Effect of the *Suryanamaskar* in the management of Dyslipidemia: A clinical study

Jaideep Arya[1] , Manju Bora[2]

1-Chairman- Haryana Yog Aayog, Secretary General- National Yogasana Sports Federation, and Ph.D Scholar, Maharaja Agrasen Himalayan Garhwal University, Uttarakhand, India.
2-Professor, Maharaja Agrasen Himalayan Garhwal University, Uttarakhand, India .

Article Info

Corresponding author-
Jaideep Arya, Chairman- Haryana Yog Aayog, Secretary General- National Yogasana Sports Federation, and Ph.D Scholar, Maharaja Agrasen Himalayan Garhwal University, Uttarakhand, India – 246169.

Email: sunilatraye@gmail.com

ABSTRACT:

The purpose of the study was to find out the effect of Surya namaskar on the management of Dyslipidemia patients. To achieve this purpose, sixty (N=60) patients with Dyslipidemia were selected from Bhiwani, Haryana with their ages ranging between 21 to 57 years. They were classified into two groups i.e.; one is the control group (N=30) (Medicine + No change in their daily routine) and the other is an experimental or interventional group (N=30) (Medicine + *Suryanamaskar* practice 30 ± 10 minutes/day for 5 days/week over the period of twelve weeks). *Suryanamskar* was assessed for all the selected subjects by an expert Yoga trainer doing an intervention programme, and the Dyslipidemia was examined by the level of Cholesterol, level of triglycerides, level of high-density Lipoprotein-s, and level of very low-density Lipoprotein-s test before and after the intervention programme and collected data were subjected to statistical treatment by using SPSS (Statistical Package of Social Sciences, version 20). In all the cases 0.05 level of confidence was fixed to test the significance. After that, in the concluding phase, the result has become significant, that depict, the *Suryanamaskar* training shows better improvement in the management of Dyslipidemia.
Keywords: Yoga, *Suryanamaskar,* Dyslipidemia

INTRODUCTION

Yoga is becoming a science rather than philosophy or religion. In the recent era, *Hathayoga* is becoming more popular. In different texts, there is different sub-division of Hathyoga tradition. According to *Gherand Samhita*, there are seven sadhana or *saptsadhna* of Yoga whereas in *Hathpradipika* there is four sadhana for doing Yoga. Maharishi Patanjali provides eight (8) limbs of Yoga or Ashtanga Yoga. According to a great Yoga guru Swami Sivananda Saraswati from Rishikesh: "Yoga is assimilation & cooperation between feeling, thought & deed or assimilation between heart, head and hand".[1] Yoga includes practices like *Shatkarma, Asanas, Pranayam*, and *Dhyan*a which are practiced for the betterment of the health and union with the supreme soul. It was discovered by Indian Rishis and Munis thousands of years ago to adopt a stable vibrant lifestyle and now it is becoming a helpful technique for improving health and curing diseases.[2] Many studies conducted on Yoga reported valuable health

benefits and proved Yoga can be the most economical and favorable form of physical practice. Yoga produces physiological changes providing improvement of self and gaining the full potential of body, mind, and soul.[3]

Lipids:

In layman's language, a lipid is known as fat, it is a hydrophobic molecule comprising the essential components of all living cells. In the human body, we perform a number of important functions by playing an important role in the cellular structure, serving as concentrated storage forms of energy, metabolic regulators, protecting internal organs by a cushioning effect, etc.

It can be further classified into two types viz **element constant & element variable**.

Plasma Lipids:

There are four main categories of lipids present in plasma in varying amount [4,5]

1. **Cholesterol and its esters:** cholesterol is the most important animal steroid which forms an important structural component of the cell membrane. It is widely distributed in the human body and a total of about 140 mg/dl of cholesterol is present in an adult weighing 70 kilograms.

2. **Triglycerides:** triglycerides, also known as triacyl glycerol or neutral fats are esters of three fatty acids and glycerol. They are derived either from dietary sources (exogenous) or synthesized within the human body (endogenous). The liver and adipose tissue are the major sites of triglyceride synthesis. The triglycerides constitute 95 % of the adipose tissue, where they are mainly used for the storage of energy whereas in the liver triglycerides are mainly secreted as very low-density lipoprotein (VLDL). These triglycerides are broken down into free fatty acids and utilized as an energy source.

3. **Phospholipids:** conjugated lipids that contain glycerol, fatty acids, and a nitrogenous base. The main plasma phospholipids are lecithin, sphingomyelin, and cephalins. They constitute about 2 % LDL and 30% HDL.

4. **Non-esterified fatty acids (NEFA):** Also termed as free fatty acids, they are complexed with albumin in the plasma and are mainly derived from the lipolysis of triglyceride stored in the adipose tissue. They function either to supply energy by oxidation or are incorporated into tissue lipids by esterification.

Lipoproteins:

Lipoproteins are large mostly spherical complexes of lipids and proteins that transport lipids (primarily triglycerides, cholesterol esters, and fat-soluble vitamins) through the body fluids (plasma, interstitial fluid, and lymph). Their functions are:

a) In the absorption of dietary cholesterol, long-chain fatty acids, and fat-soluble vitamins.

b) The transport of triglycerides, cholesterol, and fat-soluble vitamins from the liver to the peripheral tissues; and

c) The transport of cholesterol from the peripheral tissues to the liver.

Surya Namaskar

In this present time, Modern development encapsulated with time constraints, the importance of Yoga has taken a fillip and its spread across the world is manifold due to scientific authentication.'*Surya*' means the sun and '*namaskar*' means to bend down in proper forms due to its benefits and has been acclaimed as the best exercise for all the modern day for assumptive lifestyle.[6,7] As the Sun has been worshipped since ancient times by one and all also it's the symbol of attaining spiritual consciousness. *Surya Namaskar* stimulates the *Pingala Nadi* by the absorbance of solar energy by the body. It contains asanas, pranayama, mantra, and dhyana techniques also Surya Namaskar channelizes and stabilizes the physical as well as mental stages. There are twelve postures in the regular method and rhythm and energy are the essentials that makeup *Surya Namaskar*. This gives an energetic body and balance of the mind.[8]

Techniques of *Surya Namaskar*

Surya Namaskar is an ancient meditative technique also called one kind of Yoga which is the skill of solar vitalization. This contains asanas; pranayama, and mantras also contain three aspects procedure and vital energy, and regularity. It consists of 12 postures chanted in a particular posture which is a particular breathing pattern and each of which relates to one of the 12 symbols of the zodiac. The benefits of *Surya Namaskar* are to vitalize and clear the entire system, increase gastric fire and improve the functioning of all parts of the human body and tone each and every muscle.*Surya Namaskar* is a beautiful attitude in its basic, so there are two physical techniques available and every pose would only take up to 30 – 40 seconds to complete the cycle might not be lost for more than 10 minutes, and never forget 2 minutes for relaxation. One complete round of *Surya Namaskar* contains these 12

positions performed in series twice. Related to each of the 12 positions is a mantra,which for optimal benefit should be constant orally or intellectually.

OBJECTIVES OF THE STUDY:

The objectives of the study are as under:

1. To investigate the effect of *Suryanamaskar* on dyslipidemia patients.
2. To compare the effect of *Suryanamaskar* on dyslipidemia patients (interventional group) and dyslipidemia patients (control group).

Hypotheses:

The present study will be conducted to test the following hypotheses:

1. There exists no significant difference in the effect of *Suryanamaskar* on dyslipidemia patients (interventional group) and dyslipidemia patients (control group)**.**

METHOD

In this study, the assessment of biochemical parameters (Lipid profile blood test) before and after 12 weeks of Yoga interventional (*Suryanamaskar*) of dyslipidemia patients was conducted in the Healthcare Diagnostic Centre, Bhiwani (Haryana) and Agility Diagnostics, Bhiwani (Haryana) for medical examining.

Selection Of The Subject:

Sixty patients of dyslipidemia, with a history of low and very low-density lipoproteins, in the age of 19-54 years, were selected. The diagnosis parameters of dyslipidemia patients were done according to the WHO criteria. The scope and objectives of the present study were explained to all the subjects.
Ethical Clearance number-EC/NEW/INST/2022 /2489 dated -03-08-2020

Methodology

The dyslipidemia patients were divided into two separate groups:
Group I (n=30) dyslipidemia patients who practice *Suryanamaskar* (Yoga Intervention) for 12 weeks. All these patients performed *Surynamanskar* practices for 12 weeks/45 minutes under the guidance of an expert Yoga trainer.
Group II (n=30) Dyslipidemia or control group patients, were retained on allopathic medications only. These patients were not considered in any interventional practices.

Suryanamakar

All the interventional group subjects were taught Yogic practices. The duration of the practice was 30 minutes session from 7:30 AM to 8:00 AM. It was advised to keep a towel and empty bladder prior to Yogic practices. The practitioner was to perform lastly relaxation in Shavasana to normalize the body and breathing. This relaxed the mind and body after the session.

1. Sukshma Vyayama (Loosening Practices)
i) Neck bending
ii) Shoulder Movement
iii) Trunk Movement
iv) Knee Movement
2. Suryanamaskar (Sun-salutation)
3. Shavasana (Relaxation)

Biochemical Parameters

The basal parameters included in the biochemical investigations were:-

1. Lipid panel from blood.

The blood sample was analyzed by autoanalyzer PLUS.
Descriptive Statistics

The raw data related to biochemical tests were analyzed by using the SPSS programme version of 20 software facilities. The data were expressed as Mean$\pm$ S.D. The computed values of the mean, and standard deviation of the total sample. Frequency distributions were graphically represented in the frequency polygons.

1. Interventional group indicates (*Suryanamaskar*)
2. Control group

This table 1 and figure 1 depict that the level of cholesterol decreases in dyslipidemia interventional group patients i.e., 277.647$\pm$9.73 as compared to dyslipidemia control group patients i.e., 315.453$\pm$14.34 shows the 12 weeks of Yoga protocol intervention had to decrease the cholesterol level and significantly improve the health of patients.
In this table 2 and figure 2 depict that the level of triglycerides decreases in dyslipidemia interventional group patients i.e., 151.719$\pm$15.59 as compared to dyslipidemia control group patients i.e., 206.729$\pm$17.56 shows the 12 weeks of Yoga protocol (*Suryanamaskar*) intervention had decreased the triglycerides level and significantly improve the health of patients and also decrease the chance of health illness.
This table 3 and figure 3 depict that the level of high-density lipoprotein (HDL) i.e., good cholesterol increases in dyslipidemia interventional group patients i.e.,

61.591±9.13 as compared to dyslipidemia control group patients i.e., 57.629±8.72 that shows after 12 weeks of Yoga protocol intervention practice increase the HDL level and significantly improve the health of patients. High levels of HDL cholesterol can lower the risk of heart disease and stroke.

This table 4 and figure 4 depict that the level of very low-density lipoprotein (VLDL) decreases in dyslipidemia interventional group patients i.e., 26.019±4.51 as compared to dyslipidemia control group patients i.e., 37.514±6.21 that shows after 12 weeks of Yoga protocol intervention practice had a significant decrease in the VLDL level and significantly improve the heart health and also seen a decrease in the percentage of triglyceride, which shrink narrow passage and restrict blood flow.

This table 5 and figure 5 depict that the level of low-density lipoprotein i.e., bad cholesterol decreases in dyslipidemia interventional group patients i.e., 90.114±10.21 as compared to dyslipidemia control group patients i.e., 108.991±11.05 shows after 12 weeks of Yoga protocol (*Suryanamaskar*) intervention practice had significantly decreased in the LDL level and significantly improve the heart health and also decrease the risk of heart disease, stroke and any other kind of illness.

This table 6 and figure 6 depict the comparison in the level of low-density lipoprotein (LDL) and high-density lipoprotein (HDL) in dyslipidemia interventional group patients i.e., 2.002±0.27 (post-test) as compared to dyslipidemia control group patients i.e., 2.519±0.71 (post-test) which shows after 12 weeks of the Yoga protocol (*Suryanamaskar*) intervention practice group has significant improvement in the percentage rather than the control group and also improves heart health. This table 7 and figure 7 depict the comparison in the level of total cholesterols and high-density lipoprotein (HDL) in dyslipidemia interventional group patients i.e., 4.011±0.39 (post-test) as compared to dyslipidemia control group patients i.e., 4.241±0.65 (post-test) which shows after 12 weeks of the Yoga protocol intervention practice group has significant improvement in the percentage rather than the control group. The *Suryanamaskar* practice also stimulates the *Pingala nadi* (Right Nostril) which is a symbol of increasing Heat (*Agni tattva*) in the human body that also helps to remove accumulated fat i.e., lipids and control the level of cholesterol.

RESULTS

After data interpretation, it is concluded from the data

analysis it is statistically highly significant ($p < 0.005$). The overall effects of the Yoga protocol (*Suryanamskar*) on the physiological properties of dyslipidemia patients showed that more effective to improve overall health and also decrease the level of cholesterol that improves the health of the heart.

Although, Post-intervention data shows that the patients reported a feeling of betterment physically and psychologically. This indicates the practice of *suryanamaska*r practices helps in prevention and management approaches to overall health. In *Vedic* literature, it also generates the energy of all six chakras which eliminate all kinds of *Vyadi* from the body.

DISCUSSION

As per Yogic literature, *Suryanamaskar* is a symbol that stimulates and regulates all types of 13th Agni including *jatharagni* (digestive fire) in the human body. It indicates that after proper stimulation the *Agni*, level of cholesterol, and other associated problems come under the prevention and curative stage in the human body.

This form of practice can increase the health of the heart and also increase the parasympathetic nervous activity. Thus, it is possible, Yoga can improve the health of blood vessels and the junction of the capillaries.

CONCLUSION

The finding of this study shows that Yoga practice management help to alleviate high cholesterol level and the Yoga intervention program (Only on *Suryanamaskar*) is systematically enhanced the health of dyslipidemia patients.

ORCID

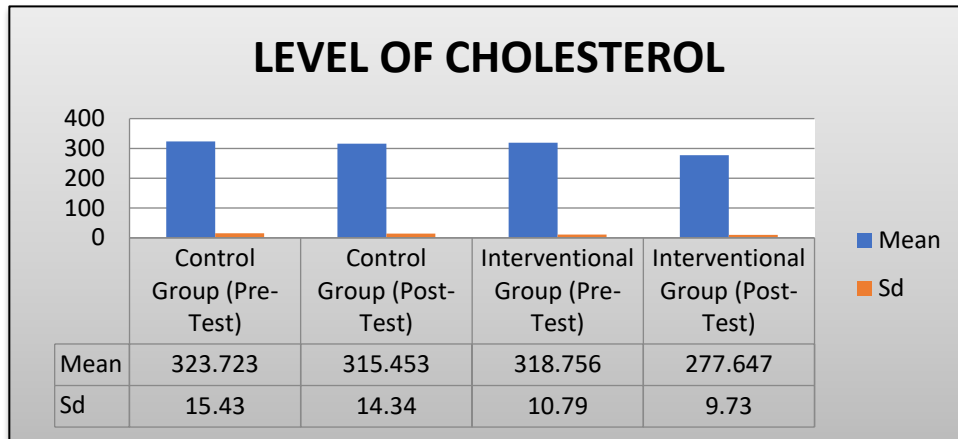*Jaideep Arya* 🆔, https://orcid.org/0000-0002-6482-4493

REFERENCES

1. Ahn, C. H., & Choi, S. H. (2015). *New Drugs for Treating Dyslipidemia : Beyond Statins*. 87–94.

2. Bhatia, S. K. (2010). Coronary Artery Disease Coronary. *Biomaterials for Clinical Applications*, 23–49.

3. Binkoski, A. E., Zhao, G., Coval, S. M., Clemmer, K. F., & Hecker, K. D. (2021). *Dietary fat : assessing the evidence in support of a moderate-fat diet ; the benchmark based on lipoprotein metabolism*. *2002*, 287–298. https://doi.org/10.1079/PNS2002157

4. Djelilovic-Vranic, J., Alajbegovic, A., Zelija-Asimi, V., Niksic, M., Tiric-Campara, M., Salcic, S., & Celo, A. (2013). Predilection role diabetes mellitus and dyslipidemia in the onset of ischemic stroke. *Medical Archives (Sarajevo, Bosnia and Herzegovina)*, *67*(2), 120–123. https://doi.org/10.5455/medarh.2013.67.120-123

5. Ebrahimi, H., Hassan, M., Hashemi, H., & Fotouhi, A. (2016). Diabetes & Metabolic Syndrome : Clinical Research & Reviews Dyslipidemia and its risk factors among urban middle-aged Iranians : A population-based study. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, 1–8. https://doi.org/10.1016/j.dsx.2016.01.009

6. Gaggini, M., Morelli, M., Buzzigoli, E., DeFronzo, R. A., Bugianesi, E., & Gastaldelli, A. (2013). Non-alcoholic fatty liver disease (NAFLD) and its connection with insulin resistance, dyslipidemia, atherosclerosis and coronary heart disease. *Nutrients*, *5*(5), 1544–1560. https://doi.org/10.3390/nu5051544

7. Ghadir, M. R., Riahin, A. A., Havaspour, A., Nooranipour, M., & Habibinejad, A. A. (2010). The relationship between lipid profile and severity of liver damage in cirrhotic patients. *Hepatitis Monthly*, *10*(4), 285–288.

8. GM, K. (2014). Role of Yoga in Chronic Kidney Disease: A Hypothetical Review. *Journal of Nephrology & Therapeutics*, *04*(03). https://doi.org/10.4172/2161-0959.1000167

9. Gupta, R., Rao, R. S., Misra, A., & Sharma, S. K. (2017). Recent trends in epidemiology of dyslipidemias in India. *Indian Heart Journal*, *69*(3), 382–392. https://doi.org/10.1016/j.ihj.2017.02.020

Table 1: Comparative and monitoring the level of cholesterol of pre-test and post-test of the control group and intervention group: A primary data source.
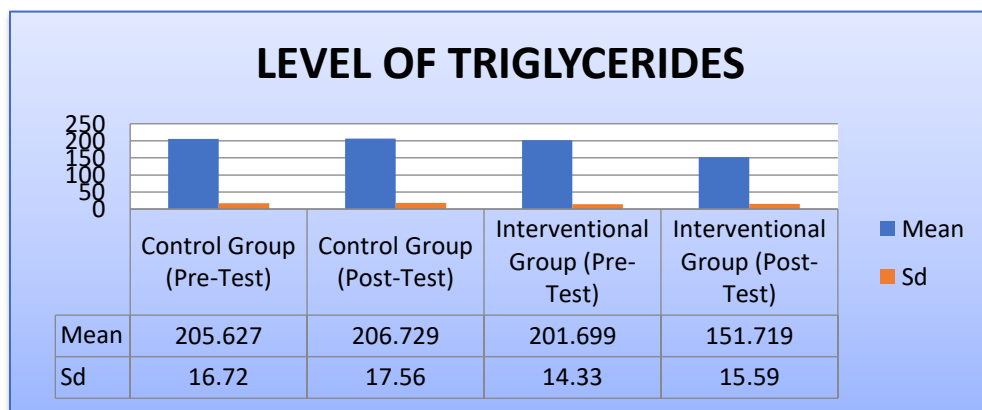
		Pre-test		Post-test	
		Mean	Sd(σ)	Mean	Sd (σ)
1.	Control group	323.723	15.43	315.453	14.34
2.	Interventional group	318.756	10.79	277.647	9.73

LEVEL OF CHOLESTEROL

	Control Group (Pre-Test)	Control Group (Post-Test)	Interventional Group (Pre-Test)	Interventional Group (Post-Test)
Mean	323.723	315.453	318.756	277.647
Sd	15.43	14.34	10.79	9.73

Figure 1: pre and post of analyses of both groups i.e., control group v/s intervention group (*Suryanamskar* protocol) to analyze changes in the level of cholesterol, where (c=30, I=30) and level of significance ($\leq$0.05)

Table 2: Comparative and monitoring the level of triglycerides of pre-test and post-test of the control group v/s intervention group: A primary data source.

		Pre-test		Post-test	
		Mean	Sd(σ)	Mean	Sd (σ)
1.	Control group	205.627	16.72	206.729	17.56
2.	Interventional group	201.699	14.33	151.719	15.59

LEVEL OF TRIGLYCERIDES

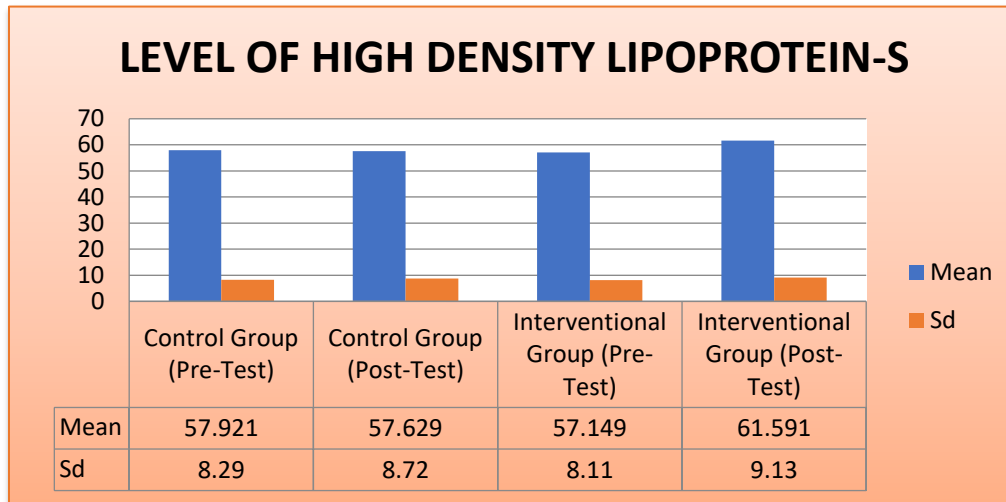|	Control Group (Pre-Test)	Control Group (Post-Test)	Interventional Group (Pre-Test)	Interventional Group (Post-Test)
Mean	205.627	206.729	201.699	151.719
Sd	16.72	17.56	14.33	15.59

Figure 2: pre and post of analyses of both groups i.e., control v/s interventional group (*Suryanamskar* protocol) to examine changes in the level of triglycerides, where (c=30, I=30) and level of significance ($\leq$0.05).

Table 3: Comparative and monitoring the level of high-density lipoproteins of pre-test and post-test of Control group and interventional group: A primary data source.

		Pre-test		Post-test	
		Mean	Sd(σ)	Mean	Sd (σ)
1.	Control group	57.921	8.29	57.629	8.72
2.	Interventional group	57.149	8.11	61.591	9.13

LEVEL OF HIGH DENSITY LIPOPROTEIN-S

	Control Group (Pre-Test)	Control Group (Post-Test)	Interventional Group (Pre-Test)	Interventional Group (Post-Test)
Mean	57.921	57.629	57.149	61.591
Sd	8.29	8.72	8.11	9.13

Figure 3: pre and post of analyses of both groups i.e., control group v/s interventional group (*Suryanamskar* protocol) to examine changes in the level of High-Density Lipoprotein, where (c=30, I=30) and level of significance (≤ 0.05).

Table 4: Comparative and monitoring the level of very low-density lipoproteins of pre-test and post-test of the control group and interventional group: A primary data source.

		Pre-test		Post-test	
		Mean	Sd(σ)	Mean	Sd (σ)
1.	Control group	37.890	5.48	37.514	6.21
2.	Interventional group	36.811	4.89	26.019	4.51
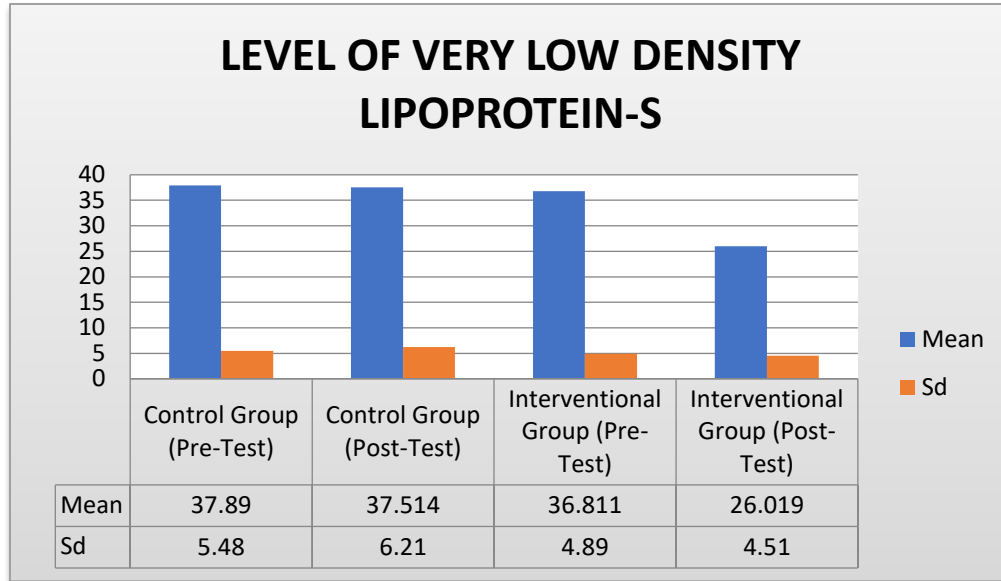
Figure 4: pre and post of analyses of both groups i.e., control group v/s interventional group (*Suryanamskar* protocol) to examine changes in the level of very low-density lipoprotein, where (c=30, I=30) and level of significance (≤0.005).

Table 5: Comparative and monitoring the level of low-density lipoprotein-s of pre-test and post-test of control group and interventional group: A primary data source

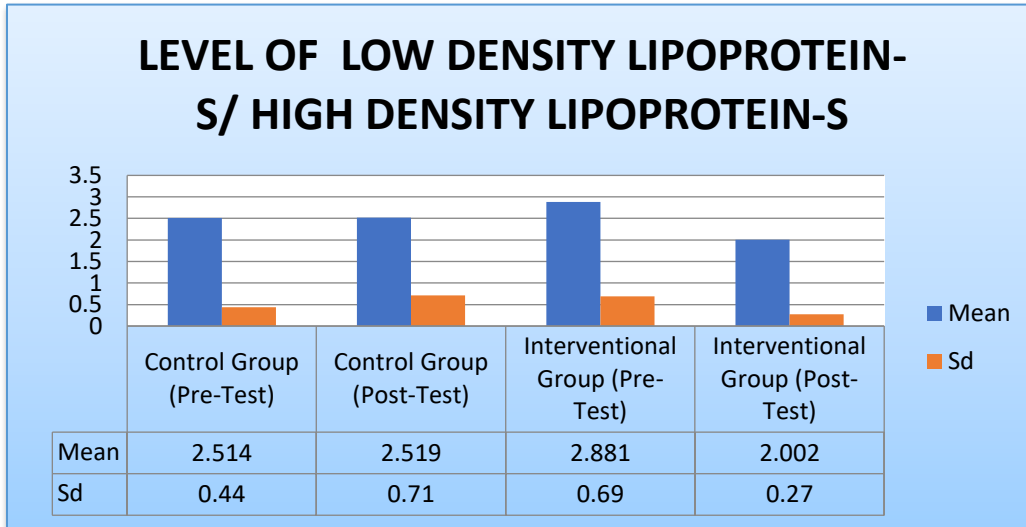|		Pre-test		Post-test	
		Mean	**Sd(σ)**	**Mean**	**Sd (σ)**
1.	**Control group**	*109.791*	*10.51*	*108.991*	*11.05*
2.	**Interventional group**	*110.015*	*9.99*	*90.114*	*10.01*
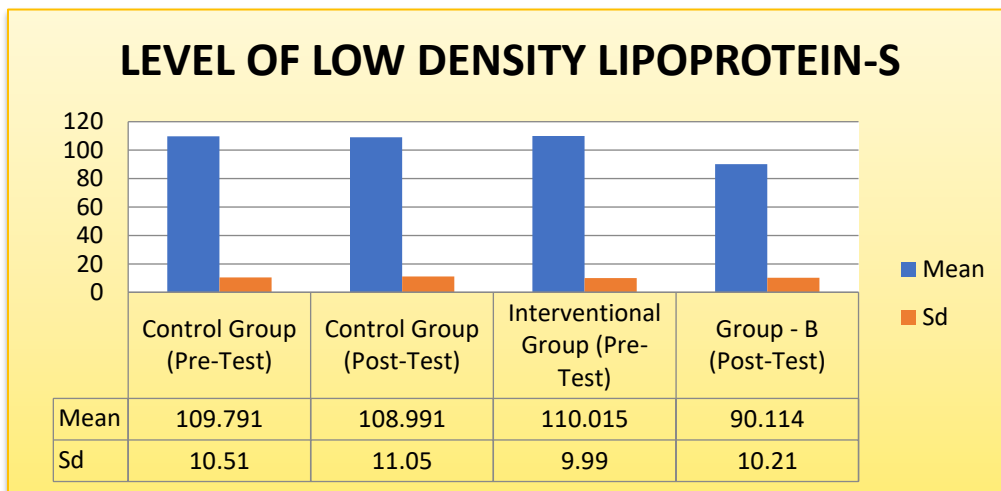
Figure 5: pre and post of analyses of both groups i.e., control group v/s interventional group (*Suryanamskar* protocol) to examine changes in the level of low-density lipoprotein, where (c=30, I=30) and level of significance (≤0.05).

Table 6: Comparative and monitoring the level of low-density lipoprotein-s/high-density lipoprotein-s of pre-test and post-test of the control group and interventional group: A primary data source.
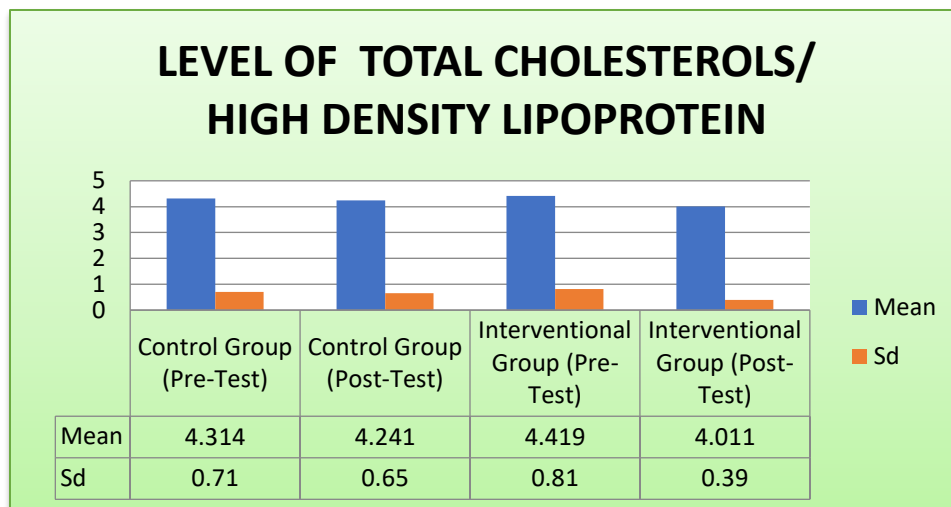
		Pre-test		Post-test	
		Mean	Sd(σ)	Mean	Sd (σ)
1.	Control group	2.514	0.44	2.519	0.71
2.	Interventional group	2.881	0.69	2.002	0.27

LEVEL OF LOW DENSITY LIPOPROTEIN-S/ HIGH DENSITY LIPOPROTEIN-S

	Control Group (Pre-Test)	Control Group (Post-Test)	Interventional Group (Pre-Test)	Interventional Group (Post-Test)
Mean	2.514	2.519	2.881	2.002
Sd	0.44	0.71	0.69	0.27

Figure 6: pre and post of analyses of both groups i.e., control group v/s interventional group (*Suryanamskar* protocol) to examine changes in the level of LDL/HDL, where (c=30, I=30) and level of significance ($\leq$0.005).

Table 7: Comparative and monitoring the level of total cholesterols/high-density lipoprotein of pre-test and post-test of the control group and interventional group: A primary data source.

		Pre-test		Post-test	
		Mean	Sd(σ)	Mean	Sd (σ)
1.	Control group	4.314	0.71	4.241	0.65
2.	Interventional group	4.419	0.81	4.011	0.39

LEVEL OF TOTAL CHOLESTEROLS/ HIGH DENSITY LIPOPROTEIN

	Control Group (Pre-Test)	Control Group (Post-Test)	Interventional Group (Pre-Test)	Interventional Group (Post-Test)
Mean	4.314	4.241	4.419	4.011
Sd	0.71	0.65	0.81	0.39

Figure 7: pre and post of analyses of both groups i.e., control group v/s interventional group (*Suryanamskar* Protocol) to examine changes in the level of total cholesterol/high-density lipoprotein, where (c=30, I=30) and level of significance (≤0.05).