	65
Grade II (□30.0)	-	-	10	5
Total	100	100	100	100

Table 5. Effect of Supplementation on Waist Hip Ratio

	Experimental Group (%)				Control Group (%)			
	Male		Female		Male		Female	
Waist Hip Ratio	Initial	Final	Initial	Final	Initial	Final	Initial	Final
0.80-0.85	-	-	40	70	-	-	40	40
0.86-0.90	-	-	60	30	20	20	60	60
0.91-0.95	20	80	-	-	50	50	-	-
0.96-1.00	80	20	-	-	30	30	-	-
Total	100	100	100	100	100	100	100	100

Table 6. Effect of Supplementation on Biochemical parameters

Blood Parameters	Experimental Group Initial	Experimental Group Final	Control Group Initial	Control Group Final	't' value
Blood Glucose mg/dl					
Fasting Blood Glucose	171.6 ±16.98	143.0 ±19.54	172.6 ±16.74	173.2 ±16.85	I Vs F (E) 8.736** I Vs F (C) 1.81^{NS} E Vs C 16.36**
Post Prandial Blood Glucose	211.55 ±25.67	167.35 ±21.72	204.55 ±35.46	202.4 ±32.92	I Vs F (E) 14.36** I Vs F (C) 0.88^{NS} E Vs C 63.54**
Lipid Profile mg/dl (NCEP,2009)*					
Total cholesterol <200	274.35 ± 42.94	222.2 ± 30.56	262.5 ± 31.08	260.5 ± 31.12	I Vs F (E) 7.25** I Vs F (C) 0.980^{NS} EVs C 7.45**
HDL cholesterol >60	66.55 ± 31.09	79.5 ± 35.93	74.45 ± 14.22	75.4 ± 14.25	I Vs F(E) 5.83** I Vs F (C) 0.190^{NS} EVs C 6.58**
LDL cholesterol <100	168.3 ± 25.15	114.45 ± 32.97	137.4 ± 43.64	136.5 ± 43.99	I Vs F (E) 7.60** I Vs F (C) 0.451^{NS} EVs C 10.39**
VLDL cholesterol <30	39.35 ± 13.29	28.3 ± 10.14	51.65 ± 10.781	50.75 ± 10.82	I Vs F (E) 5.77** I Vs F (C) 0.32^{NS} EVs C 6.80**
Triglyceride <150	196.4 ± 66.50	141.1 ± 50.94	254.35 ± 54.07	253.3 ± 54.29	I Vs F (E) 5.78** I Vs F (C) 0.034^{NS} EVs C 6.82**

control group, 30 per cent were found to be in normal grade, whereas 60 per cent of the diabetics were in grade I obesity and ten per cent of the subjects were in grade II obesity before supplementation and after supplementation 30 per cent of the diabetics respectively were in normal category and 65 per cent of the diabetics were found to be in grade I obesity and five per cent of the subjects were in grade II obesity.

that 43 per cent of male had the habit of drinking alcohol daily, 10 per cent of male had the habit of drinking alcohol once in a week and 47 per cent of male had the habit of drinking alcohol occasionally. Backer (2000) points out that heavy drinker had a higher risk of death from cardiovascular diseases.

Effect of Supplementation of Ash Gourd and Curry Leaves Salad on Diabetics

Body Mass Index

Table IV presents the body mass index of the hyperlipidemic diabetics in the experimental and control groups before and after supplementation. The above table showed that in experimental group 30 per cent of the diabetics were normal and 70 per cent of the subjects were in Grade I obesity before supplementation and after the supplementation period. It was observed that 80 per cent of the diabetics were in the normal category and their BMI was within the range of 20.0-25.0 and only 20 per cent of the subjects were in Grade I obesity. In the Results recorded for the BMI grade clearly depicted that in the experimental group subjects in grade I obesity was shifted to normal grade, this may be due to the effect of ash gourd and curry leaves salad supplementation which helped them to reduce their body weight and obesity grades.

Waist Hip Ratio

Table V presents the waist hip ratio of the selected diabetics and hyperlipidemic subjects. According to NIN (2005), the standard waist hip ratio for reference men and women is 0.95 and 0.80 respectively. In the experimental group, 20 per cent of male had the waist hip ratio within the range of 0.91-0.95 and 80 per cent of male had the waist hip ratio within the range of 0.96-1.0 before the supplementation period. After the supplementation period Waist hip ratio of the male subjects (80 per cent) were in normal range of 0.91-0.95 from 0.96-1.00. In case of female (40 per cent) were within the range of 0.80-0.85 and 60 per cent of female had above the normal ratio within the range of 0.86-0.90 before the supplementation but after the supplementation the waist hip ratio had reduced in

case of the female and the percentage had reduced to 70 per cent. It remains the same for the rest of the 30 per cent. There is no change in the control group.

Biochemical Parameters

Table VI discuss the Biochemical parameters of the selected diabetics and hyperlipidemic subjects. The mean fasting blood glucose level of experimental group before the supplementation was 171.6mg/dl and had reduced to 143.0mg/dl after the supplementation period of three months. The difference showing statistical significant at (P <0.01) level. The mean fasting blood glucose level of control group before supplementation was 172.6mg/dl and had been recorded as 173.2mg/dl after the supplementation and the difference was not statistically significant. Experimental group revealed a better significant reduction at one per cent level ('t' value 16.36) in the fasting blood glucose level when compared with control group. From the results obtained, it was concluded that supplementation of combined ash gourd and curry leaves salad was highly helpful and cost effective food to control and manage the blood glucose level among the type II diabetic population without any side effect.

available and indigenous which was highly effective for the proper management of diabetes mellitus. The mean total cholesterol level of the diabetics was 274.3 mg/dl before supplementation and the same had reduced to 222.2mg/dl after supplementation with salad for a period of three months. When these values were statistically analyzed the difference was found to be statistically significant (P<0.01). The mean HDL-cholesterol was 66.5mg/dl before supplementation and had increased to 79.5mg/dl after supplementation with a significant difference (P<0.01). The mean value of LDL-cholesterol was 168.3mg/dl before supplementation and had decreased to 114.4mg/dl after supplementation. The difference between the two values when statistically analyzed was found to be significant (P<0.01). The mean value of VLDL cholesterol was 39.3mg/dl before supplementation and had decreased to 28.3mg/dl after supplementation with a significant difference (P<0.01). The mean triglyceride level of the diabetics was 196.4mg/dl before supplementation and had reduced to 141.1mg/dl after supplementation and the difference was found to be statistically significant (P<0.01). The mean total cholesterol level of the control group was 262.5mg/dl and it had reduced to 260.7mg/dl. The mean VLDL cholesterol 51.65mg/dl and it

Table 7. Effect of Supplementation on Blood Pressure Level

Blood Pressure (mm/Hg)	Experimental Group		Control Group		't' value
	Initial	Final	Initial	Final	
Systolic Blood pressure	151.4 ± 6.227	116.7 ± 8.848	153.6 ± 8.183	152.7 ± 9.330	I Vs F (E) 14.4** I Vs F (C) 0.064^{NS} EVs C 18.57**
Diastolic Blood pressure	100.3 ±9.234	81.9 ±10.351	94.6 ± 5.295	94.8 ± 4.741	I Vs F (E) 8.67** I Vs F (C) 0.25^{NS} EVs C 13.68**

** - Significant at (P<0.01); NS – Not Significant; I – Initial; F – Final

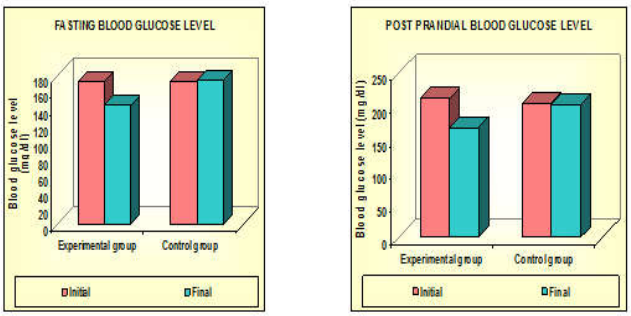

Fig. 1. Blood Glucose Level of the Selected Subjects

The mean post prandial blood glucose level of the experimental group before supplementation was 211.2mg/dl and had reduced to 167.3mg/dl after supplementation period which was statistically significant at (P<0.01) level. The mean post prandial blood glucose level of control group before supplementation was 204.5mg/dl and it was reduced to 202.4mg/dl after supplementation. When these values were analyzed statistically, the difference was found to be not significant. Experimental group showed a better reduction in the post prandial blood glucose level, when compared with control group with a statistical difference at one per cent level ('t' value 63.54) (Figure I). From the above result, it was concluded that ash gourd and curry leaves salad is having hypoglycemic effect especially lowering the post prandial glucose level. So the supplement given is low cost, locally

had reduced to 50.75mg/dl in control group. The mean HDL was 74.45mg/dl and it has increased to 75.4mg/dl, the mean triglyceride was 254.3mg/dl and it had reduced to 253.3mg/dl. The mean LDL level of the non-supplemented diabetics was 137.4mg/dl and it had reduced to 136.5mg/dl at the end of the study period. With regard to the various fractions of cholesterol also the difference between the initial and final values was not statistically significant. Experimental group showed better reduction in the total cholesterol, LDL cholesterol, VLDL cholesterol and triglyceride when compared with control group with a statistical difference at (P<0.01) with 't' value 7.45, 10.39, 6.80, 6.82 respectively. With regard to the experimental group, the HDL cholesterol level had been increased when compared to the control group with a statistical difference at one per cent level ('t' value 6.58) (Figure II). Thus ash gourd and curry leaves salad supplemented group showed lower lipid levels when compared with the non-supplemented group after the period of 90 days.

The mean systolic pressure level of experimental group before the supplementation was 151.4mm/Hg and had reduced to 116.7 mm/Hg after the supplementation period of three months. The difference showing statistical significance at (P<0.01) level. The mean systolic pressure of the control group before supplementation was 153.6 mm/Hg and after supplementation it had reduced to 152.7 mm/Hg though the difference was not statistically significant. Experimental group showed a better reduction in the systolic blood pressure level, when compared with control group with a statistical

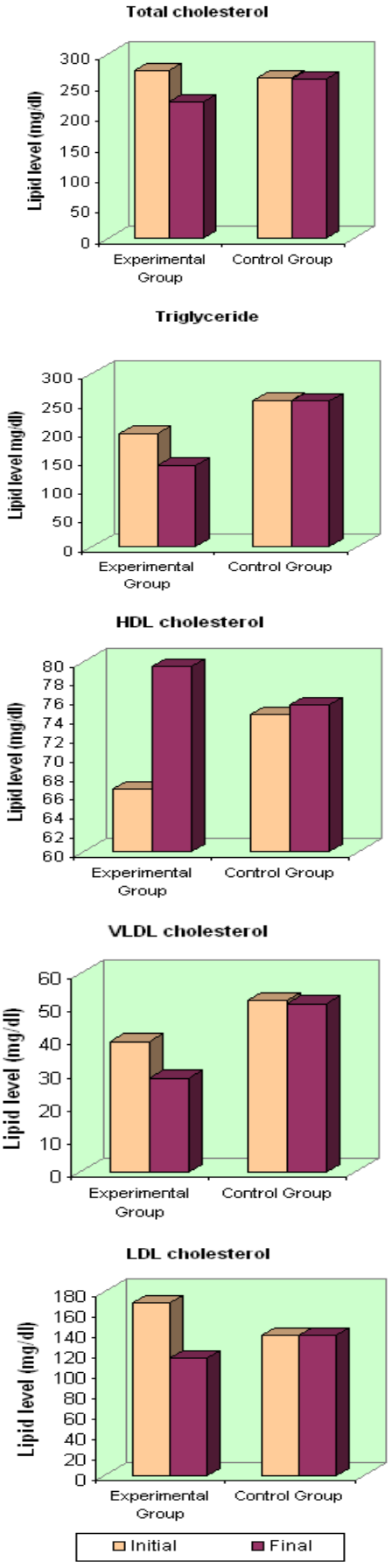

Fig. 2. Lipid Profile of the Selected Subjects

difference at one per cent level ('t' value 18.57). From this result, it is concluded that ash gourd and curry leaves salad are having the effect of lowering systolic pressure, so the supplement was highly effective for the proper management of blood pressure among diabetics. The mean diastolic pressure level of experimental group before the supplementation was 100.3 per cent of mm/Hg and had reduced to 81.9 per cent of mm/Hg after the supplementation period of three months. The difference showed statistical significance at ($P<0.01$) level. The mean diastolic pressure of control group before supplementation was 94.6 per cent of mm/Hg and after supplementation it was recorded as 94.8 per cent of mm/Hg though the difference was not statistically significant. Experimental group showed a better reduction in the diastolic pressure when compared with control group with a statistical difference at one per cent level ('t' value 13.68). From the results obtained, it is concluded that supplementation of ash gourd and curry leaves salad as a combination is highly helpful to control and alter the blood pressure level among the type II diabetic population.

Summary and Conclusion

The present study revealed that supplementation of ash gourd and curry leaves as a combination is highly helpful to control and manage the blood glucose level among the diabetics. It is concluded that ash gourd and curry leaves are simple functional foods having hypoglycemic and hyperlipidemic effect. So the supplementation given is low cost, locally available and indigenous highly acceptable recipe which was significantly effective for the proper management of diabetes mellitus without any side effects.

Blood Pressure Level

Table VII discuss the Blood Pressure Level of the selected diabetics and hyperlipidemic subjects.

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