Research Article **ISSN: 2349 – 7114**

Asian Journal of Research in Pharmaceutical Sciences and Biotechnology

Journal home page: www.ajrpsb.com

A STUDY ON IMPACT OF VEGETABLE OILS AND FISH OIL ON RAT LIPID PROFILE

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ABSTRACT

It's a fact that elevated TG's, LDL and decreased HDL in serum are major risk factor for coronary artery disease, it became necessary to establish the effect of oil consumption on lipid profile. In spite of all business making publicity stunts by oil manufactures choosing best oils from wide variety of availability is very difficult for public so, we try to establish cardiac friendliness of oils by conducting animal studies on albino rats. 30 albino male rats were used in this study. The animals are randomly allocated into 5 groups (each group of 5) of approximately equal average body weight (150-200gm). In this study rat feed is prepared by mixing 15 ml of oil for every 85 gm. of feed and rats are feeded for duration of 28 days. At the end of the experimental period (7-8 weeks) animals were fasted for 12hrs and blood samples are collected Lipid profile is conducted and results are compared with std reference values. From this study we concluded that the TC levels are elevated on use of Groundnut oil comparing to other oils, HDL levels are elevated on use of olive oil comparing to other oils, The LDL levels are elevated on use of groundnut oil and low in fish oil, The TG levels are decreased than normal in case of all oil but fish oil shows TG level near to normal group. Finally we conclude that fish oil is cardiac friendly showing good impact on lipid profile as it shows low TC, LDL levels and high HDL level comparing to control. Next to that olive oil is showing better impact on lipid profile.

KEYWORDS

Lipid profile, TC, LDL, HDL and TG.

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INTRODUCTION

Lipids (Greek: lipos-fat) are of good importance to the body because the chief light weight storage variety of energy, besides their role in cellular structure and other alternative cellular functions. As such, lipids are a heterogeneous cluster of compounds and thus, it's rather tough to outline them exactly.

Definition

Lipids could also be considered organic substances comparatively insoluble in water, soluble in organic solvents (alcohol, ether, etc), probably belongs to fatty acids and utilised by the living cells.

Classification of lipids

Lipids are generally classified (modified from Bloor) into

Simple lipids

Esters of fatty acids with alcohols. These are primarily of 2 varieties.

Fats and oils (triacylglycerols)

These are esters of fatty acids with glycerol. The difference between fat and oil is simply physical. Thus, oil may be a liquid whereas fat may be a solid at room temperature.

Waxes

Esters of fatty acids (usually long chain) with alcohols except glycerine. These alcohols could also be open-chain or acyclic. Cetyl alcohol is generally found in waxes.

Complex (or compound) lipids

Esters of fatty acids with alcohols containing extra groups likephosphate, nitrogenous base, carbohydrate, protein etc. they are additional divided:

Phospholipids

Lipids containing phosphoric acid and regularly a nitrogenous base. This can be additionally to alcohol and fatty acids. i) Glycerophospholipids: These phospholipids contain glycerol because the alcohol e.g., lecithin, cephalin. ii) Sphingophospholipids: Sphingospine is that the alcohol in this cluster of phospholipids e.g., sphingomyelin.

Glycolipids

These lipids contain a fatty acid, carbohydrateand nitrogenous base. The alcohol is sphingospine, thence they're additionally known as as glycosphingolipids. glycerol and phosphate are absent e.g., cerebrosides, gangliosides.

Lipoproteins

Macromolecules complexes of lipids with proteins.

Other complex lipids

Sulfolipids, aminolipids and lipopolysaccharides are among the other complex lipids.

Derived lipids

These are the derivatives obtained on the chemical reaction of cluster one and cluster a pair of lipids that possess the characteristics of lipids. These include glycerol and other alcohols, fatty acids, mono- and diacylglycerols, lipid soluble vitamins, steroid hormones, hydrocarbons and organic compound bodies.

Miscellaneous lipids

These include a large range of compounds possessing the characteristics of lipids e.g., carotenoids, squalene, hydrocarbons such as pentaconase (in bees wax), terpenes etc.

Neutral lipids

The lipids that are uncharged are referred to as neutral lipids. These are mono-, di-, and triacylglycerols, cholesterol and cholesteryl esters. in keeping with their functions, lipids are Storage lipids- Fatty acids Triacylglycerols and mono, di Sterols Structural lipids- Phospholipids Sacchrolipids other lipids- Proteolipids and Lipoproteins Polyketides.

Aim

To study the impact of vegetable oils and fish oil on rat lipid profile.

Objective:

- To observe the amount of lipid depositions in the body on use of vegetable oils and fish oil.
- To suggest a better cardio-friendly oil.

LITERATURE SURVEY

1. Mazid M A *et al* (2014). Current study showed that each the fish and vegetable oils have important anticholesterol effects on hypercholesterolemic rats. However, compared to the vegetable oil, fish oil has stronger impact on the blood lipid profile. Regular dietary intake of fish and vegetable oils would cut back the danger of cvs complication.
2. Victor U. Nna *et al* (2014). We have a tendency to so conclude that the edible oils employed in this study reduced the danger of CHD by reducing blood serum cholesterol concentrations, with CCO, SBO and SSO being additional helpful as blood

serum TC concentrations were lowest in those groups than RPO and PKO. Also, the edible oils used for this study enhances erythropoiesis, but RPO, PKO and SBO are harmful to leucopoiesis.

MATERIAL

Experimental animals

The Wistar Albino is one of the most commonly and vastly used class of laboratory animals. Its popularity as laboratory animal is next only to that of mice. Just as the mice, rat's availability spreads over the whole world specially in places of human habitation. Rattusnorvegicus adapts readily to breeding and living in the laboratory conditions. It is believed that about 3 to 5 million rats are used yearly in laboratories all over the world, which account for use of 10-15% of the total number of laboratory animals of different species.

METHODOLOGY

1. Age matched (3-4 months) of 30 albino male rats were used in this study.
2. All animals are allowed to kept under normal healthy conditions and fed on a control diet for 1 week before treatment.
3. The animals are randomly allocated into 5 groups (each group of 5) of approximately equal average body weight (150-200gm).
4. Utmost care is taken to provide same environmental housing conditions namely
   a) Temperature
   b) Light
   c) Aeration
5. Mineral water is supplied daily for all rats.
6. All experimental procedures are done in accordance with IAEC.
7. At the end of the experimental period (8 weeks) animals were fasted for 12hrs and blood samples are collected into clean centrifuge at 3000rpm for 15minutes.
8. Blood is used for estimation of lipid profile as TG, TC, LDL-C, HDL-C, etc.

TEST DIET PREPARATION

Test diet is prepared by mixing 15 ml vegetable oils (fish oil) with normal commercial rat pellet. 15gm (oils) + 85gm of rat pellet are mixed and left for some time at room temperature before feeding.

- 1st group-Animals are fed with normal rat pellet diet i.e., control diet.
- 2nd group-Animals are fed with normal rat pellet diet+ sunflower oil.
- 3rd group-Animals are fed with normal rat pellet diet+ ground nut oil.
- 4th group-Animals are fed with normal rat pellet diet+ olive oil.
- 5th group-Animals are fed with normal rat pellet diet+ fish oil.

RESULTS

By comparing,

The total cholesterol level is increased in rat given with ground nut oil so it may cause cardiac problems.

The Triglycerides levels are decreased as it is beneficial

HDL values are equal with control (Good cholesterol)

LDL values are increased as it is dangerous (Bad cholesterol)

TC/HDL and LDL/HDL values are increased thereby occurrence of atherosclerosis and coronary heart disease may increases

By comparing,

The total cholesterol level is increased in rat given with sunflower oil, it may cause cardiac problems.

The triglyceride levels are decreased as it is beneficial

HDL values are same as control (Good cholesterol)

LDL values get increased as it is dangerous (Bad cholesterol)

TC/HDL and LDL/HDL are increased thereby increasing the occurrence of atherosclerosis and coronary heart disease

By comparing,

The total cholesterol level is increased in rat given with olive oil thereby it may causes cardiac problems.

The triglyceride level is get decreased as it is beneficial.

HDL level increases

LDL level is too increased as it is dangerous

TC/HDL and LDL/HDL values are equivalent to control

DISCUSSION

Now-a-days people are in confusion on choosing better oil for their daily use for leading a healthy and happy life. As we know that these oils will contain different types of fatty acids which are useful if we use in limits and some may cause physiological changes within our bodies and contributing to multiple diseases.

Here are 6 reasons why vegetable oils if taken in excess amounts are downright toxic.

1. Vegetable oils are very unnatural in large amounts.
2. Vegetable oils mess up the fatty acid composition of the body's cells.
3. Vegetable oils contribute to inflammation.
4. Vegetable oils are loaded with trans-fat.
5. Vegetable oils can dramatically raise your risk of CVD.
6. Vegetable oil consumption is associated with various other diseases.

So, with the results of this lipid profile test we can determine approximate risk for cardiovascular diseases and certain forms of pancreatitis.

Comparing to all,

The TC levels are elevated on use of Groundnut oil comparing to other oils and next sunflower oil shows less than groundnut oil but higher than olive and fish oils. Olive oil shows TC level higher than fish oil.

The HDL levels are elevated on use of olive oil comparing to other oils. The fish oil also shows high amount but less than olive oil. The sunflower and groundnut oil shows low HDL level than remaining oils.

The LDL levels are elevated on use of groundnut oil and low in fish oil than other oils.

The TG levels are decreased than normal in case of all oil but fish oil shows TG level near to normal group.

The TC/HDL level is high in both groundnut and sunflower oil groups comparing to normal and olive and fish oil groups shows same level of TC/HDL level to normal.

The LDL/HDL level is high in all oil containing groups comparing to normal.

Grouping of animals

Table No.1: Type of diet

Group. No	Type of diet	No. of animals
1	Control	5
2	Diet+groundnut oil	5
3	Diet+sunflower oil	5
4	Diet+olive oil	5
5	Diet+fish oil	5

Table No.2: The average values of lipid profile in rat are listed in the following table

TC	73.37mg
HDL	21.6mg
LDL	35.29mg
TG	82.35mg
TC/HDL	3.39mg
LDL/HDL	1.62mg

Table No.3: Control values of rat lipid profile

Animal. No	TC	HDL	LDL	TG	TC/HDL	LDL/HDL
1	73.37	21.6	35.29	82.35	3.39	1.62
2	73.36	21.58	35.27	82.34	3.38	1.64
3	73.37	21.59	35.28	82.35	3.39	1.63
4	73.36	21.6	35.29	82.33	3.37	1.62
5	73.37	21.6	35.29	82.35	3.39	1.63
Average	73.37	21.6	35.29	82.35	3.39	1.63

Table No.4: Values of lipid profile before starting the experiment

Animal No.	TC	HDL	LDL	TG	TC/HDL	HDL/LDL
1	71.18	21.51	33.25	81.68	3.3	0.64
2	70.2	21.49	32.2	80.69	3.26	0.66
3	71.15	21.4	33.19	81.54	3.32	0.64
4	70.28	21.5	33.2	81.4	3.26	0.64
5	71.18	21.54	33.24	80.48	3.3	0.64
Average	70.79	21.48	33.01	81.1	3.28	0.64

Table No.5: Comparative effect of ground nut oil on rat lipid profile after 28 days

Animal. No.	TC	HDL	LDL	TG	TC/HDL	LDL/HDL
1	118mg	24.0mg	89.2mg	38.9mg	5.6	4
2	120mg	22.0mg	86.2mg	40mg	5.8	4.2
3	119mg	21.0mg	85.2mg	39mg	5.5	4.3
4	120mg	20mg	88.2mg	38mg	5.4	4.1
5	118mg	22mg	89.1mg	37mg	5.2	4.1
Average	119mg	21.mg	87.5mg	38.5mg	5.5	4.1

Table No.6: Values of lipid profile before starting the experiment

Animal. No.	TC	HDL	LDL	TG	TC/HDL	HDL/LDL
1	73.37	21.6	35.29	82.35	3.39	0.61
2	72.26	20.59	35.26	83.4	3.5	0.58
3	73.35	21.52	35.28	82.52	3.4	0.6
4	72.29	21.56	35.26	82.29	3.35	0.61
5	73.35	21.58	35.29	82.3	3.39	0.61
Average	72.9	21.37	35.27	82.57	3.4	0.6

Table No.7: Comparative effect of sunflower oil on rat lipid profile after 28 days

Animal. No	TC	HDL	LDL	TG	TC/HDL	HDL/LDL
1	74.56	22.7	35.16	83.24	3.28	0.64
2	73.54	22.59	35.4	83.22	3.25	0.63
3	72.48	22.6	35.2	83.19	3.2	0.64
4	73.56	22.68	35.3	83.16	3.24	0.64
5	72.59	22.7	35.4	83.14	3.19	0.64
Average	73.3	22.65	35.29	83.19	3.23	0.64

Table No.8: Values of lipid profile before starting the experiment

Animal. No.	TC	HDL	LDL	TG	TC/HDL	LDL/HDL
1	101mg	30.0mg	59.4mg	58.0mg	3.3	1.9
2	100mg	30.0mg	59.2mg	56.0mg	3.2	1.7
3	102mg	31.0mg	59.3mg	58.0mg	3.3	1.8
4	101mg	30.0mg	59.2mg	58.0mg	3.1	1.9
5	102mg	31.0mg	59.4mg	58.2mg	3.3	1.9
AVERAGE	101.2mg	30..2mg	59.3mg	57.64mg	3.24	1.84

Table No.9: Comparative effect of olive oil on rat lipid profile after 28 days

Animal. No	TC	HDL	LDL	TG	TC/HDL	LDL/HDL
1	115mg	22mg	86.2mg	33.9mg	5.2	3.9
2	114mg	21mg	85.2mg	33.6mg	5	3.8
3	112mg	22mg	86.2mg	32.6mg	5.1	3.8
4	115mg	21mg	86.2mg	31.6mg	5.2	3.7
5	114mg	22mg	85.2mg	32.9mg	5.1	3.9
AVERAGE	114mg	21.6mg	85.8mg	32.92mg	5.12	3.82

Table No.10: Values of lipid profile before starting the experiment

Animal. No	TC	HDL	LDL	TG	TC/HDL	HDL/LDL
1	73.7	22.15	35.73	79.16	3.32	0.61
2	73.6	22.12	35.76	79.15	3.32	0.61
3	73.2	22.1	35.72	79.13	3.31	0.61
4	72.9	22.11	35.71	79.11	3.29	0.61
5	72.3	22.14	35.7	79.1	3.26	0.62
Average	73.14	22.12	35.72	79.13	3.3	0.61

Table No.11: Comparative effect of fish oil on rat lipid profile after 28 days

S.No	TC	HDL	LDL	TG	TC/HDL	LDL/HDL
1	95.8mg	25.0mg	57.5mg	66.8mg	3.8	2.3
2	92.4mg	23.0mg	56.5mg	65.8mg	3.6	2.1
3	93.4mg	24.0mg	56.3mg	65.4mg	3.4	2
4	95.8mg	24.8mg	55.3mg	65.2mg	3.2	2
5	95.8mg	25.0mg	57.5mg	66.8mg	3.8	2.1
Average	94.64mg	24.36mg	56.62mg	66mg	3.56	2.1

Table No.12: Overall effect of oils on rat lipid profile after 28 days

TC	119	114	101.2	94.6	73.37
HDL	21.8	21.6	30.2	24.3	21.6
LDL	87.5	85.8	59.3	56.6	35.29
TG	38.5	32.92	57.6	66	82.35
TC/HDL	5.5	5.1	3.2	3.5	3.39
LDL/HDL	4.1	3.8	1.84	2.1	1.63

Figure No.1: Rats during experiment

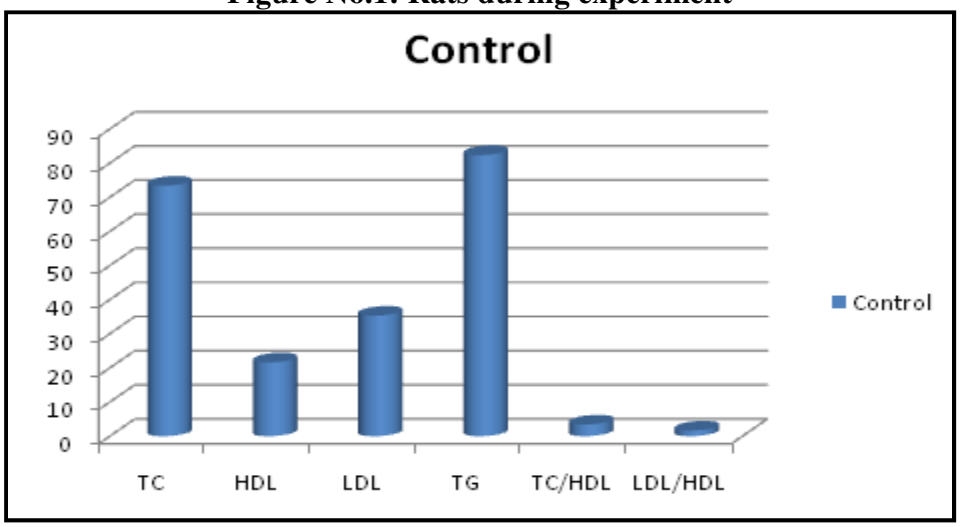

Figure No.2: Control values of rat lipid profile

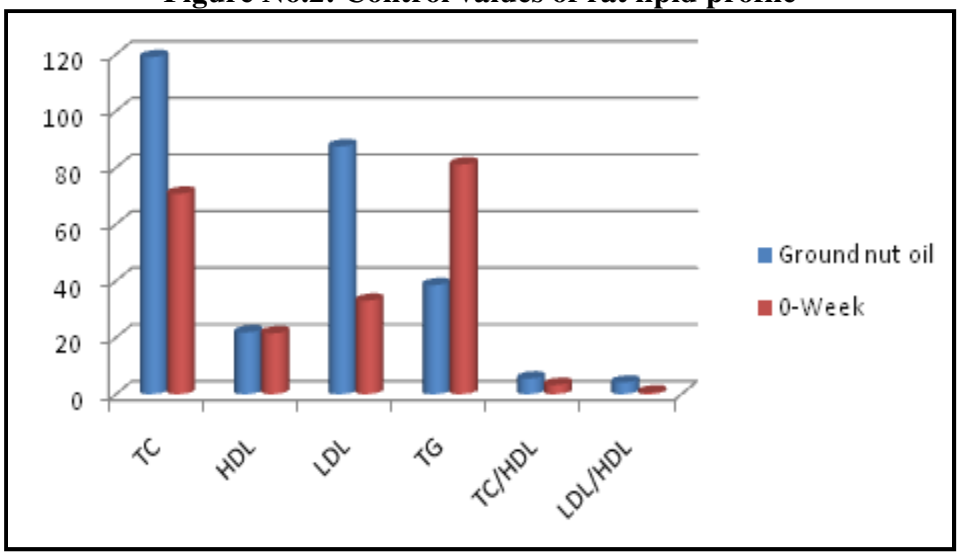

Figure No.3: Comparative effect of groundnut oil on rat lipid profile after 28 days

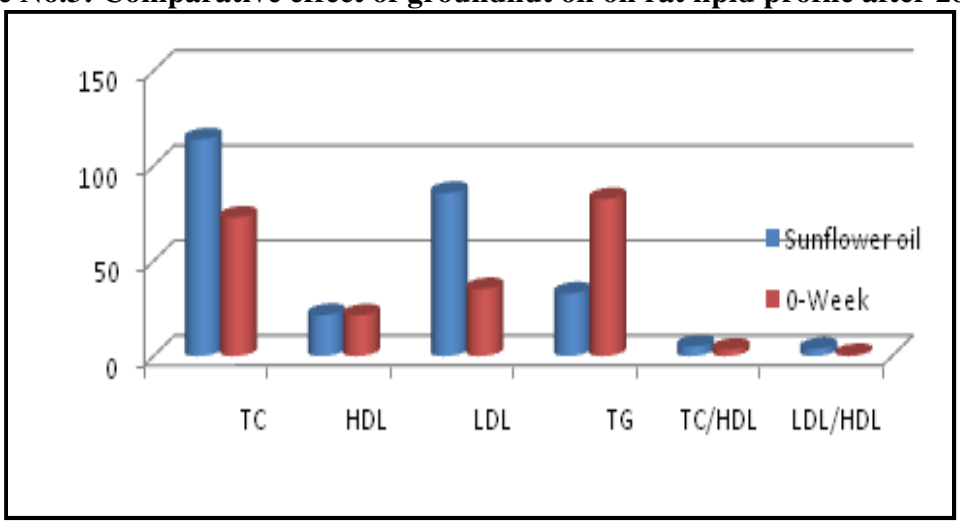

Figure No.4: Comparative effect of sunflower oil on rat lipid profile after 28 days

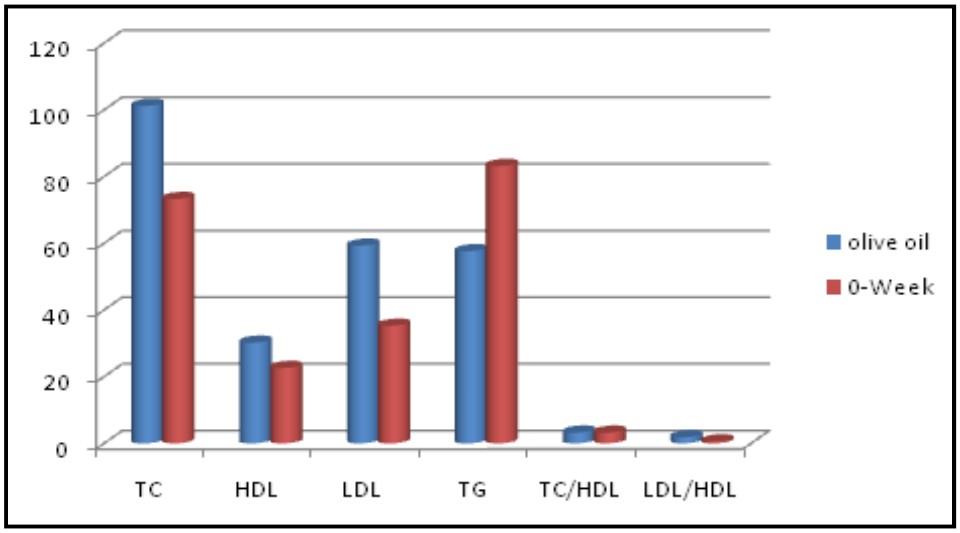

Figure No.5: Comparative effect of olive oil on rat lipid profile after 28 days

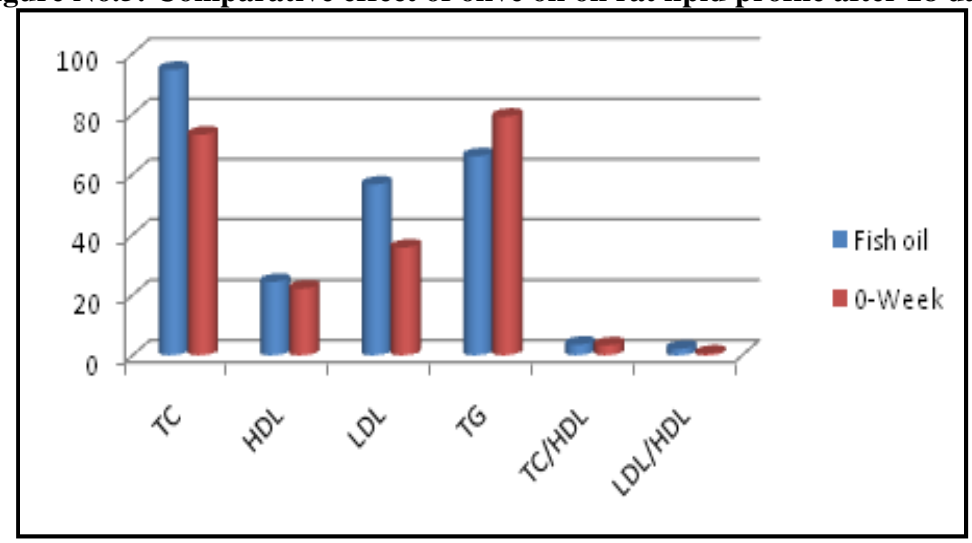

Figure No.6: Comparative effect of fish oil on rat lipid profile after 28 days

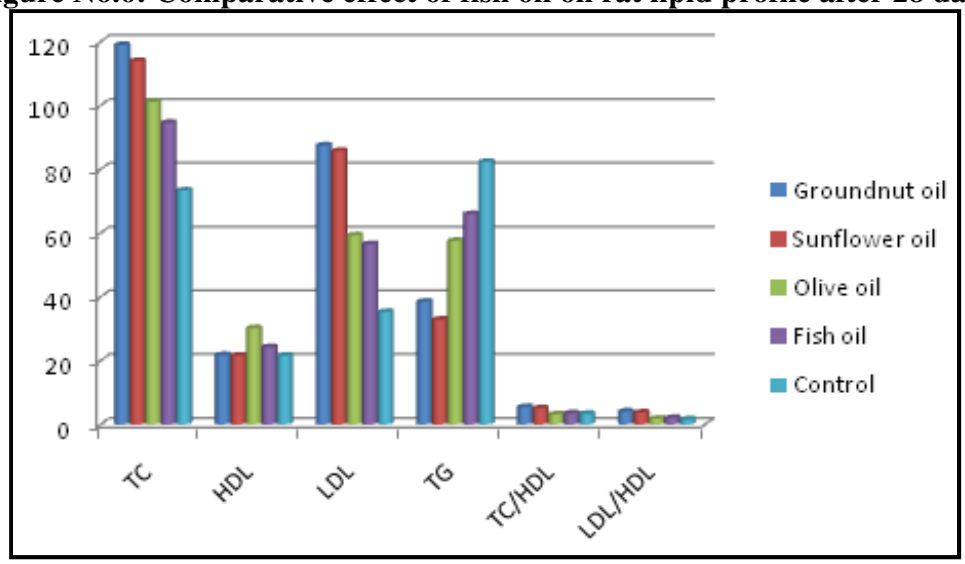

Figure No.7: Overall effect of oils on rat lipid profile after 28 days

CONCLUSION

Finally we conclude that fish oil is showing good impact on lipid profile as it shows low TC, LDL levels and high HDL level comparing to control thereby reducing further cardiac problems and maintains good health conditions of the people.

Next to that olive oil is showing better impact on lipid profile but less than fish oil as it shows higher HDL level and also high TC and LDL levels.

Ground nut oil and Sunflower oil shows higher TC, LDL levels and low HDL level as comparing to remaining groups thereby using these oils may cause severe complications.

ACKNOWLEDGEMENT

The authors wish to express their sincere gratitude to Department of Pharmacology, Narasaraopeta Institute of Pharmaceutical Sciences, Narasaraopet, Guntur, Andhra Pradesh, India for providing necessary facilities to carry out this research work.

CONFLICT OF INTEREST

We declare that we have no conflict of interest.

BIBLIOGRAPHY

1. Eqbal Dauqan, Halimah Abdullah Sani, Aminah Abdullah, Zalifah Mohd Kasim. Effect of Different Vegetable Oils (Red Palm Olein, Palm Olein, Corn Oil and Coconut Oil) on Lipid Profile in Rat, *Food and Nutrition Sciences,* 2(4), 2011, 253-258.
2. Karaji-Bani M, Montazeri F and Hashemi M. Effect of Palm Oil on Serum Lipid Profile in Rats, *Pakistan Journal of Nutrition,* 5(3), 2006, 234-236.
3. Mohammad EL-Sayed, Mohamed Elsanhoty, and Mohamed Fawzy Ramadan. Impact of dietary oils and fats on lipid peroxidation in liver and blood of albino rats, *Asian Pac J Trop Biomed,* 4(1), 2014, 52-58.
4. Jeevaratnam K and Jyothsna Karanth. Effect of dietary lipid, carnitine and exercise on lipid profile in rat blood, liver and muscle, *Indian Journal of Experimental Biology,* 47(09), 2009, 748-753.
5. Sevil Kurban, Idris Mehmetoglu and Gulsum Yilmaz. Effect of diet oils on lipid levels of the brain of rats, *Indian Journal of Clinical Biochemistry,* 22(2), 2007, 44-47.
6. Satyanarayana U. Biochemistry, *Elsevier Publisher,* 4th Edition, 2013, 810.
7. Victor U. Nna, Nsima M. Essien, Stella C. Bassey, Ofem E.Ofem. Comparative Effect of Chronic Consumption of Some Edible Vegetable Oils on Lipid Profile and some Haematological Parameters in Rats, *Scholars Research Library,* 5(7), 2014, 16-21.
8. Amr A. Rezq, Fatma A. Labib and Abd Elrahman M. Attia. Effect of Some Dietary Oils and Fats on Serum Lipid Profile, Calcium Absorption and Bone Mineralization in Mice, *Pakistan Journal of Nutrition,* 9(7), 2010, 643-650.
9. Mohd Mazid and Nooris Naqvi. Differential yield and quality response of four chickpea cultivars following the foliar spray of five selected plant growth regulators, *Agric. Sci. Digest,* 34(4), 2014, 268-272.

Please cite this article in press as: Mallikarjuna Reddy K *et al*. A study on impact of vegetable oils and fish oil on rat lipid profile, *Asian Journal of Research in Pharmaceutical Sciences and Biotechnology,* 6(2), 2018, 35-43.