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Home Science

# A COMPARITIVE STUDY ON EFFECT OF NUTRIMIX ON ELEVATED LIPID LEVELS IN DIABETIC SUBJECTS – AN EXPERIMENTAL PRE- POST STUDY

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**ABSTRACT** In the present study hyperglycemic and hyperlipedmic subjects were supplemented with fiber and polyphenol rich nutrimix. The study was designed as comparative study between residents of 2 cities i.e Vizag (Andhra Pradesh) and Bhubaneswar( Odisha), from each city 80 participants were selected in the age group of 40-60 years. The data relating to study was collected using questionnaire method. The product was supplemented as a part of their daily diet for a period of 6 months. Post analysis the result showed decrease in lipid levels of the participants. A significant improvement was found in lipid profile of type 2 diabetic subjects.

**KEYWORDS :** Nutrimix, Diabetes, Supplementation, Lipid Levels .

## INTRODUCTION

Dyslipidemia is one of the major risk factors for cardiova scular disease in diabetes mellitus. Early detection and treatment of dyslipidemia in type-2 diabetes mellitus can prevent risk for atherogenic cardiovascular disorder. In diabetic population lipids may elevate due to hormonal and metabolic disturbances. The metabolic pathways for utilization of fat and carbohydrate are deeply and intricately interrelated. Considering insulin's profound effect on carbohydrate metabolism it also has important effects on lipid metabolism. Insulin affects lipids by these actions:-

- It enhances the entry of fatty acids from blood into adipose tissue.
- It promotes chemical reactions that ultimately use fatty acids and glucose derivatives from triglycerides.
- It inhibits lypolysis , reducing the release of fatty acid from adipose tissue into the blood.

Collectively these actions favors removal of fatty acid and glucose from the blood and promote their storage as triglyceride. (Laurlee Sherwood, 2007) In absence or low levels of insulin fat is not removed from the blood stream, which results in rise of triglycerides. Abnormal lipid and sugar levels may be due to abnormal metabolism but they can be handled and put under control by dietary and lifestyle changes.

Diabetes is associated with various complications contributing to morbidity and mortality associated with diabetes. Approximately, 80% of deaths in patients with diabetes are attributable to cardiovascular disease (Haffner, et.al, 1998). It is well-established that dyslipidemia is a major risk factor for macro vascular complications in patients with type-2 diabetes mellitus (Farmer2008). The characteristic features of diabetic dyslipidemia are a high plasma triglyceride concentration, low HDL cholesterol concentration and increased concentration of small dense LDL-cholesterol particles (Sidana 2016) The lipid changes associated with diabetes mellitus are attributed to increased free fatty acid flux secondary to insulin resistance. In observational studies, HDL may be the most consistent predictor of CHD in type 2 diabetes subjects, followed by triglyceride and total cholesterol (Goldberg 2001) Many drugs are available for management of diabetes. However a drug with multi action leading to improvement in complications such as dyslipidemia, hypertension as well as hyperglycemia of diabetes mellitus is still to be discovered. The aim of our study was to bring into light improvement in dyslipidemia and hypoglycemia in type 2 diabetes patients after supplem entation with "Nutrimix" powder.

## METHODOLGY

The present study was conducted in 2 cities of Vizag and Bhubaneswar, supplementation was done for over a period of 6 months. The study design was multi centered open- label, randomized , controlled parallel designed trial.

In the present study subjects were selected from diabetic clinic and fitness centre from both the cities. The criteria's of selection were that people having type II diabetes along with dyslipedmia, diagnosed with diabetes for not more than 10 years , without any diabetic complications like neuropathy, nephropathy, cardiopathy and personal willingness of participation.

## PREPARATION OF NUTRIMIX:-

In view of the fact that diets with high fiber and polyphenol content are good for blood sugar and lipid levels , the current study was undertaken to develop a nutrimix which could be used as a supplement for hyperlipedmic diabetic patients.

The processed raw materials were mixed in a pre determined proportion, obtained through sensory evaluation of various blends.

Prior to supplementation the nutrimix was analyzed for shelf life, moisture content , fiber and phytonutrients.

The subjects from the experimental group were asked to consume 10 gm nutrimix per day. The nutrimix was generally added to the food preparation like dals, chapati or it was taken as it is. The subjects in control group did not receive any supplementation. Lipid profile (HDL,TC and TG) was collected on 0 day, 90$^{th}$ day and 180$^{th}$ day of the experimental group subjects. The obtained results from the blood test in both control and experimental group were analyzed using statistical tests like mean, standard deviation, percentage and t-test.

## RESULT AND DISUSSION:-

For the present study recently diagnosed diabetics were selected, as they would respond better to the supplementation. In Vizag about 70-75% subjects in both the groups were having diabetic since last -3 years. A majority of 81% and 72.5% subjects from experimental and control respectively were diagnosed hyperlipedmia 0-2 years ago. In Bhubaneswar group almost 50- 55% subjets were having sugar from last 2-3 years . in case of hyperlipedmia 71.25% in experimental group and 72.5% in control group were diagnosed only 0-2 years ago.

Proceeding towards the changes in blood parameters shows us the following results:-

**High Density Lipoprotein**

**Table 1(a) MEAN HDL(mg/dl) OF VIZAG EXPERIMENTAL GROUP**

| Age group | Initial HDL Values (mg/dl) | 3 months Later values (mg/dl) | Change in (mg/dl) | Change In % | 6 months Later values (mg/dl) | Change in (mg/dl) | Change In % | Total Elevation |
|---|---|---|---|---|---|---|---|---|
| 40-46 | 45.15±12.8 | 48.25±11.6 | 3.1 | 6..8 | 52.45±12.1 | 4.2 | 8.7 | 7.3(16.1%) |
| 47-54 | 47.57±14.3 | 51.43±12.6 | 3.8 | 8.11 | 54.1±13.8 | 2.6 | 5.2 | 6.5(13.7%) |
| 55-60 | 49..4±6.9 | 52.6±8.4 | 3.15 | 6.37 | 55.8±7.9 | 3.2 | 6 | 6.3(12.8% |

Data present in table 1(a) indicate improvement in HDL post supplementation. Among subjects of Vizag it was seen that in 40-46 years age group HDL increased by 16.1%. In 47-54 year old people it was improved by 13.7%. Among 55-60 years olds 12.8% increase in HDL was seen.

**Table 1(b) MEAN HDL ( mg/dl) OF VIZAG CONTROL GROUP**

| Age group | Initial HDL Values (mg/dl) | 3 months Later values (mg/dl) | Change in (mg/dl) | Change In % | 6 months Later values (mg/dl) | Change in (mg/dl) | Change In % | Total Changes |
|---|---|---|---|---|---|---|---|---|
| 40-46 | 47.3±14.4 | 46.2±15.7 | 0.9 | 1.9 | 42.7±15.8 | 3.5 | 8.1 | ↓4. 6(9. 7%) |
| 47-54 | 44.09±13.8 | 46.7±14.0 | 2.6 | 5.5 | 48.4±15.1 | 1.7 | 3.5 | ↑4.4(9.9%) |
| 55-60 | 47.1±16.2 | 46.2±15.4 | 1.1 | 2.3 | 45.8±15.6 | 0.4 | 0.8 | ↓ 1.3(2.7%) |

Data present in Table 1(b) indicates changes in mean HDL levels of Vizag control group where it an be seen that in HDL level increased by 9·9% in only 47-54 years age group · In 40-46 years and 55-60 years age group mean HDL decreased by 9·7% and 2·7% respectively·

**Table 1 (c) Comparison of Mean, Standard Deviation, T-value and P-value of between experimental and control groups, before and after supplementation**

| Age group | | | Mean | | t-value | p-value |
|---|---|---|---|---|---|---|
| | N | | Expt | Control | | |
| 40-46 | E=24 | 0 day | 45.1±12.8 | 47.3±14.4 | 0.47ns | 0.6858 |
| | C=8 | 180th day | 52.4±12.1 | 42.7±15.8 | 181ns | 0.0788 |
| 47-54 | E=28 | 0 day | 47.5±14.3 | 44.0±13.8 | 1.10ns | 0.2712 |
| | C=64 | 180th day | 54.1±13.8 | 48.4±15.1 | 1.70ns | 0.0909 |
| 55-60 | E=28 | 0 day | 49.4±6.9 | 47.1±16.2 | 0.59** | 0.5534 |
| | C=8 | 180th day | 55.8±7.9 | 45.8±15.6 | 2.49** | 0.0175 |

Ns- non significant; *and ** indicate significance of p values at 1% and 5% levels respectively

**Table 2(a) MEAN HDL (mg/dl) OF BHUBANESWAR EXPERIMENTAL GROUP**

| Age group | Initial HDL values ( mg/dl) | 3 months Later values ( mg/dl) | Change in (mg/dl) | Change In % | 6 months Later values ( mg/dl) | Change in (mg/dl) | Change In % | Total Elevation |
|---|---|---|---|---|---|---|---|---|
| 40-46 | 44.61±7.2 | 47.2±9.3 | 2.6 | 5.8 | 51.1 | 3.9 | 6.6 | 6.4(14.3%) |
| 47-54 | 42.68±5.4 | 44.8±10.5 | 2.12 | 4.9 | 47.8 | 3 | 6.6 | 5.1(11.9%) |
| 55-60 | 44.71±7.5 | 46.8±13.2 | 2.09 | 4.6 | 49.0 | 2.2 | 4.7 | 4.2(9.3%) |

Among Bhubaneswar subjects in 40-46 years age group mean HDL increased by 14.3% , whereas in 47-54 age bracket the increase was 11.9%. Least increase in HDL level was seen in 55-60 years age group, by 9.3%.

**Table 2(b) MEAN HDL( mg/dl) OF BHUBANESWAR CONTROL GROUP**

| Age group | Initial HDL values ( mg/dl) | 3 months Later values ( mg/dl) | Change in (mg/dl) | Change In % | 6 months Later values ( mg/dl) | Change in (mg/dl) | Change In % | Total Elevation |
|---|---|---|---|---|---|---|---|---|
| 40-46 | 47.41±13.4 | 47.8±12.4 | 0.4 | 0.8 | 48.04±13.3 | 0.2 | 0.4 | 0.6(1.2%) |
| 47-54 | 45.8±12.6 | 47.0±13.7 | 1.2 | 2.5 | 47.3±14.9 | 0.3 | 0.6 | 1.5(3.2%) |
| 55-60 | 45.71±11.6 | 48.1±13.0 | 2.4 | 4.9 | 50.5±14.4 | 2.4 | 4.7 | 4.8(10.5%) |

Among Bhubaneswar control group increase in HDL was seen in all age group · Highest change was seen in 55-60 yrs age group i.e. 10·5%

**Table 2 (c) Comparison of Mean, Standard Deviation, T-value and P-value of between experimental and control groups, before and after supplementation.**

| Age group | N | | Mean | | t-value | p-value |
|---|---|---|---|---|---|---|
| | | | Expt | Control | | |
| 40-46 | E=21 | 0 day | 44.6±7.2 | 47.4±13.4 | $0.82^{ns}$ | 0.4156 |
| | C=17 | $180^{th}$ day | 51.1±7.6 | 48±13.3 | $0.90^{ns}$ | 0.3725 |
| 47-54 | E=36 | 0 day | 42.6±5.4 | 45.8±12.6 | $1.3^{ns}$ | 0.1687 |
| | C=33 | $180^{th}$ day | 47.8±8.9 | 47.3±14.9 | $0.17^{ns}$ | 0.8648 |
| 55-60 | E=23 | 0 day | 44.7±7.5 | 45.7±11.6 | $0.35^{ns}$ | 0.7208 |
| | C=30 | $180^{th}$ day | 49±8.1 | 50.5±14.4 | $0.44^{ns}$ | 0.6563 |

Ns- non significant; *and ** indicate significance of p values at 1% and 5% levels respectively

## COMPARITIVE ANALYSIS OF HDL LEVELS OF VIZAG AND BHUBANESWAR EXPERIMENTAL SUBJECTS POST SUPPL EMENTATION

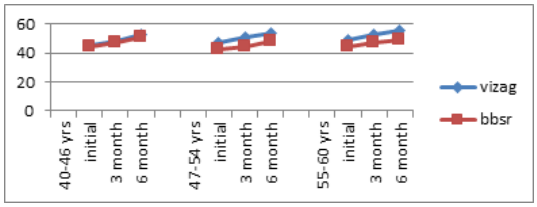


Figure I: Comparative Change in mean HDL levels of experimental group of both Vizag and Bhubaneswar subjects

From the above data it can be seen that max increase in HDL is seen in 40-46 years age group in both cities which is 16.1% for Vizag and 14.3 % for Bhubaneswar. In 47-54 years age group it was 13.7% in Vizag and 11.9% in Bhubaneswar subjects. Least improvement in HDL was seen in eldest age group where only 12.8% and 9.3% HDL increased in Vizag and Bhubaneswar respectively.

The above increase in HDL among diabetic subjects after supplementation with Nutrimix is at par with a study which shows increase in HDL by 27.8% after intake of oats rich bread for 8 weeks conducted by Reyna.et.el (2007) . This positive change is believed to be due to presence of β- glucan. Presence of appel peel in a nutrimix helps is elevating HDL levels due to presence of flavoids such as quercetin , proanthocynadin , anthocynadin which improve HDL and endothelial function of blood vessel as stated by Kaur.et.al (2013)

Cumin powder raises HDL in diabetic rats in a study conducted by Dandpani and Co (2010) this treatment with cumin was proved better than a drug called Glibenelamide.

Total Cholestrol (TC)

**Table 3(a)MEAN TOTAL CHOLESTROL (mg/dl) OF VIZAG EXPERIMENTAL GROUP**

| Age group | Initial TC values (mg/dl) | 3 months Later values (mg/dl) | Change in (mg/dl) | Change In % | 6 months Later values (mg/dl) | Change in (mg/dl) | Change In % | Total Reduction in (mg/dl) |
|---|---|---|---|---|---|---|---|---|
| 40-46 | 194.7±21.2 | 178±18.6 | 16.7 | 8.5 | 163.5±20 | 14..5 | 8.1 | 31.2(16%) |
| 47-54 | 223.2±19.7 | 208±16.8 | 15.2 | 6.8 | 193.5±17.8 | 14.5 | 6.9 | 29.7(13.3%) |
| 55-60 | 211±21.9 | 196.7±14.7 | 14.3 | 6.7 | 183.6±23.4 | 13.1 | 6.6 | 27.4(12.9%) |

Effect of Nutrimix on cholesterol levels of the experimental subjects is shown in table 3(a). In Vizag subjects among 40-46 years old cholesterol decreased by 16%. In 47-54 years age group post supplementation TC came down by 13.3%. In the eldest group TC level reduced by 12.9% in 6 months.

**Table 3(b) MEAN TOTAL CHOLESTROL ( mg/dl) OF VIZAG CONTROL GROUP**

| Age group | Initial TC values (mg/dl) | 3 months Later values (mg/dl) | Change in (mg/dl) | Change In % | 6 months Later values (mg/dl) | Change in (mg/dl) | Change In % | Total Reduction in (mg/dl) |
|---|---|---|---|---|---|---|---|---|
| 40-46 | 225.7±44.0 | 229.8±39.7 | 4.1 | 1.7 | 237.0±42.3 | 7.2 | 3.0 | ↑11.3(5.0%) |
| 47-54 | 221.5±45.2 | 215.6±36.7 | 5.9 | 2.73 | 226.6±37.1 | 11.0 | 4.8 | ↑5.1(2.3%) |
| 55-60 | 229±40.5 | 223.5±35.5 | 5.5 | 2.46 | 216.0±33.6 | 7.5 | 3.4 | ↓13.0(5.6%) |

From the above table 3(b) it can be seen that apart from 55-60 years age group subjects belonging to rest 2 age groups showed increase in cholesterol levels which were 5% in 40-46 years age group and 2·3% in 47-54 years age group·

**Table 3 (C) Comparison of Mean, Standard Deviation, T-value and P-value of between experimental and control groups, before and after supplementation**

| Age group | N | | Mean | | t-value | p-value |
|---|---|---|---|---|---|---|
| | | | Expt | Control | | |
| 40-46 | E=24 | 0 day | 194.7±21.2 | 225.7±44.0 | 2.69** | 0.0115 |
| | C=8 | 180th day | 163.5±20.0 | 237±42.3 | 6.69* | 0.0001 |
| 47-54 | E=28 | 0 day | 223.2±19.7 | 221.5±45.2 | 0.19ns | 0.8491 |
| | C=64 | 180th day | 193.5±17.8 | 226.6±37.1 | 4.49* | 0.0001 |
| 55-60 | E=28 | 0 day | 211±21.9 | 229±40.5 | 1.39ns | 0.1718 |
| | C=8 | 180th day | 183.6±23.4 | 216±33.6 | 3.12* | 0.0036 |

Ns- non significant; *and ** indicate significance of p values at 1% and 5% levels respectively

**Table 4(a)MEAN TOTAL CHOLESTROL (mg/dl) OF BHUBA NESWAR EXPERIMENTAL GROUP**

| Age group | Initial T C values (mg/dl) | 3 months Later values (mg/dl) | Change in (mg/dl) | Change In % | 6 months Later values (mg/dl) | Change in (mg/dl) | Change In % | Total Reduction in (mg/dl) |
|---|---|---|---|---|---|---|---|---|
| 40-46 | 189±15.4 | 176±21.2 | 13 | 6.8 | 154±8.9 | 22 | 12.5 | 35(18.5%) |
| 47-54 | 223.5±26.1 | 205.4±19.7 | 18.1 | 8 | 183.6±26.9 | 21.8 | 10.6 | 39.817.8%) |
| 55-60 | 212.2±16.1 | 191.6±14.3 | 20.6 | 9.7 | 176.8±22.3 | 14.8 | 7.72 | 35.4(16.6%) |

**Table 4(b) MEAN TOTAL CHOLESTROL (mg/dl) OF BHUB ANESWAR CONTROL GROUP**

| Age group | Initial T C values (mg/dl) | 3 months Later values (mg/dl) | Change in (mg/dl) | Change In % | 6 months Later values (mg/dl) | Change in (mg/dl) | Change In % | Total Reduction in (mg/dl) |
|---|---|---|---|---|---|---|---|---|
| 40-46 | 218.6±36.1 | 223.8±35.4 | 5.2 | 2.3 | 227.5±32.7 | 3.7 | 1.6 | ↑8.9(4%) |
| 47-54 | 254.0±41.2 | 246.9±38.6 | 7.1 | 2.8 | 237.3±39.7 | 9.6 | 4.0 | ↑16.7(6.5%) |
| 55-60 | 231.8±42.3 | 234.6±38.5 | 2.8 | 1.1 | 239.5±43.6 | 4.9 | 2.04 | ↑7.7(3.3%) |

Table 4(b) elucidates the change in cholesterol level of Bhubaneswar control group participants· Where decrease in cholesterol by 6.5% was seen in 47-54 years age group but in 40-46 years and 47-54 years age group increase in mean cholesterol was by 4% and 3·3% respectively·

**Table 4 © Comparison of Mean, Standard Deviation, T-value and P-value of between experimental and control groups, before and after supplementation.**

| Age group | | | Mean | | t-value | p-value |
|---|---|---|---|---|---|---|
| | N | | Expt | Control | | |
| 40-46 | E=21 | 0 day | 189±15.4 | 218.6±36.1 | 3.4* | 0.0016 |
| | C=17 | 180th day | 154±18.9 | 227.5±32.7 | 9.8* | 0.0001 |
| 47-54 | E=36 | 0 day | 223.5±26.1 | 254±41.2 | 3.70* | 0.0004 |
| | C=33 | 180th day | 183.6±26.9 | 237.3±39.7 | 6.46* | 0.0001 |
| 55-60 | E=23 | 0 day | 212.2±16.1 | 231.8±42.3 | 2.10** | 0.0403 |
| | C=30 | 180th day | 176.8±22.3 | 239.5±43.6 | 6.28* | 0.0001 |

Ns- non significant; *and ** indicate significance of p values at 1% and 5% levels respectively

**COMPARITIVE ANALYSIS OF TOTAL CHOLESTEROL LEVE LS OF VIZAG AND BHUBANESWAR EXPERIMENTAL SU BJECTS POST SUPPLEMENTATION**

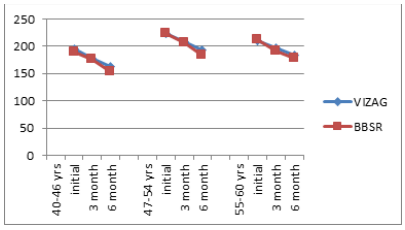


Figure II: Comparative Change in mean Total cholesterol levels of experimental group of both Vizag and Bhubaneswar subjects

From the above data it can be seen that reduction in TC level was better among the subjects of Bhubaneswar then Vizag among all age group. In 40-46 age group reduction is 16% Vizag subjects and 1.5% in Bhubaneswar. Among 47-54 years age group it was 13.1% and 17.8% among Bhubaneswar and Vizag respectively. In oldest group mean TC was reduced by 12.9% among Vizag residents and 16.6% in Bhubaneswar group.

The results are at par with study conducted by Topping and Illiman (1995) which concluded that oats accelerates cholesterol metabolism. In rat fecal bile acids and neutral sterol excretion was enhanced.

According to Srinivasa and co (2011) in Diabetic rats fed with cumin decrease in cholesterol was 22.7%. It also reduced eye lense aldose reductase.

**TRIGLYCERIDE (TG)**

**Table 5(a) MEAN TRIGLYCERIDE (mg/dl) OF VIZAG EXPERIMENTAL GROUP**

| Age group | Initial TG values (mg/dl) | 3 months Later values (mg/dl) | Change in (mg/dl) | Change In % | 6 months Later values (mg/dl) | Change in (mg/dl) | Change In % | Total Reduction in (mg/dl) |
|---|---|---|---|---|---|---|---|---|
| 40-46 | 206.0± 32.6 | 183.6± 29 | 22.4 | 10.8 | 159.5±28.1 | 24.1 | 13.1 | 46.5(22.5%) |
| 47-54 | 261.3±26.2 | 241.6± 30.3 | 19.7 | 7.5 | 209.7±34.7 | 32.6 | 13.4 | 51.3(19.6%) |
| 55-60 | 195.8±39.1 | 183± 37.0 | 12.8 | 6.4 | 165.9±36.0 | 17.1 | 9.3 | 29.9(15.2%) |

Data in 5(a) tells the decrease in triglyceride levels among all age groups. In 40-46 years age group among vizag participants TG dropped by 22.5% post supplementation. In 47-54 years age bracket it came down by 19.6% . In the eldest group mean TG levels were 15.2% lower.

**Table 5(b) MEAN TRIGLYCERIDE (mg/dl) OF VIZAG CON TROL GROUP**

| Age group | Initial TG values (mg/dl) | 3 months Later values (mg/dl) | Change in (mg/dl) | Change In % | 6 months Later values (mg/dl) | Change in (mg/dl) | Change In % | Total Reduction n (mg/dl) |
|---|---|---|---|---|---|---|---|---|
| 40-46 | 163.8±24.7 | 166.5±27.7 | 2.7 | 1.6 | 171.5±25.5 | 5 | 2.9 | ↑7.7(4.7%) |
| 47-54 | 189.7±34.1 | 178.9±33.8 | 10.8 | 6.03 | 183.0±27.6 | 4.1 | 2.24 | ↑6.7(3.5%) |
| 55-60 | 178±32.1 | 187.0±29.4 | 9.0 | 4.8 | 191.2±34.3 | 4.2 | 2.19 | ↑13.2(7.4%) |

Table 5(b) indicates the in change Triglycerides levels of control participants city · It can be seen that in 55-60 years age group mean triglyceride levels increased by 7·4% followed by 4·7% in 40-46 years age group· A decrease of 3·5% was seen in 47-54 years age group·

**Table 5 (c) Comparison of Mean, Standard Deviation, T-value and P-value of between experimental and control groups, before and after supplementation**

| Age group | | | Mean | | t-value | p-value |
|---|---|---|---|---|---|---|
| | N | | Expt | Control | | |
| 40-46 | E=24 | 0 day | 206±32.6 | 163.8±24.7 | 3.34* | 0.0022 |
| | C=8 | 180th day | 159.5±28.1 | 171.5±25.5 | 1.06ns | 0.2939 |
| 47-54 | E=28 | 0 day | 261.3±26.2 | 189.7±34.1 | 9.8* | 0.0001 |
| | C=64 | 180th day | 209.7±34.7 | 183±27.6 | 3.94* | 0.0002 |
| 55-60 | E=28 | 0 day | 195.8±39.1 | 178±32.1 | 1.17ns | 0.2479 |
| | C=8 | 180th day | 165.9±36.8 | 191.2±34.3 | 1.73** | 0.0912 |

Ns- non significant; *and ** indicate significance of p values at 1% and 5% levels respectively

**Table 6(a) MEAN TRIGLYCERIDE (mg/dl) OF BHU BA NESWAR EXPERIMENTAL GROUP**

| Age group | Initial TG values (mg/dl) | 3 months Later values (mg/dl) | Change in (mg/dl) | Change In % | 6 months Later values (mg/dl) | Change in (mg/dl) | Change In % | Total Reduction in (mg/dl) |
|---|---|---|---|---|---|---|---|---|
| 40-46 | 287±24.7 | 254.5±27.8 | 32.5 | 11.3 | 218±26.8 | 36.5 | 14.3 | 69(24.0%) |
| 47-54 | 179±20.1 | 167.3±24.2 | 11.7 | 6.5 | 145.5±22.3 | 21.8 | 13.0 | 33.5(18.7%) |
| 55-60 | 210±21.7 | 187.4±27.1 | 22.6 | 10.7 | 165.2±25.4 | 23.7 | 12.6 | 46.3(22%) |

The same trend as vizag experimental was seen in Bhubaneswar group. Among 40-46 years bracket TG decreased by 24%. In 47-54 years age group it came down by 18.7%. Among 55-60 years age group the decrease was 22%.

**Table 6(b) MEAN TRIGLYCERIDE ( mg/dl) OF BHUBA NES WAR CONTROL GROUP**

| Age group | Initial TG values (mg/dl) | 3 months Later values (mg/dl) | Change in (mg/dl) | Change In % | 6 months Later values (mg/dl) | Change in (mg/dl) | Change In % | Total Reduction in (mg/dl) |
|---|---|---|---|---|---|---|---|---|
| 40-46 | 216.7±31.2 | 220.0±36.2 | 3.3 | 1.5 | 224.5±28.7 | 4.5 | 2.0 | ↑7.8(3.5%) |
| 47-54 | 234±28.1 | 220.0±34.1 | 14.0 | 6.3 | 229.7±26.2 | 9.7 | 4.2 | ↑4.3(1.7%) |
| 55-60 | 242.0±31.3 | 236.3±24.1 | 5.7 | 2.4 | 227.5±39.3 | 8.8 | 3.8 | ↑14.5(5.9%) |

Among Bhubaneswar control group participants triglycerides levels increases in youngest age group by 3·5% remaining 2 age groups showed decrease in triglyceride levels by 1·7% along 47-54 years old participants and 5·9% in eldest group·

**Table 8 (c) Comparison of Mean, Standard Deviation, T-value and P-value of between experimental and control groups, before and after supplementation.**

| Age group | N | | Mean | | t-value | p-value |
|---|---|---|---|---|---|---|
| | | | Expt | Control | | |
| 40-46 | E=21 | 0 day | 287±24.7 | 216.7±31.2 | 7.75* | 0.0001 |
| | C=17 | 180th day | 218±26.8 | 224.5±28.7 | 0.72ns | 0.4760 |
| 47-54 | E=36 | 0 day | 179±20.1 | 234±28.1 | 9.41* | 0.0001 |
| | C=33 | 180th day | 145.5±22.3 | 229.7±26.2 | 14.32* | 0.0001 |
| 55-60 | E=23 | 0 day | 210±21.7 | 242±31.3 | 4.18* | 0.0001 |
| | C=30 | 180th day | 165.2±25.4 | 227.5±39.3 | 6.60* | 0.0001 |

Ns- non significant; *and ** indicate significance of p values at 1% and 5% levels respectively

## COMPARITIVE ANALYSIS OF TRIGLYCERIDES LEVELS OF VIZAG AND BHUBANESWAR EXPERIMENTAL SUBJECTS POST SUPPLEMENTATION

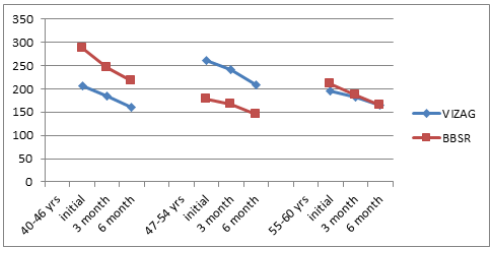


Figure III: Comparative Change in mean Triglycerides levels of experimental group of both Vizag and Bhubaneswar subjects

Decrease in mean TG level post supplementation was seen among the subjects of both the cities. In 40-46 years age group a huge reduction of 24% was seen in Bhubaneswar residents and 22.5% in Vizag group. In the next group 18.7% decrease was seen in Bhubaneswar subjects compared to 19.6% in Vizag subjects. In 55-60 years age group 2% triglyceride levels reduced in Bhubaneswar group and only 152% in Vizag group.

In the above results decrease in TG an be owed to the presence of apple peel . As the results are on par with the study conducted by Sugiaa and co (2007) which showed among both mice and human in spite of having Triglyceride rich food the same levels did not increase in blood when consumed with an apple.

Mango leaf extracts decreased serum glucose and triglyceride levels in KK-AY diabetic mice. TG level decreased when mango leaf extract upregulated AMPK and altered lipid metabolism . active metabolites determined were Iriflophenone, benzophenone-c-glucoside, 3-c-β-glucoside (Liu.et.al,2013)

A major component in nutrimix is ragi which was found to be producing Adiponecin hormone which is produced by fat tissues to burn fat. In one study rats with high TG when fed with ragi flour for 5 weeks, decreased their Triglyceride levels and C- reactive protein levels.

## CONCLUSION

On a whole it can be observed from the results that Nutrimix had a very positive hypolipedmic effect on type 2 diabetic patients. Presence of fiber and phytochemicals like anthocyanin and resvertrol helped in management of lipid levels. Introduction of such Nutrimix in daily diet along with proper lifestyle help in keeping away cardiopathy complications in type 2 diabetics.

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