

## A Comparative Study on Step Aerobics Versus Zumba on Blood Pressure and Lipid Profile in Pre-Hypertensive College Students

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### Abstract

Pre-Hypertension stage is a warning sign that may get high blood pressure in future, which will lead further serious complications. There are several life style adjustments like weight control, regular exercise and balance diet in reducing pre-hypertension. Pre-hypertension leads to an early premorbid change in the future development of hypertension. Evidence suggests that Step aerobics and Zumba Training may be the best way to treat Pre-hypertension in college students. To our knowledge there were no studies done comparing Step Aerobics and Zumba. Hence need of the study arises.

**Methods:** Prospective Study Design 66 subjects with mean age of 21 years having a clinical diagnosis of Pre-hypertension were randomly allocated into two groups. Group A received Step Aerobics and Group B received Zumba Training for about 3 sessions a week for 6 weeks. The Outcomes of this Intervention were measured by Sphygmomanometer for Blood Pressure, Blood test for Lipid Profile.

**Results:** Statistical analysis of this data revealed that within group comparison both groups showed significant improvement in all parameters whereas in between group's comparison Zumba Training showed better improvement compared to Step Aerobics.

**Conclusion:** The present study concluded that after 6 weeks of Intervention of both Step Aerobics and Zumba Training showed significant improvement in Blood Pressure and Lipid Profile. Hence, we conclude that Zumba Training is a Suitable Adjunct in improving Blood Pressure and Lipid Profile in Pre-hypertensive College Students.

**Keywords:** Pre-hypertension, Step Aerobics, Zumba, Blood pressure, Systolic Blood pressure, Diastolic Blood pressure, Lipid profile, High density lipoprotein

### INTRODUCTION

Hypertension is also known as high blood pressure. Hypertension is defined as Systolic Blood Pressure as (SBP) >140mmHg or Diastolic Blood Pressure as (DBP) >90mmHg. <sup>(1,2)</sup> It is major risk factor for heart diseases, stroke, kidney failure and premature death. It poses a great burden on both the health system and

economy. Hypertension is one of the most common chronic illness that is described as silent killer. <sup>(3)</sup> The concept of Pre-hypertension was introduced as a new guideline for the management Blood Pressure by the seventh report of Joint National Committee on prevention, detection, evaluation and treatment of

High Blood Pressure (JnC-7) and it is of Systolic Blood Pressure of 120-139mmHg and/or Diastolic Blood or Diastolic Blood Pressure equal to or above 90mmHg<sup>(4)</sup>. In the meantime, it is divided as stage Pressure of 80-89mmHg.<sup>5</sup>Pre- hypertension act as a warning sign in younger age group which indicates the risk of developing hypertension in later life. Pre-hypertension have an increased risk of cardiovascular morbidity and mortality compared with patients who have normal Blood pressure.<sup>(5)</sup> Worldwide prevalence of Pre-hypertension in healthy adults is 36.3%. Prevalence of Pre-hypertension ranging from 20-80%.<sup>6</sup>The overall prevalence of Pre-hypertension in medical students are 43% in men and 35% in women. The prevalence is more in men than women<sup>(6, 7)</sup> It is relatively with the recognized traditional cardiovascular risk factors such as Obesity, Diabetes mellitus and Dyslipidemia. Pre-hypertensive group had higher level of blood `glucose, higher body mass index, lower level of HDL cholesterol<sup>(8)</sup> Exercise training can decrease the blood pressure by reducing the peripheral vascular resistance, and also Sympathetic nervous system activity is of major importance in the development and maintain of hypertensive state.<sup>(9)</sup> Aerobic exercise reduces insulin resistance and insulin levels through complex interactions with endothelial function and sympathetic nervous system activity in reducing blood pressure<sup>(10)</sup> Step Aerobics is mainly focused on cardiovascular fitness and body composition. It includes stepping up and stepping down. It involves choreographed rhythmical movements on step performed to cadenced musical arrangement. Step Aerobics affects mostly the development of cardiovascular and respiratory system.<sup>(11)</sup> Zumba dance is a characteristic of cardiac movement such as jumping, spinning and moving faster. It is the fusion of basic principle of aerobic interval training and strengthening exercise which promotes the consumption of calories improves cardiovascular system.<sup>(12)</sup> Zumba improves fitness and weight loss, reduction in cholesterol level, strengthening the muscles that involved in respiration, to facilitate the flow of air in and out of lungs, improving circulation efficacy and reduce the blood pressure.<sup>(13)</sup> The hypothesis of this study was Zumba training will have significant improvement on Blood pressure and lipid profile when compared to Step Aerobics among subjects with Pre-hypertensive college students.

## MATERIALS AND METHODS

**Study Design:** Prospective Study Design.

**Ethical Clearance and Informed Consent:** The Study protocol was approved by the Ethical Committee of GSL Medical College& General Hospital, Rajamahendravaram (Annexure-I). The investigator explained the purpose of the study and given the subject information sheet. The participants were requested to provide their consent to participation in the study (Annexure-II). All the participants signed the informed consent and the rights of the included participants have been secured.

**Study Population:** Subjects clinically diagnosed with Pre-hypertension by a physician

**Study Setting:** Subjects were recruited from College of Physiotherapy, GSL Institutions, Rajamahendravaram, Andhra Pradesh, India.

**Study Duration:** The study was conducted during the period between July 2019 to June 2020.

**Sampling Method:** Convenience sampling method

**Intervention Duration:** 3 sessions a week for 6 weeks includes Step Aerobics and zumba training.

**Sample Size (n):** A total 185 Pre- hypertensive subjects were screened in that 66 subjects were recruited who met the inclusion criteria and willing to participate in the study. Recruited Participants were explained the purpose and relevance of the study. Those willing Volunteer were included in the study after obtaining Informed Consent. All the eligible Participants were consecutively randomized to either Step Aerobics Group or Zumba training Group with 33 Subjects in each group.

## MATERIALS USED:

Consent form, **Data** collection form, Sphygmomanometer, Stethoscope, Step Aerobics stool Recording Sheet

## INCLUSION CRITERIA

- The age group between 18 to 25 years.
- Pre-hypertension college students diagnosed by physician.
- No previous practice of ZUMBA dance.
- Both male and female students.

- Cholesterol level 41-59mg/dl.

## EXCLUSION CRITERIA

- Musculoskeletal injuries.
- Metabolic / cardio respiratory disorders.
- Students on any medication.
- Cholesterol level >60mg/dl.
- Diabetes.
- Obesity.
- Smokers and alcoholics.
- Psychiatric problems.

**STUDY PROCEDURE:** Total 66 subjects who met inclusion criteria and willing to participate in this study were taken by means of Convenience sampling method. All the Subjects were explained about the Condition and mode of assessment and written an informed consent. Baseline measurements were taken before the treatment intervention and the subjects were randomly allocated in to two Groups A and B Step Aerobics Group and Zumba Training Group and these subjects were scheduled to attend exercise session 3 days a week for 6 weeks.

**10 minutes of Warm up exercises for both interventions:** The warm up exercises consists of basic Aerobic dance movements, muscle toning exercises, slight squats are allowed.

**10 minutes of cool down exercises for both interventions:** End of each session, the subjects were asked to perform cool down exercises followed by stretching exercises, breathing exercises, relaxation exercises.

## GROUP A: (STEP AEROBICS) <sup>(14, 15)</sup>

Exercise session consists:

- A warm up.
- Step aerobic exercise.
- A cool down.

**WARM UP:** In every session warm up consists of 10 minutes dance Aerobics

**STEP AEROBIC PROTOCOL:** Step Aerobics training was performed using the low impact version, in which 1 foot remains in contact with the floor or bench at all times. Therefore, not allowing any

hopping or jumping movements. The Step Aerobics choreographies included patterns such as the conventional basic steps: Step 'V', Step 'L', and Step 'A' to both right and left side; alternating knee-lift sequence; alternating leg up and down patterns and step kicks. Arm movements such as biceps curls and lateral raises at shoulder level. The music cadence of all session was set between 120- and 126-foot strikes per minute.

**COOL DOWN:** A cool down session consists of 10 minutes breathing and flexibility exercise.

**GROUP B: (ZUMBA)<sup>(16)</sup>:** Basic principles of zumba exercise:

- Warm up.
- Main part of work out.
- Cool down and stretching.

**WARM UP:** Warm up has contained basic dance steps (march, step touch, side to side) with gradually increasing the tempo of music (120-135bpm), without any leaps and jumps. The second part of the warm up is to muscle toning exercise were performed with soft intensity through dance variations, slightly squats were allowed (tempo 125-140bpm). The goal of warm up is to Increase body temperature, muscle blood flow, joint mobilization and the psychological preparation as well. The total warm up time was 8-10 minutes (tempo 120-140 bpm).

**ZUMBA TARINING PROTOCOL:** The Zumba training was performed with 8-10 zumba fitness songs. The exercise movements and intensity are related with tempo of the music (tempo between 140-160 bpm). Each dance, lasting for 3-5 minute, with pause 15-30sec. At the end of the main part of the training is that trainees enjoy the music and dance at the same time practicing.

**COOL DOWN:** The final part of the training contained easy dance movement with soft music with mental and physical relaxing process. Stretching was performed for muscle relaxes and to prevent muscle soreness, and to increase body flexibility too. There were not any jumps or squats allowed, and all the movements were performed in lying or standing position.

## STATASTICAL ANALYSIS

Statistical analysis was performed by using SPSS software version 21.0 and Microsoft excel-2007. Descriptive data was presented in the form of mean  $\pm$  Standard deviation and mean difference percentages were calculated and presented.

**BETWEEN THE GROUPS:** Independent student “t” test was performed to assess the statistically significant difference in mean value between the Groups for Blood Pressure and Lipid Profile

**WITH IN THE GROUPS:** paired student “t” test was performed to assess the statistical difference with in the group for Blood pressure and Lipid Profile from Pre-test and Post-test values of pre-hypertensive college students. For all statistical analysis P-Value < 0.05 was considered as statistically significant with 95% confidence intervals.

## RESULT:

The aim of the study was to find the effectiveness of Step Aerobics versus Zumba on Blood pressure and Lipid profile in subjects with Pre-hypertensive college students.

The consort flow chart of the study showed the study organization in terms of subjects screening, random allocation and analysis following the intervention.

A total of 185 subjects were screened for eligibility, amongst 66 subjects were recruited in to the study. All the subjects who meet inclusion criteria have undergone baseline Assessment and included subjects were randomized into two equal groups in which Group A consists of 33 subjects and Group B consists of 33 subjects.

The results of this study were analyzed based on the outcome parameter, Blood pressure by Sphygmomanometer, Lipid profile by Blood test.

## DISCUSSION

The Aim of the study was to evaluate the effectiveness of Step Aerobics versus Zumba on Blood Pressure and Lipid Profile in subjects with Pre-hypertension. Since there have been no previous studies comparing the Step Aerobics to Zumba Training on improving the Blood Pressure and Lipid Profile in Pre-hypertensive subjects. To our knowledge, this is the first study to demonstrate that supervised Zumba Training was more effective than Step Aerobics in improving Blood Pressure and Lipid Profile in subjects with Pre-hypertension in College Students.

In this study Pre-hypertensive subjects who underwent Step Aerobics or Zumba Training for 6 weeks, and the parameters are measured before and after the interventions which includes Blood Pressure and Lipid Profile. These parameters are used to assess the cardiovascular fitness in subjects with Pre-hypertension.

The results of this study revealed that there is statistically significant difference between pre and post values of Zumba Training in improving Blood Pressure and Lipid Profile after 6 weeks of intervention in subjects with Pre-hypertension in College Students.

According to the present diagnostic criteria of Hypertension, Pre-hypertension is regarded as normal BP that needs not to be treated. However, the increasing of BP and increasing of cardiovascular disease is slow evolving process an research shown that those with Pre-hypertension are at higher risk for Hypertension and cardiovascular disease compared with normotensive individuals, the common carotid artery intima-media thickness and left ventricular mass of prehypertension are significantly higher, which shows that pre-hypertension is highly associated with subclinical atherosclerosis and target organ damage. Therefore, it is essential to find a non-pharmacological way to treat Pre-hypertension.<sup>(17)</sup>

Zumba training was considered to be a great cardiovascular exercise that helps in strengthening the heart and muscles to provide more oxygen to be transported throughout the body effectively and it maintains high lung efficiency. The movements involved in Zumba that will ensure normal heart rate by lowering the blood pressure. Zumba also helps in stimulating certain hormones such as norepinephrine, serotonin and dopamine required to improve mood and increase the energy levels which can overcome stress. Zumba stimulate the release of hormone endorphins to reduce the stress causing hormone such as cortisol and adrenaline.<sup>(18)</sup>

Jitesh et.al, In their study, showed that Systolic and Diastolic Blood pressure are found to be decreased in relative rate after the practice of Zumba dance. The result will show that there is reduction in Blood pressure by 3.33mmHg in Systolic and 3.2mmHg in Diastolic. Thus, shows that zumba dance have significantly reducing in blood pressure without intake of blood pressure reducing pills.<sup>(19)</sup>



Nurliyana Hannah et.al, reported that Zumba facilitates in stress relief both internally and externally by proving a way for an individual to deal with any condition that may lead to stress. All the movements involved in zumba helps in overcoming the stress of weight gain as they allow an individual to lose weight and becoming fit and at the same time, they burning 1000 calories in an hour. <sup>(20)</sup>

Step Aerobics (SA) had become a very popular exercise modality for the fitness industry. Step Aerobics involves stepping up and down on a single bench to choreographed grouped- led movements to cadenced musical arrangement. <sup>(21)</sup> Aerobic exercise Training plays an important role in treatment strategy for Hypertensive control. Aerobic exercise should prevent the age associated vascular endothelial dysfunction. It can reduce Blood Pressure via improving vascular stiffness and endothelial function. Although cardiovascular fitness was also increased with bench step aerobics. <sup>(22)</sup>

Whelton et.al, reported that confirmed the positive impact of Aerobics exercise on reduction of Blood pressure. It showed that aerobic exercise decreases Blood pressure by reducing the levels of triglycerides and low-density lipoprotein and loss of excess body fat. It also increases oxidation of total body fat and activates lipoprotein lipase which plays an important role in lowering Blood pressure. <sup>(23)</sup>

S. R Collier et. Al, reported that effect of four weeks of Aerobic and resistance exercise training on arterial stiffness, blood flow and blood pressure in Pre-hypertension and stage-1 hypertension founds that resistance exercise training resulted in increased arterial stiffness whereas aerobic exercise training decreased arterial stiffness in individuals with Pre-hypertension to essential Hypertension despite similar reduction in Blood pressure. <sup>(24)</sup>

Our study supported by Jen-Chen Tsai et, al. in their study regular Aerobic exercise of mild-to moderate intensity reduces Blood Pressure and improves Lipid profile in Hypertensive patients. <sup>(25)</sup>

The present study showed an improvement in all outcome parameters which include Blood Pressure and Lipid Profile in both Step Aerobics and Zumba Training. But when compared to Step Aerobics, Zumba Training showed more improvement this is may be due to reduced Blood Pressure and activate

muscle lipase and increase High Density Lipoprotein cholesterol.

The result of the present study showed that both groups showed statistically significant difference from pre to post intervention however Zumba Training group showed greater improvement than Step Aerobics group.

However, according to my anticipation the SBP, DBP & HDL levels are significantly accepted determinants of controlling Blood pressure and improved by Zumba training technique than Step Aerobics exercise program by the end of 6 weeks of treatment.

## CONCLUSION

After Six weeks of Intervention both Step Aerobics group and Zumba Training group were shown significant improvement in Blood Pressure and Lipid Profile in Pre-hypertensive College Students. However, Zumba Training Group was shown greater percentage of improvement when compared to Step Aerobics Group. Hence, we conclude that Zumba Training is a suitable adjunct to Physiotherapy treatment in subjects with Pre-hypertensive College Students.

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## TABLES

**Table-1 Analysis of Mean scores of SBP from Pretest to Posttest within Group-A**

		Mean	SD	P-Value	Inference
<b>GROUP A</b>	PRE	127.90	3.37	0.0001*	HIGHLY SIGNIFICANT
	POST	122.10	2.57		

**Table-2 Analysis of mean scores of SBP from pretest to posttest within Group-B**

		Mean	SD	P-Value	Inference
<b>GROUP B</b>	PRE	126.63	3.23	0.0001*	HIGHLY SIGNIFICANT
	POST	119.97	1.02		

**Table-3 Comparison of SBP Mean scores of SBP between the Group A & B**

		Mean	SD	P-Value	Inference
PRE	GROUP A	127.90	3.37	0.1493	INSIGNIFICANT
	GROUP B	126.63	3.23		
POST	GROUP A	122.10	2.57	0.0001*	SIGNIFICANT
	GROUP B	119.97	1.02		

**Table-4 Analysis of Mean Scores of Lipid profile (HDL) from pretest to posttest Within Group-A**

		Mean	SD	P-Value	Inference
<b>GROUP A</b>	PRE	44.03	1.66	0.0001*	HIGHLY SIGNIFICANT
	POST	47.56	2.78		

**Table-5 Analysis of Mean scores of Lipid profile (HDL) from pretest to posttest within Group-B**

		Mean	SD	P-Value	Inference
<b>GROUP B</b>	PRE	45.27	3.84	0.0001*	HIGHLY SIGNIFICANT
	POST	51.03	3.94		

**Table-6 Comparison of Lipid profile (HDL) scores between the Group A&B**

		Mean	SD	P-Value	Inference
PRE	GROUP A	44.03	1.66	0.1201	INSIGNIFICANT
	GROUP B	45.27	3.84		
POST	GROUP A	47.56	2.78	0.0003*	SIGNIFICANT
	GROUP B	51.03	3.94		

**Table-7 Analysis of Mean Scores of DBP from pretest to posttest within Group-A**

		Mean	SD	P-Value	Inference
GROUP A	PRE	85.70	2.52	0.0001*	HIGHLY SIGNIFICANT
	POST	82.03	1.62		

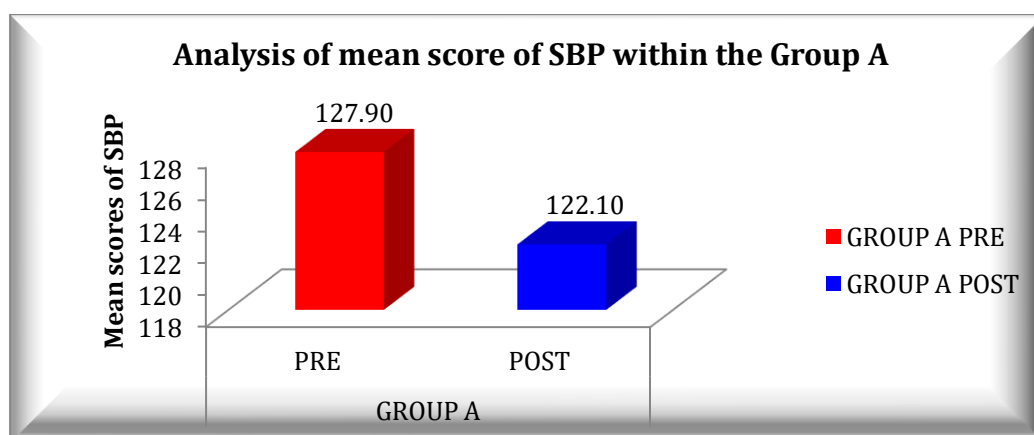
**Table-8 Analysis of Mean scores of DBP from pretest to posttest within Group-B**

		Mean	SD	P-Value	Inference
GROUP B	PRE	85.30	2.45	0.0001*	HIGHLY SIGNIFICANT
	POST	80.17	0.93		

**Table-9 Comparison of mean scores of DBP scores between the Group A&B**

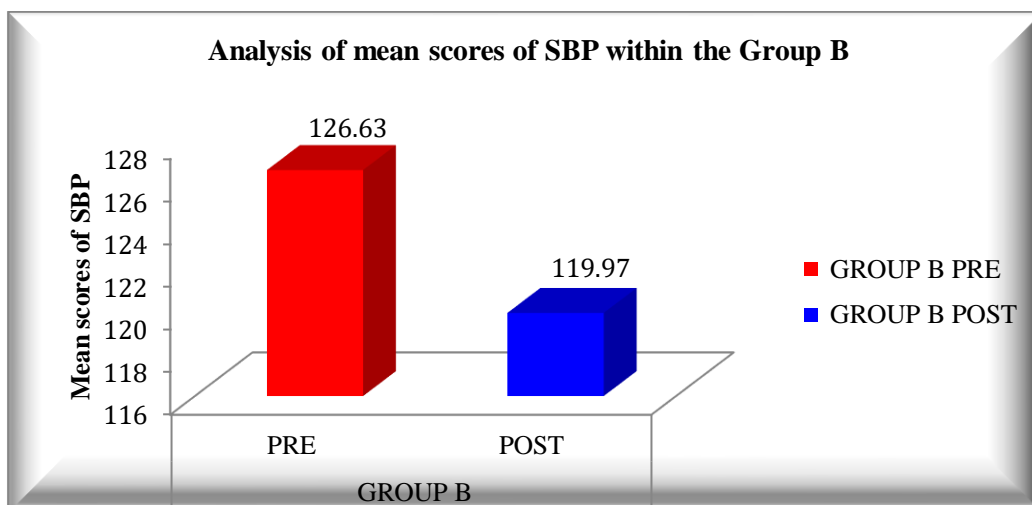
		Mean	SD	P-Value	Inference
PRE	GROUP A	85.70	0.58	0.5423	INSIGNIFICANT
	GROUP B	85.30	0.56		
POST	GROUP A	82.03	0.44	0.0001*	SIGNIFICANT
	GROUP B	80.17	0.48		

## FIGURES

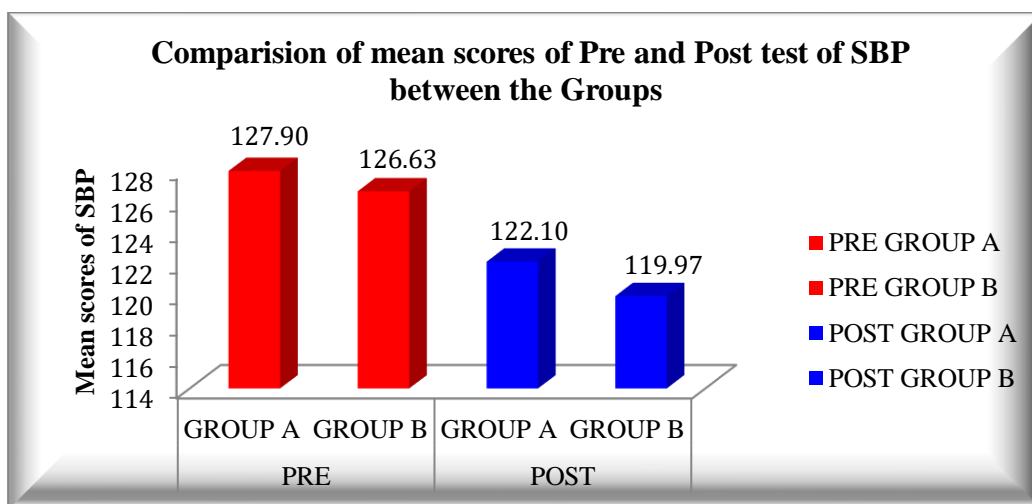
**Figure-1: Analysis of Mean scores of SBP from Pretest to Posttest within Group-A**



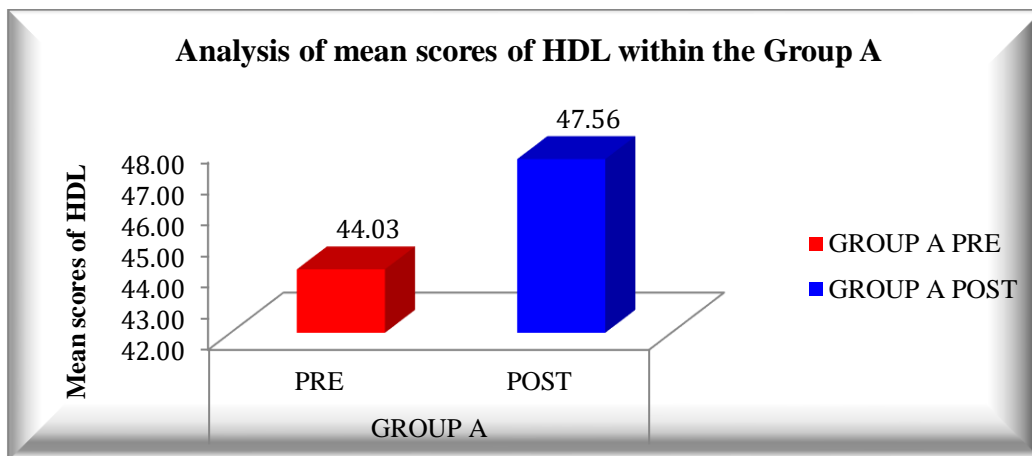
**“Figure-2: Analysis of mean scores of SBP from pretest to posttest within Group-B**



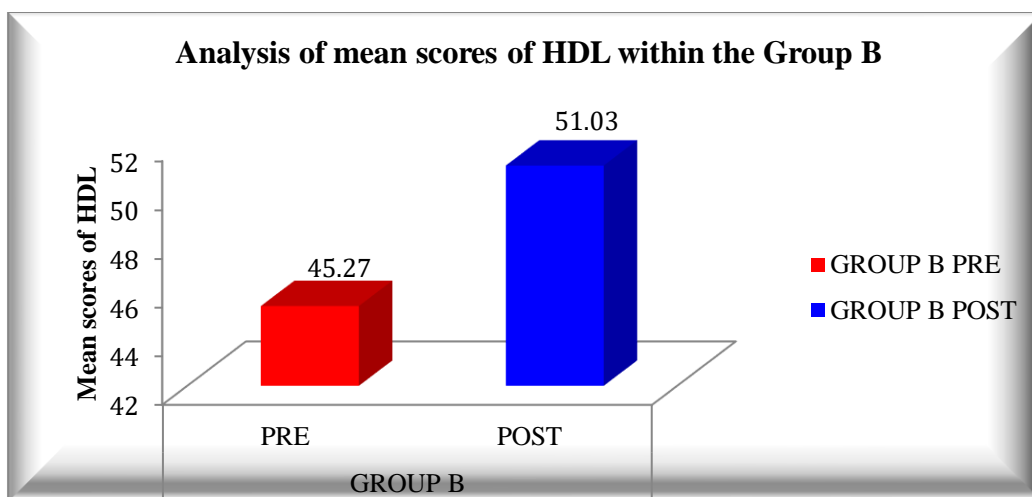
**“Figure -3: Comparison of SBP Mean scores of SBP between the Group A& B**



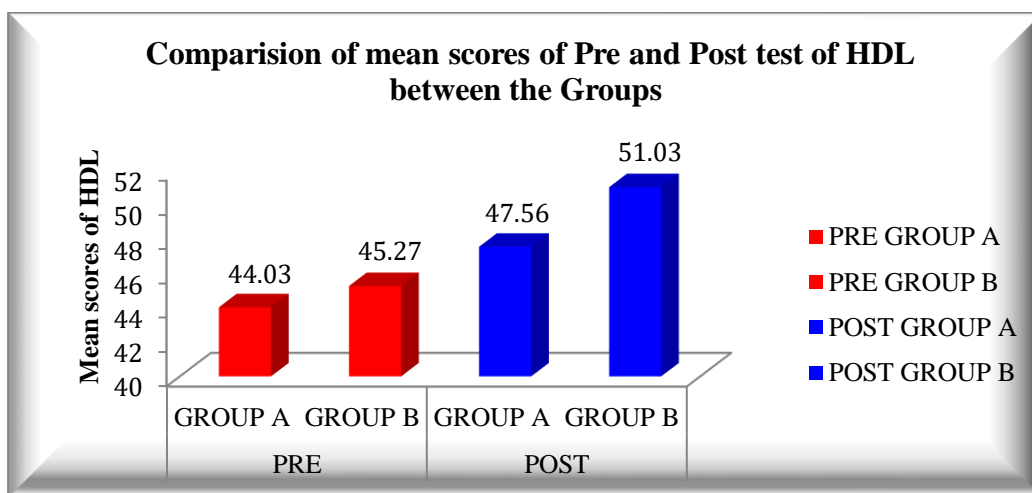
**“Figure -4: Analysis of Mean Scores of Lipid profile (HDL) from pretest to posttest Within Group-A**



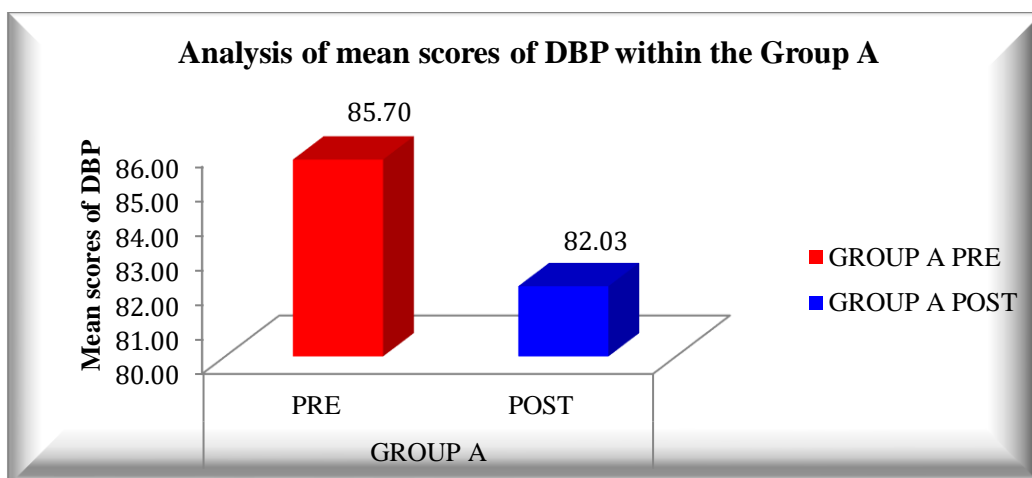
**“Figure- 5: Analysis of Mean scores of Lipid profile (HDL) from pretest to posttest within Group-B**



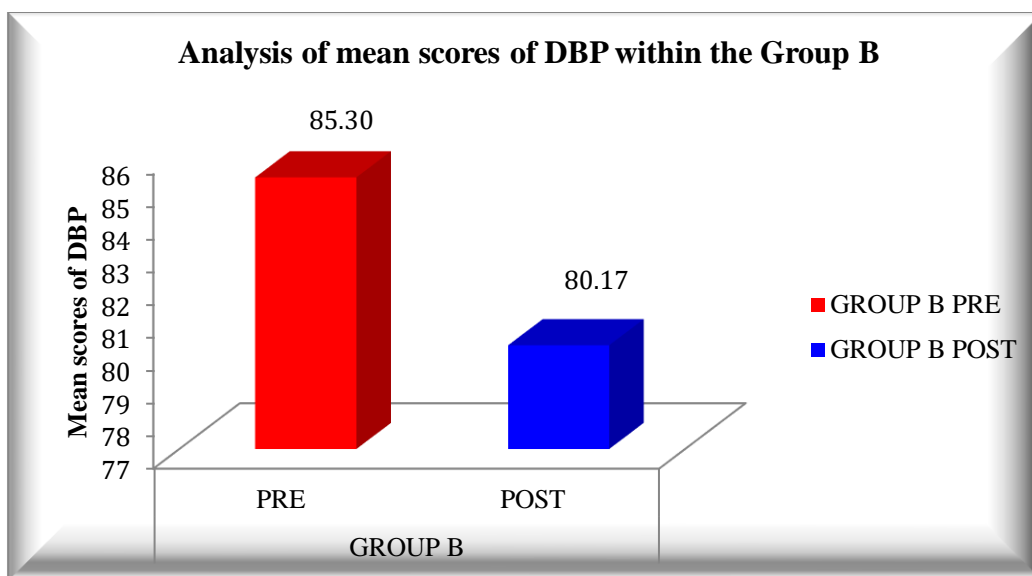
**“Figure-6 : Comparison of Lipid profile (HDL) scores between the Group A&B**



**“Figure-7: Analysis of Mean Scores of DBP from pretest to posttest within Group-A**



**“Figure-8: Analysis of Mean scores of DBP from pretest to posttest within Group-B**



**Figure-9: Comparison of mean scores of DBP scores between the Group A&B**

